Global Scientific JOURNALS
GSJ: Volume 8, Issue 2, February 2020, Online: ISSN 2320-9186
www.globalscientificjournal.com

A REVIEW ON SAFETY CLIMATE FACTORS IN NIGERIAN CONSTRUCTION SYSTEM

Chijioke Osuji[1] J.N Ugbebor[2] J.C Igwe[3]

[1,2] Center For Occupational Health, Safety And Environment Institute of Petroleum Studies, University of Portharcourt Rivers State, Nigeria

[3] Department of Pure and Industrial Chemistry, Abia State University, Uturu Abia State Nigeria

Abstract

This review presents an outline of related writing about safety climate compliance. In particular, it covered the hypothetical investigations which incorporates the core importance of safety climate; safety climate versus safety culture; the multidimensional idea of safety climate; connections between safety climate and safety execution; the results of safety climate; the safety climate factors. It likewise surveyed the historical points of view of safety execution; the theoretical framework of safety practices with particular research on the refinement amongst compliance and participation; the extension of the idea of safety performance. However, particular consideration was given to the applicable empirical literatures connected with safety climate factors and compliance; administration commitment regarding safety as a segment of safety climate; safety training as a segment of safety climate; employee's involvement in safety and security as a segment of safety climate; safety communication and criticism as a segment of safety climate and safety execution.

Key words: Safety, Construction, Climate factor, Safety performance, Empirical model

1.0 Introduction

The construction industry is noted for steadily high incidence rates which has resulted in different injuries and fatalities in itsworksites (Grill *et al*., 2015). It is estimated that in 2003, over 260000 occupationally related accidents and resultant injuries occurred, yet grossly underreported (Hamalianen *et al.*, 2009). Evidently, it is noted that the construction industry is the most exceedingly terribly affected among every single work related segment of the society (Health and Safety Executive, 2010). Also, Mouleeswaran (2014) concurs that the infrastructure related development industry still records for an unbalanced number of occupational related fatalities in spite of recent endeavors to enhance safety among workers and in workplaces.

Relatedly, Sousa *et al.* (2014) contends that the rate of mishaps is as yet the most astounding in the construction industry in spite of the generous upgrades accomplished in safety and security as the years progressed. Seemingly, a workforce that is sound in health is a basic achievement factor to corporate organisations (Lipstein and Kellermann, 2016). Likewise, most mishaps in work environments and particularly the thereby further exerting the need to integrate health and safety activities to the general management of organizations has been ascribed to human exercises and related mistakes (Raviv *et al.*, 2017).

The construction industry is no doubt the backbone of economic and social development of every nation. Through its forward and backward linkages, it connects all other sectors of the economy and serves as the rallying point for national development (Okoye, 2016). Raheem and Issa (2016) opined that there are growing concerns on why construction industry's occupational accident rates have remained high in the world especially, the developing countries. According to the National Bureau of Statistics (2010-2015), the construction industry contribution to the Nigeria Gross Domestic Product (GDP) was 2.88% in 2010; 3.31% in 2011; 3.05% in 2012; 3.59% in 2013; 3.82% in 2014; & 3.88% in 2015. Contributing a total of N121, 900.86 million Naira of the Gross Fixed Capital Formation; and employed 6,913,536 personnel excluding the casual workers in 2012. When compared against other subsectors of the Nigeria economy, the industry ranked 7th in the contribution to GDP in 2015.

Despite the construction industry's contributions to economic development, the industry is still facing untold challenges especially in the developing countries and Nigeria is not an exception (Laryea, 2010). In terms of safety performance however, the construction industry has performed abysmally (Ling*et al.*, 2012).Janackovic *et al.*(2013)infers that as a complex, dynamic and challenging sector, the construction

workforce, as a whole, comprises a diverse mix of races, socio-economic groups and cultures which makes the construction process more challenging. As noted by Huang and Hinze (2006)some dramatic improvements had taken place over decades and yet Alkilani *et al*. (2013)argued that the safety record in the construction industry continues to be one of the poorest, thus, continues to hinder safety performance assessment and improvement. Sousa*et al*. (2014) suggested that this high percentage could be due to many factors related specifically to the construction industry, e.g. dynamic with a constant changing environment where it is normal to have a number of work teams in the same area of the construction site working on different tasks and changing as the project proceeds.

Comparatively, in Saudi Arabia for instance, the construction industry is considered a major contributor to work accidents (Mosly, 2015). According to Gosi (2015), the total number of reported work accidents in 2014 was about 69,241 accidents of which the construction industry accounted for 51.35% of these accidents. The USA witnessed 8,993 deaths at construction workplaces during the period 2003 to 2011, which is the highest number of fatalities among deaths occurring in other industries (Mahmoudi*et al.*, 2014).The Labour Statistics of Taiwan puts the fatalities rate per 1,000 workers in the Taiwanese construction industry at 0.13 in 2008, which is much higher than the fatality rate from accidents in other industries (Cheng *et al.*, 2012). The Tanzanian, construction industry was ranked the second most dangerous industry after mining due to a constant increase in fatalities and permanent disabilities that has been experienced in the country (Phoya, 2012). A cross-sectional survey by Irumba (2014), analysed accidents in the construction industry in Kampala, Uganda and indicated an injury rate in Kampala alone of 3,797 per 100,000 workers and a fatality rate of 84 per 100,000 workers in 2012, which are higher accident and fatality rates. In addition, Maano and Lindiwe (2017) cited the increasing injuries and fatalities in the South Africa's construction industry was evidenced by the 2010 and 2011 fatality and injury rates which stood at 19.2 and 14,626 per 100,000 workers, respectively.

There are growing concerns by the modern research scholars on why construction industry's occupational accident rates have remained high in the world especially, the developing countries (Raheem and Issa, 2016). Complimentarily, according to Neal *et al*. (2000), in recent years, there has been a shift on emphasis within the safety literatures, away from individual level factors that might be responsible for accidents and incidents, such as error or non-compliance with safety procedures, towards organizational factors, such as safety climate. As noted earlier, accidents in organizations is a factor of human-related activities, therefore it is critical to also identify and suggest human-factor related activities in addressing safety-related challenges in the form of compliance to safety in construction sites. Zohar (1980) noticed that safety climate is a depiction of shared workers view of how safety and security administration is being operationalized in the working environment and at a specific minute in time. Zohar (2000), additionally clarified that these unmistakable recognitions give a sign of the (genuine) need of safety in an association with respect to different needs, for example, creation or quality.

In the course of the most recent 25 years, safety climate studies has taken four main headings which are; (a) planning psychometric measurement instruments and undercovering their basic factor structures (Zohar, 1980); (b) developing and testing theoretical/hypothetical models of safety climate to find out determinants of safety conduct and accidents (Brown *et al.*, 2003) (c) investigating the connections between safety culture and authoritative climate (Silva *et al.*, 2004), and (d) analysing the connection between safety climate discernments and real safety compliance (Glendon and Litherland, 2001). Safety climate has been a profitable concept to enhance safety in the previous couple of decades (Zohar, 2010).

In the Nigeria, a couple of studies have been done in connection to safety climate and safety execution.The most noticeable safety climate factors distinguished by Health and Safety Executive (2010) are, conviction and value; administrative commitment; risk level and hazard identification; administration proficiency; labourer's inclusion and responsibility; security foundations and authorities; safety education and training; site administration; and institutionalization. Strikingly, administration duty; security instruction and preparing; and convictions and observations is by all accounts the most noticeable.

2.1 Theoretical framework

2.1.1 The concept of safety climate

The original paper on safety climate defined it as "shared employee perceptions about the relative importance of safe conduct in their occupational behaviour" (Zohar, 1980). This definition identifies safety climate as consensual or shared social cognition regarding the relative importance or priority of safety versus productivity at the workplace. Such socially shared ideas try to educate employees of administration sense of duty regarding their safety and health, controlling proper undertaking practices amid work including physical dangers.

Safety climate observations develop by sharing individual encounters that educate workers of the degree to which administration puts resources into their insurance at the workplace (as opposed to production),

leading them to develop congruent behaviour-outcome expectations and act accordingly (Pousette *et al.*, 2008). Characteristically, safety climate informs employees about the priority of safety during production processes involving physical or health risks, resulting in compatibly adjusted role behaviour. A positive safety climate will increase the frequency of safety behaviour among employees working in hazardous environment and vice versa (Colley *et al.*, 2013).

Policy strategies, procedures, and practices constitute the framework of the organisational condition, climate perception as request looking for elucidations of the environmental to the idea of connections between or the relative needs among these components as opposed to the translation of individual components in isolation (Colley *et al.*, 2013).Hence, safety climate identifies with imparted observations with respect to the need of safety policy strategies, procedures and practices, and the degree to which safety and security compliant or improving conduct is upheld and compensated at the working environment (Zohar, 2000). The more reasonable and thorough safety strategies are and the all the more every now and again they are imparted and actualized amid generation forms, the more prominent is seen administration sense of duty regarding representative assurance, constituting the centre importance of safety climate (Zohar, 2000).

2.1.2 Safety Climate Versus Safety Culture

Safety climate and safety culture are often used interchangeably. However, they are quite distinct in scope and meaning. Utilizing the organisational climate and culture literary works as rules and guidelines, safety alludes to employees' observations in regards to the need of safety. The targets or referents of such climate perceptions, according to the organizational culture literature relate to surface-level expressions, or artefacts of underlying, deeper-level elements such as safety-related beliefs and values (Tholen *et al.*, 2013). However, because each deep-level element can express itself by a large number of artefacts, there is a few-to-many mapping such that few deeper-level elements can produce a large variety of surface-level elements. As a result, perceptions of surface-level elements cannot be used to decipher the identity of deep-level (and subconscious) elements (Nadhim *et al.*, 2016). Safety culture is those things however centred altogether on how safety is perceived by and large inside an organization and whether it is at last organized or not. A decent safety culture is one that puts security first constantly, trains staff, has worked in systems and checks and encourages confidence among workers, open discourse and shared duty (amongst other things) (Stock and McFadden, 2017). Hence, safety climate is a reflection of safety culture (Zohar and Hofmann, 2012).

2.1.3 The Multidimensional Nature of Safety Climate

Griffin and Curcuruto (2016) recorded that a noteworthy theoretical and down to earth challenge has been achieving significant level of consensus about constituent components of safety (Christian *et al.* 2009; Zohar 2010). The scope of variables that may be incorporated is wide, including impression of formal practices, for example, training and additionally more casual procedures, for example, group relationship (Christian *et al.* 2009). As noted previously, one must separate the substance of safety climatic observations from other individual discernments, for example, hazard evaluation and demeanours toward safety (Huang *et al.* 2006). Clarke (2006) meta-examination inspecting 22 experimental investigations distinguished theoretical perplexity in measures of safety climate, prompting an assortment of models that conflated recognitions and attitudes. Furthermore, different investigations included develops, for example, auras, convictions, hazard recognitions, and work stressors as components of safety climate. It was hard to find out an unmistakable connection between safety climate and safety results since key connections were clouded by conglomeration crosswise over various psychological constructs, and by overlap among safety and non-safety factors (Wallace *et al.* 2006). Clarke (2006) meta-investigation demonstrated that all the more obviously characterized perceptual ways to deal with safety climate tended to expand the prescient power for results, for example, word related accidents.

Review of available literatures have distinguished more than 50 distinct factors or reasonable topics that have been incorporated into safety climate surveys (Flin *et al.*, 2000; Guldenmund 2000). Griffin and Neal (2000) distinguished three general domain of safety and security administration in an association. These are: general policies, formal procedure systems, and work practice relating to safety advancement in the working environment. Cases of particular practices incorporating safety correspondence, safety preparing through education and training, and safety administration frameworks. Through the encounters of employees as identify with these parts of the association amid day by day interactions, employees build up a bound together impression of the need of safety generally speaking in the working environment (Zohar 2008). The vast majority of the scientific investigations on safety climate has concentrated on surveying experimental models as opposed to creating theoretical/hypothetical systems about the substance and impacts of safety climate. Empirical issues incorporate the dimensionality of safety climate, for example, the factor structure of estimation scales and their

prescient legitimacy for an assortment of safety outcomes (Clarke 2006). In spite of the decent variety of measurements portrayed in literatures, the different definitions and measures demonstrate some shared characteristic across core conceptual themes. Key subjects incorporate the impression of administrative responsibility for safety and security, safety frameworks and techniques, and preparing and competence frameworks identified with working securely (Griffin and Curcuruto, 2016).

2.1.4 Relationships Between Safety Climate and Safety Performance

Social exchange theory and anticipation-valence theory are two hypothetical components that may clarify and foresee the connection between safety climate and safety conduct (Neal and Griffin, 2006). Social exchange theory hypothesizes that, when an association watches over the prosperity of workers (i.e., the association has a positive safety climate), the workers are probably going to create verifiable commitments to perform obligations, utilizing conduct helpful to the association. Apart from their standard core work duties, they also perform organizational citizenship behaviour, i.e., extra-role functions other than core work activities. Hofmann and Morgeson (1999) have discovered that when an association stresses more on safety and wellbeing, its employees respond by consenting to set up safety and security techniques (Neal and Griffin, 2006).

The expectancy-valence theory hypothesizes that inspiration is a mix of workers' valence, hope and instrumentality. Valence is the profundity of need that a worker has for extrinsic/outward (e.g. promotion, advancement) or intrinsic (e.g. fulfilment/satisfaction) rewards. Expectations refers to level of certainty an employee is equipped for accomplishing the objectives of a work order. Instrumentality is a worker's view of being compensated as guaranteed by the administration (Vroom, 1964). As far as safety execution is guaranteed, workers will act securely when they see that such conduct will bring esteemed intrinsic or extrinsic outcomes. At the point when an association genuinely values safety and wellbeing of employees, there is an abnormal state of safety climate in the association. In view of behaviour-outcome expectancy, workers are probably going to act securely in light of the fact that they expect that their safety and wellbeing conduct would be remunerated and such conduct would convey a profitable result to them (Neal and Griffin, 2006).

2.1.5 Consequences of Safety Climate

Zohar (2014) introduced safety climate as a facet-specific construct that is required to foresee harmonious results, that is, safety execution and occupational accident bringing about substantial body injury and/or property or environmental harms. Since routine tasks execution can be refined at various levels of safety and wellbeing, safety behaviour must be roused by intrinsic or extrinsic factors. Person-related, or intrinsic factors that have been shown in recent meta-analytic studies to affect safety behaviour include personality dispositions such as conscientiousness (Christian *et al.*, 2009) and agreeableness (Clarke, 2006), organizational commitment and job satisfaction (Clarke, 2010), and occupational stress and burnout (Nahrgang *et al.*, 2011).

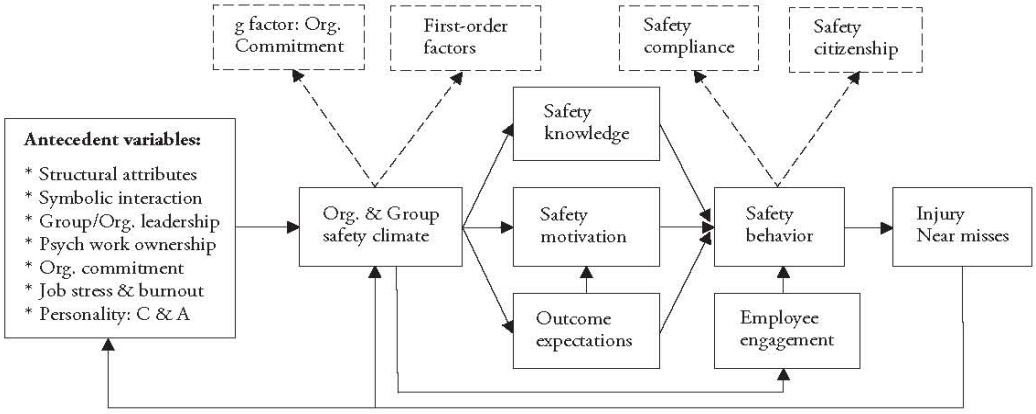

Figure 2.1: Conceptual model of safety climate with antecedent and outcome variables*(Source: Zohar, 2014)*

Path models tested by the preceding group of meta-analytic studies indicated, however, that safety climate perceptions, relating to extrinsic or contextual factors, offered significantly stronger prediction of safety behaviour and subsequent accidents. Furthermore, other person-related factors that have long been assumed to predict safety behaviour, such as fatalistic safety beliefs and attitudes Example: “accidents will happen no matter what I do” (Williamson *et al.*, 1997), failed to be supported in meta-analytic path models. Safety climate illustrates, in this way, that social development of reality, bringing about the rise of any aspect particular to organizational climate, has a functional value, improving worker acclimation to complex situations describing work organization. Notwithstanding clarifying the safety climate – conduct relationship in expectancy theory

terms, utilizing extrinsic safety motivation as a climate driven mediator variable, a second arbiter variable, safety learning has been utilized to clarify this relationship (Neal and Griffin, 2006).

Safety climate, demonstrative of the apparent prioritization of this feature, has been expected to advance safety and wellbeing learning and aptitudes in view of the more organized execution viewpoints at work are probably going to be better observed by supervisory staff, leading employees to put resources into expertise acquisition as a methods for execution improvement. In other words, because (safety) performance improvement depends on acquisition of relevant knowledge and skills, safety climate level will affect eff orts invested in their acquisition. Safety knowledge and skills can be mapped on a continuum extending from awareness of simple safety rules and regulations to more refined, discretion-based actions in complex situations, indicative of increasing professional expertise (Lipshitz *et al.,* 2001; Shattuck and Miller, 2006; Crandall, et al., 2006).

As noted, recent meta-investigations support the robustness of the safety climate-outcome connections crosswise over enterprises and nations (Beus *et al.,* 2010; Christian *et al.,* 2009; Clarke, 2010; Nahrgang *et al.,* 2011). In the meantime, it ought to be noticed that these meta-investigations fluctuate as far as particular intervention paths, revealing either a full intercession path (i.e., safety climate to safety knowledge and information and inspiration to safety behaviour to injury (Christian *et al*., 2009), a mostly mediated path in which safety climate is identified with damage both specifically and by implication through its impact on safety conduct (Clarke, 2010), or a non-mediated path driving straightforwardly from climate to injury outcomes (Nahrgang *et al*., 2011).

A broadly utilized operational definition recognizes it as a positive work-related perspective that is portrayed by (physical and mental) energy, commitment, and absorption (Schaufeli *et al*., 2002; Schaufeli *et al., 2006*). Appropriately, a positive safety climate, demonstrative of the four basic components said above, is probably going to be reciprocated by employees, prompting engagement and role enhancing practices reaching extending beyond safety execution, profiting the association at large.

Some supportive evidence for such a relationship was accounted for in a current meta-examination of 113 investigations showing that safety climate influences various generic (i.e., non-safety)outcomes, for example, organizational responsibility and citizenship conduct (Clarke, 2010). This meta-investigation grows past research discoveries concentrating on proactive wellbeing particular results of security atmosphere, for example, safety citizenship conduct (Hofmann *et al.,* 2003), proposing that safety climate outcomes may likewise incorporate generic/non-specific (i.e., non-safety) aspects, for example, organizational duty and citizenship. Given that worker engagement leads, in addition to other things, to the extremely same outcomes (Macey and Schneider, 2008), demonstrating semantic nearness, it can be contended that safety climate advances or work-related force and commitment, the essential markers of employee engagement.

2.1.6 Safety Climate Factors

Several researchers have identified different safety climate factors related to construction industry (Glendon and Litherland, 2001; Mohamed, 2002; Yule *et al*., 2007). However, in designing a framework for safety climate questionnaire, Fu, Zhang, Xi and Zhang (2006) review a number of safety climate surveys mainly from the year 2000 and found that nine safety climate dimensions were most common. These include: (1) Belief and value (2) Management commitment (3) Risk level and hazards identify (4) Management efficiency (5) Workers involvement and commitment (6) Safety institutes and specialists (7) Safety education and training (8) Site management; and (9) Standardization. A further survey of safety climate articles proposes that management commitment, safety training, worker's involvement in safety and safety communication and feedback are the most predominant safety climate factors that have better capability of influencing safety performance outcomes especially safety compliance.

2.2 Conceptual framework

Hofmann and Morgeson (1999) have discovered that when an association accentuates security, its workers respond by following built up safety and wellbeing systems (Neal and Griffin, 2006). The hope valence hypothesis theorizes that motivation is a blend of labourers'. The association between safety climate and specific safety practices, for instance, compliance with strategic systems and making proposition to improve safety and security and proactivity is of basic to note. Workers' safety, security and prosperity hones accept a crucial part in keeping up an ensured work environment and have been seemed to predict working condition mishaps and injuries (Clarke 2006, Neal and Griffin, 2006; Christian *et al.,* 2009). Safety preparedness by individuals are once in a while conceptualized as central safety outcome as they constitute a quantifiable outcome, which is more proximally related to psychological factors than mishaps and injuries in the workplace (Christian *et al.,* 2009). Likewise, safety execution rehearses tend to be expected with more vital accuracy than more distal outcomes, which routinely have a low base rate and skewed conveyances (Zohar, 2000). Like occupation

execution when all is said and done, safety performance practices can be scaled by the repetitiveness with which employees participate in the practices and are recognizable to the extent their harbingers and covariation with safety outcomes (Burke *et al.,* 2002). A current meta-examination of 32 ponders by Clarke (2013) exhibited that a more raised measure of safety conduct is connected with less occupational related wounds.

2.2.1 The distinction between compliance and participation

A number of theoretical models of safety behaviour have been put forward. A model of safety performance outlined by Burke *et al*. (2002) defined as "actions or behaviours that individuals exhibit in almost all jobs to stimulate the health and safety of workers, clients, the public, and the environment" — includes four factors: (a) employing individual protective equipment, (b) engaging in work practice to reduce risk, (c) communicating hazards and accidents, and (d) exercising employee rights and responsibilities. However, since the beginning of the 2000s, further conceptual distinctions emerged between safety "compliance" and safety "participation," referring to, respectively, "generally mandated" safety behaviours and safety behaviours that are "frequently voluntary" (Neal *et al.,* 2000). This dissimilarity is comparable to that amongst task and circumstantial performance in the job performance literature (Borman and Motowidlo 1993). Commencing this perspective, safety compliance behaviours are the central part of safety activities that are essential for the prescribed work processes to sustain a minimum perception of safety. Instances of safety compliance behaviours comprise the subsequent safety rules and procedures and complying with occupational safety regulations.

Alternatively, safety involvement describes behaviours that might not be directed to an individual but that do help to improve an environment that supports safety (Neal and Griffin 2006). These behaviours consist actions such as contributing and participating in intentional safety activities, aiding co-workers with safety-related concerns, and appearing in safety consultations. Nevertheless, the current research will only examine safety compliance.

2.2.2 Expanding the concept of Safety performance

Hon *et al*. (2014), stated that "safety studies have a tendency to use statistical data of calamities or injuries to quantity safety performance". By contrast, beside the actual injury accounts, more contemporary studies have also used unconventional data such as self-reported injury data composed through questionnaires (Siu *et al*., 2004; Huang *et al.,* 2006) and self-reporting has been shown to be a reliable and valid source of injury data (Begg *et al.,* 1999; Gabbe *et al.,* 2003). In the words of Gabbe *et al*. (2003), the correctness of self-reported injuries could be as high as 80%. Conversely, accidents or injuries are reactive processes and are comparatively occasional. They may not be actual indicators of safety since they only mirror incidences of failures (Cooper and Phillips, 2004). They are also "insufficiently sensitive of dubious accuracy, retrospective and ignorant risk exposure (Glendon and Litherland, 2001). Lingard *et al*. (2011) have also recounted that injuries consequent upon lost time and medical management occur intermittently and are ineffectual pointers of safety performance. They recommended applying a more fine-grained quantity of workgroup safety performance such as micro- accidents or minor (non-reportable) injuries in forthcoming research. According to Beus *et al.* (2010) "safety climate should be more effective in predicting injuries of a less serious nature. It because nor injuries, which frequently come before serious ones, are more approximate to safety climate than serious injuries

2.2.3 Historical Perspectives of Safety Performance

The chronological perspectives of safety performance are being offered in this research owning to the fact that safety compliance is one of the constituents of safety performance (safety behaviours). Neal and Griffin (1997) and Griffin and Neal (2000) gave prominence to enlightening safety and health in the workplace cantered on the classification of work behaviours to work performance by Borman and Motowildo (1993). The two main constituents of work performance as suggested by Borman and Motowildo (1993) are task performance and contextual performance. They noted that task performance denotes prescribed job-related activities that donate to set overall managerial goals and intentions while contextual performance is regarded as activities that give to the societal and mental principles of the organization. Task performance is not voluntary and informal in nature, but contextual performance is seen as such (Borman and Motowildo, 1993). Applying the above concepts to the safety research area, Neal and colleagues (Neal and Griffin, 1997; Griffin and Neal, 2000) related the conceptions to safe and unsafe activities in the workplace, in that task performance became safety compliance, while contextual performance metamorphosed to safety participation. Hence, safety compliance is seen as formal on-the-job events that add to safety at work.

Some instances of compliance are, observing safety guidelines and regulations, following processes and routine of appropriate peculiar protective equipment (Brondino *et al*., 2012; Hammer *et al.,* 2016). Safety participation thus denotes undertakings that may not directly be central to workplace safety, but assist create an atmosphere that supports safety, including the demonstration of increased awareness of hazards, promoting safety program in the workplace and assisting workmates learn to do their jobs safely (Jiang and Probst, 2015).

Cooper and Phillips (2004) recommended that quantifying safety performance has become problematic as reactive pointers are being used (accident rates and compensation costs). But one foremost issue with this is that safety outcomes (Cohen, 2002) are reliant on lower stages of structure failures. It is in the interpretation of this fact that emerging strategies (Strickoff, 2000) on quantifying safety performance proposes the use of pre-emptive procedures that emphasizes on contemporary safety activities to govern system achievement instead of system failures. However, a combination of both strategies will help establishments to be able to ascertain the actual level of safety inherent in their workstations (Cooper and Phillips, 2004).

The current research therefore is exploring one of the constituents of safety performance (safety compliance) acting as a pre-emptive quota of assimilating safety performance. A series of research have surveyed safety performance (also referred to as safety behaviours based on proactivity) with safety compliance and safety participation as components (Lu *et al*., 2016; McCabe *et al*., 2016; Mullen *et al*., 2017). Owing to the continuous call for enhanced safety performance indicators. For example, Wu *et al.* (2008) recommended that the administrators of organizations should try to categorize approaches that will eventually improve the safety climates inside their organizations as this will have the necessary progressive impact on safety performance. It is also noteworthy to state that safety performance is critical owing to the increasing amount of accidents, injuries and fatalities and in response to major organizational accidents (Mearns *et al.,* 2003) and for the prevention of economic loss for organizations (Gillen *et al.,* 2002). Therefore, factors that improve safety is precarious to be examined.

It has been stated that it is noteworthy that a lack of, and/or the absence of requisite safety supervision systems principals some disconnect between organizational structures - human, technological and systems structures. This has thus metamorphosed to the injuries and fatalities and attendant costs recorded in establishments. Therefore, it is pertinent to categorize and scrutinize the direst factors that are capable of improving safety performance indicators in the form of compliance and participation. These are human factor indicators are critical to reducing the incidence of accidents, injuries and fatalities (Clarke, 2006; Fernández-Muñiz *et al*., 2014; Rodriguez *et al*., 2017). Consequently, investigators and business consultants have suggested mechanisms through which safety performance in the form of safety compliance can be enhanced.

2.3 Review of Empirical studies

2.3.1 Safety Climate Factors and Compliance

Neal and Griffin (2016) submitted that the significance of safety for people and organizations has reinvigorated study on the concrete imports of safety climate, with a robust emphasis on safety performance and safety consequence indicators. This section briefly reviewed the connections amongst safety climate and safety performance of constructing repair, preservation, trivial modification and also additional works (RMAA) and then scrutinizes the liaison amongst profiles of apparent organizational values, safety climate and safety outcomes; the impression and investigation of safety climate studies in the construction industry. Finally, it will highlight the comparative valuation of safety climate of casual and permanent construction workers in South-East Nigeria. The safety climate factors selected for this investigation and their connection with safety compliance will now be discussed.

2.3.2 Management commitment to safety as a component of safety climate

Organization obligation is a key dimension of safety climate affecting the accomplishment of an organization's safety initiatives. In line with Zohar (1980), this assurance from the organization can become evident by various participatory approaches such as being part of and participating in safety committees, deliberation of safety in job design, and assessment of pace of work. In another position, Mearns *et al.* (2003) was of the opinion that organization obligation to safety is one of the most ideal safety climate component that influenced safety performance/behaviours. They however noted that this obligation from organization should be genuine and consistent. This is especially needed so as to highlight safety over production, upholding a high standard of safety in meetings, personal involvement of managers at safety meetings and during walk-about. In addition to the above, they further submitted that one-on-one meetings with employees where safety become the main object of discussion and the inclusion of prospects of high safety standards in in employees' job descriptions are all features of management commitment to safety.

Organization obligation to safety is a demonstration of the measure of attention given to safety related matters by top-level management which is revealed or displayed in terms of the encouragement and backing given to employees as it relates to their safety (Hsu *et al.*, 2008). This is so because, when employees have the discernment that management is devoted to their safety, they tend to take safety issues seriously thus leading to a general decrease in accident and injury rates (Yule*et al.*, 2007; Schwatka, & Rosecrance, 2016). The extent to which an organization appreciates safety is expressed in its style and level of assumable risk. This is in being preemptive in the identification, supervision and control of hazards in the workplace. An organization obligation to safety has been promoted as a key factor for achieving effective safety management. In accumulation, regular engagements between management and their employees is a requirement under the Health and Safety

Regulations, 1996 and the Safety Representatives and Safety Committees Regulations, 1977 (HSE, 2014).

Meanwhile it ought to be noted that the above relationship ought not to be construed to be similar thing as employee co-operation. They are quite separate issues. Various investigations across occupations and industries have highlighted the need for great points of commitment of management to safety issues in the work place. In 2001, the Occupational safety and health (OSH) Council of Hong Kong carried out a research among various strata of construction companies and employees. The OSH council renowned that the need for top administration level commitment to safety in the workplace cannot be over-emphasized, having submitted that positive attitudes toward safety was more noticeable among top management than supervisors, senior managers and front-line workers respectively. Mearns *et al.* (2003) in their study on the above relationships in the offshore environments espoused that management commitment to safety had a major role to play in the determination of safety across various offshore installations. They further submitted that companies whose management were dedicated to safety were characterized by lower accident rates, in sharp comparison to other companies who did not have their managements committed to safety issues.

In the manufacturing industry, Cooper and Phillips (2004) conducted an analysis of the safety climate factors (characterized various safety management practices) and safety behaviour relationship among 540 plant personnel of a packaging production plant. They found a consistent relationship between the scales of management actions with safety behaviour. This is in support of Zohar and Luria (2005), who established significant relationships between management-led safety-oriented interactions and significant changes in worker's behaviour interestingly, safety compliance is one of the components of safety behaviours so examined within the context of their study. Michael *et al.* (2005) attempted to identify the relationship between management pledge to safety and non-safety outcomes in wood manufacturing employees. Results from this study showed that workers' outcomes differ based on their perceptions on management commitment to safety. Interestingly, management obligation to safety was positively related to job satisfaction, organizational commitment, and job-related performance. They also reported a negative relationship between commitment to safety and employee extraction behaviours. This is a further reinforcement of the need for management to be committed to safety in order to spur employees to work safely and having an injury-reduced or injury-free-work place. However, the results further suggest that management assurance as a safety climate component should be further examined in view of the outcomes reported by Michael *et al.* (2005), and possibly in a different work setting as theirs.

In the health care setting Abdullah *et al.* (2009) measured the discernment of workers in public hospitals in the northern region of Malaysia on the prevalent health and safety practices and how they affect performance. The study was conducted among various categories of 418 health care workers stratified by age, gender, race, educational level, job position, years in service etc. their findings revealed that management commitment to safety showed a good level of significance in explaining the relationship, having showed approximately 55% in variance. Thus, the importance of management obligation to safety as an important practice in determining safety performance is highlighted. Other studies that focus of management commitment as an important construct in determining safety performance are as follows (Hon *et al*., 2013; Barbaranelli *et al.,* 2015). Evidently, management assurance to safety is an important construct in determining safety performance in the form of compliance, hence its selection for this study. Also, it has been observed that there is paucity in research in examining this relationship in the construction industry in Nigeria. This is a huge literature that this study filled as most of the literature available to the researcher for examination were conducted in Western, Asian and advanced work settings and socio-cultural background.

2.3.3 Safety Training as a component of Safety Climate

Safety training is one of the safety climate factors that is critical to improving safety behaviours across occupations and industries. This is largely because it measures the effectiveness of formal orientation programmes and subsequent follow-up training relating to safety practices at work (Huang *et al.*, 2006) and in the determination of work safety performance indices (Shaheen *et al*., 2014). Also, the importance of safety training has been given light by researchers as it provides the means for predicting accidents often, hence the need for the development and implementation of a systematic, all-inclusive safety and health training program for existing employees and safety orientation training programs for new employees (Randles *et al.,* 2010). It is in line with this that Law *et al.*(2006) referred to safety training as the transfer of safety knowledge on to employees so that they can work safely and with no danger to their health and wellbeing.

Safety training is unique because it has been severally linked to safety performance and its apparent importance in avoiding fatalities. For example, Vinodkumar and Bhasi (2010) submits that effective safety training is of utmost importance for the success of any organization and for the success of the OSH programmes within such organizations. Safety training leads to an improvement in behavioural skills, related knowledge and/or attitudes and also acts as a catalyst for predicting accidents. In order to improve the OSH performance at both individual and organizational level, management should set up a systematic, comprehensive safety and health training programme for new employees, provide a mentor for these employees and use a partner system

to help orient new employees in the safety, health and quality systems (Vredenburgh, 2002). It has also been noted that organizations reporting low accidents rates conducts good safety trainings for their employees and vice versa (Shaheen *et al*., 2014). In view of this, safety training is considered a very good safety climate construct and should be measured using items related to training for newly employed staff, discussing safety issues in formal and in-formal training sessions, training to meet emergency situations, encouragement to attend training programmes, and hazard assessment training.

Some studies have examined safety training as an important safety climate factor. For example, Tinmannsvik and Hovden (2003) revealed that the need for safety training across board cannot be over-emphasized, and that characteristically, companies with good safety training for their employees recorded lower accident rates as against companies that did not see safety training as a priority. This is in agreement with the findings of Vinodkumar and Bhasi (2010) who posited that in strengthening the safety training construct as a safety management practice, it must be characterized by training for new staff, discussion of safety-related matters in formal and in-formal training sessions, training for emergency preparedness and hazard identification and control.

In an attempt to evaluate a safety culture values and practices measuring instrument which focuses on relevant organizational values and practices related to safety management, among 229 participants in the aviation, gas, brewery, etc. industries, Diaz-Cabrera *et al*. (2007) noticed that training programmes as a practice was found to be significant in accident prevention and injury reduction in all the analysis conducted, irrespective of the coexistence of employees who were having diverse cultural orientations. In addition to the above, they are strongly of the opinion that training helps in reducing accidents and injuries. This is because employees are informed about adherence to safety rules and procedures, and at the same time detecting training needs, developing modifications in work procedures and revising work goals, so as to have a safe working environment (Khdair *et al.*, 2011; Zohar *et al.*, 2011; Colley *et al*. (2013), Hence, safety climate is an important component of safety climate that has to be examined across a myriad of work-settings and socio-demographic milieu.

2.3.4 Workers Involvement in Safety as a component of safety climate

To successfully promote safety in organizations, the employees must be involved. Workers involvement, which is also referred to as employee involvement, is a behaviour-based technique which involves individuals or groups in an upward communication flow and decision-making process within an organization (Vredenburgh, 2002; Vinodkumar and Bhasi, 2010). Nevertheless, the extent of involvement can range from not involving employees (supervisors making all decisions), to complete involvement of employees (all-encompassing safety decision making process). Employees are very familiar with their work environment; hence they are in a position to know what is inherent therein. They are also best placed to suggest mechanisms for improving prevailing safety situations (Rémi-Kouabenan *et al*., 2015). Consequently, employees are greatly empowered to be responsible and also be accountable for failures. This is a typical two-way interaction process which allows both the employees and their management see to the safety management structures of their organizations (Hinze *et al.*, 2013).

It has been noted above that worker's involvement is important to the organizational safety management process. However, the nature of this involvement is critical (Mashia *et al.*, 2016). According to Geller (2001), workers' involvement in the safety management process should go beyond looking after one's own health and safety, but the safety and health of other employees within the same organization. Accordingly, GOETSCH (2011) suggested that when employees are involved in the design and implementation, monitoring and follow-up of the safety management process, it gives the employees some sense of proprietorship of the programs by the workers. This is a major directional thrust towards reducing accidents and injuries. Vinodkumar and Bhasi (2010) posited that work involvement is a management practice and is measured using items related to safety committees with representation from various strata of workers in the overall safety decision-making process. This also points to the impact of senior-level management commitment in safety-related matters and in ensuring safety in the workplace. A number of empirical investigations on the perceptions and relationships with worker's involvement to safety performance does exist in the OSH literature. For example, Ford and Tetrick (2011) in their study of the relationships among organizational hazards, attitudes and safety performance noted that involving workers in the safety management process was key to administrative safety performance.

However, this involvement can be achieved through psychological empowerment via their participation in safety groups. This is in line with the suggestion of Jamal-Khan (2003) and Topf (2000) who advocated that administrative climate played a foremost role in shaping the willingness of workers to enthusiastically participating in safety committees. Jamal-Khan (2003) and Topf (2000) noted that workers are psychologically boosted to actively participate in safety-related activities when they observe that management is dedicated to their safety by way of taking the initiative in organizational-based safety management practices. This is to say that worker's involvement is an action- oriented, action-based and dynamic process that works optimally based on the interaction of the factors identified above.

Other studies that emphasized the importance of worker's involvement in safety as a key safety climate

factors are further noted. Hallowell *et al*., (2013) on improving construction safety suggested the involvement of workers in the safety management process of organizations. Kines *et al*. (2013) also suggested that workers involvement in the safety management process of organizations is critical to maintaining high safety performance standards and in reducing accidents, injuries and fatalities. Other studies in this regard are, Barbaranelli *et al.* (2015) and Lee and Dalal (2016).

The other side of this discussion is that when workers are not involved in the safety management process, it leads to "worker's pessimism" (Oyan, 2000) and can be greatly contagious in negatively affecting the behaviours and approaches of workers to perform poorly. A direct import of this is the paralysis of safety-related problem-solving activities at individual and organizational levels. Sequel to the above, it is therefore imperative to examine worker's involvement as a safety climate factor in influencing safety compliance among construction workers in Rivers State, Nigeria. The selection of this variable is thus important in view of its ability in ensuring compliance to safety in organizations.

2.3.5 Safety Communication and Feedback as a component of safety climate

Safety announcement and response has been documented as an effective way of cultivating safety performance in organizations (Zohar and Polachek, 2014). Safety announcement allows people, tasks, processes, and systems to interact for the resolve of accomplishing high OSH objectives. The way in which we communicate about safety can decide if or not the people will understand and get tangled in the safety process, and the semantic we use can most times decide whether the process is accepted or rejected (Vecchio-Sadus, 2007).

For example, the purposes of a company and announcement of the purposes to all staff of the organization is a very important aspect of effective health and safety management as lack of communication may impede workers getting involved in the safety management process (Yao, Rao, & Liu, 2013). Likewise, the role of feedback is important for safety performance as it is crucial in the communication process. This is because employee behavior depends on new occurrence. Therefore, based on an efficient communication and feedback system, management can track hazards to prevent accidents and injuries (Vredenburgh, 2002).

Safety managers need to ensure that employees across board are fully informed about safety and health policies, practices, concerns and other requisite information (GOETSCH, 2011). This can be done by way of regular safety meetings, regular personal contact by way of walk-about, safety committees and publications in the form of newsletters, e-mails, memoranda, etc. Regular feedback on performance can be good to communicate to employees through sign posts, caution signs, and other indications of safety. This data generated will not only assist the organization in having a safety system in place, but a behavior and evidenced-based safety maintenance system (Khdair *et al*., 2011). Researchers have noted that a two-way communication will have a high impact on workers, which can lead to changes in behaviour (Vinodkumar and Bhasi (2010). This can positively skew employee's behaviour to working safety. If administration of organizations provide employees with relevant information on hazards and risks associated with the operations of the organization, it builds an understanding on how to work safely.

Comcare (2004), Reason (2002) and Hopkins (2005) identified the following as the safety announcement elements that are significant in influencing workers behaviours: display of rules and procedures as reminders to working safely, demonstration of managements' commitment to safety and health of its employees, values and expectations, supervising and observing work performance, evaluating competency and promoting revision of training when required.

Others are providing feedback on safety-related matters, employee motivation, recognizing and rewarding achievement, providing instructions on how to work safely with equipment, tools, materials and processes and meeting to discuss Health, Safety and Environment (HSE) issues like hazards and incidence reports, risks valuations and functioning procedures (Vecchio-Sadus, 2007). Some studies that espoused the need for safety announcement and response as a significant constituent of safety climate are noted. For example, Bottani *et al.* (2009) noted that of the 116 companies sample collected for both SMSs adopters and non-adopters, the companies that adopted SMSs reported higher and significant safety performance indicators. They noted that the adopters of SMSs saw the need for announcement of safety related matters being able to positively predict safety performance outcomes in the form of compliance (Fernandez-Muniz *et al.*, 2007). In another work setting, Stave *et al.* (2008) noted that safety communication occurred in the form of discussions on safety related matters by the farmers, and this might have afforded the farmers very succinct opportunities to identify hazardous situations.

In the healthcare setting, Abdullah *et al.* (2009) submitted that employees' perception about safety communication was an important variable in determining OSH performance. However, the discernment level for message and feedback was much lower than organization obligation to safety and safety training. Barbaranelli *et al*. (2015) also espoused the importance of safety message as an important safety climate factor in ensuring safety compliance. Basically, safety communication and feedback are important factors in ensuring compliance to safety in organizations. This is applicable to the construction industry. However, this study has become

critical at this time when accidents and injuries rates are high in the construction industry. The industry is critical to the Nigerian economy and high rates of accidents means capital losses to organizations in the form of hospital bills, litigations, and related costs.

2.3.6 Safety Performance

Some studies have been carried out using numerous dynamics in explaining safety performance at both organizational, group and discrete stages of abstraction through diverse work-setting and socio- demographic milieu. For instance, Neal and colleagues initially proposed the use of safety-attitude based approached in curbing the incidences of accidents, injuries and fatalities, and in improving safety performance (Griffin and Neal, 2000). Hon *et al.* (2013) studied various trades in the construction industry. They noted that safety climate was the most critical approach in improving safety performance amongst the category of workers interviewed. In another work setting, Fernández-Muñiz et al., 2014) suggested that safety leadership, and risk management were precarious to improving safety performance across a number of Spanish firms. In another submission, safety investments, safety culture and venture hazard were noted to be critical in improving safety performance in organizations (Feng, Teo, Ling, and Low (2014).

In another study, Bottani *et al.* (2009) submitted that adopters of safety management systems had better safety performance records. Other factors used in understanding safety performance are also noted in the safety management literature. For example, safety attitudes (Shin *et al*., 2014), age differences (McLain and Jarrel, 2007; Clark, Oswald and Warr, 1997), risk assessment (Lind, Nenonen and Kivisto-Rahnasto, 2008; Fernández-Muñiz *et al*., 2014), OSH management systems (Santos, Barros, Mendes and Lopes, 2013; Sinelnikov, Inouye, and Kerper, 2015), safety management practices (Diaz-Cabrera *et al.*, 2007; Vinodkumar & Bhasi, 2010; Wachter & Yorio, 2014; Marín, Lipscomb, Cifuentes & Punnett, 2017), and safety climate (Zohar *et al.*, 2014; Hon *et al*., 2013).

3. Conclusion

This chapter has discussed safety performance and safety behaviours vis-à-vis safety climate factors. The importance of safety climate in ensuring worker's compliance to safety activates in organizations has also been expatiated. The safety climate factors selected for this research and the motives for their selection has been noted in this chapter. Extant empirical evaluations were done to back the arguments of the researcher.

REFERENCES

Abdullah, N. A. C., Spickett, J. T., Rumchev, K. B. and Dhaliwal, S. S. (2009). Assessing employees' perceptions on health and safety management in public hospitals. *International Review of Business Research Papers*, 5(4): 54–72.

Alkilani, S. Z., Jupp, J. and Sawhney, A. (2013). Issues of Construction Health and Safety in Developing Countries: A Case of Jordan. *Australasian Journal of Construction Economics and Building*, 13 (3): 141-156.

Barbaranelli, C., Petitta, L. and Probst, T. M. (2015). Does safety climate predict safety performance in Italy and the USA? Cross-cultural validation of a theoretical model of safety climate. *Accident Analysis and Prevention*, 77:35–44.

Begg, D.J., Langley, J.D. and Williams, S.M. (1999). Validity of self-reported crashes and injuries in a longitudinal study of young adults. *Injury Prevent*ion, 5: 142-144.

Beus, J. M., Payne, S. C., Bergman, M. E. and Arthur, W. (2010). Safety climate and injuries: an examination of theoretical and empirical relationships. *Journal of Applied Psychology*, 95: 713–727.

Borman, W. C. and Motowidlo, S. J. (1993). Expanding the criterion domain to include elements of contextual performance. In N. Schmitt, W. C. Borman, & Associates (Eds.), Personnel Selection in Organizations, (pp. 71–98). San Francisco: Jossey-Bass

Bottani, E., Monica, L. and Vignali, G. (2009). Safety Management systems: Performance differences between adopters and non-adopters. *Safety Science*, 47: 155 – 162.

Bowander, B. (1987). The Bhopal accident. *Technological Forecasting and Social Change*, 32 (2): 169–182.

Brondino, M., Silva, S. A. and Pasini, M. (2012). Multilevel approach to organizational and group safety climate and safety performance: co-workers as the missing link. *Safety Science*, 50(9):1847–56.

Brown, K. A., Willis, P. G. and Prussia, G. E. (2000). Predicting safe employee behaviour in the steel industry: Development and test of a sociotechnical model. *Journal of Operations Management*, 18: 445–465.

Burke, M. J., Sarpy, S. A., Tesluk, P. E. and Smith-Crowe, K. (2002). General safety performance: A test of a grounded theoretical model. *Personnel Psychology*, 55(2), 429-457.

Cheng, C., Leu, S., Cheng, Y. and Lin, C. (2012). Applying data mining techniques to explore factors contributing to occupational injuries in Taiwan's construction industry. *Accident Analysis and Prevention*, 48: 214–222.

Christian, M. S., Bradley, J. C., Wallace, J. C., and Burke, M. J. (2009). Workplace safety: a meta-analysis of the roles of person and situation factors. *Journal of Applied Psychology*, 94: 1103–1127.

Clark, A. E. (1997). Job satisfaction and gender: why are women so happy at work? Labour Economics, 4 (4): 341-372.

Clarke, S. (2006). The relationship between safety climate and safety performance: A meta- analysis review. *Journal of Occupational Health Psychology*, 11 (4): 315–327.

Clarke, S. (2010). An integrative model of safety climate: linking psychological climate to individual safety outcomes using meta-analysis. *Journal of Occupational and Organizational Psychology*, 83: 553–578.

Cohen, J. M. (2002). Measuring safety performance in construction. *Occupational Hazards*, 64 (6): 41–44.

Colley, S. K., Lincolne, J. and Neal, A. (2013). An examination of the relationship amongst profiles of perceived organizational values, safety climate and safety outcomes. *Safety Science*, 51(1): 69–76.

Comcare, (2004). Safe and Sound: A discussion paper on safety leadership in government workplaces, Pub 35, August, Canberra, Australia.

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.

Crandall, B., Klein, G. and Hofman, R. R. (2006). Working minds. Cambridge, MA: MIT Press.

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

Feng, Y. B., Teo, E. A. L. Ling, F. Y. Y. and Low, S. P. (2014). Exploring the interactive effects of safety investments, safety culture and project hazard on safety performance: an empirical analysis. *International Journal of Project Management*, 32(6): 932-946.

Fernández-Muñiz, B., Montes-Peón, J. M. and Vázquez-Ordás, C. J. (2014). Safety leadership, risk management and safety performance in Spanish firms Beatriz. *Safety Science*, 70: 295–307.

Fernandez-Muniz. B., Montes-Peon. J. M. and Vazquez-Ordas. C. J. (2007). Safety Management System: Development and validation of a multidimensional scale. *Safety Science*, 20: 52-68.

Fielding, A. (2007). Determining Adequate Sample Sizes. *Teaching Statistics*, 18: 6–9.

Flin, R., Mearns, K., O'Conner, P.O. and Bryden, R. (2000). Measuring Safety Climate: Identifying the Common Features. *Safety Science*, 34 (1-3): 177-192.

Ford, M. T. and Tetrick, L. E. (2011). Relations among occupational hazards, attitudes, and safety performance. Journal of Occupational Health Psychology, 16(1), 48–66.

Gabbe, B.J., Finch, C.F. Bennel, K.L. and Wajswelner, H. (2003). How valid is a self-reported 12 month sports injury history? *British Journal of Sports Medicine*, 37 (6): 545-547.

Geller, E. S. (2001). Behavioural safety & beyond: From managing behaviour to leading people. Keynote address at the Behavioural Safety Now Conference, Houston, TX.

Gillen, M., Baltz, D., Gassel, M., Kirsch, L. and Vaccaro, D. (2002). Perceived safety climate, job demands, & co-worker support among union & non-union injured construction workers. *Journal of Safety Research*, 33(1): 33-51.

Glendon, A. I. and Litherland, D. K. (2001). Safety Climate Factors, Group Differences & Safety Behaviour in Road Construction. *Safety Science*, 39 (3): 157-188.

GOETSCH, D. L. (2011). Construction Safety & Health. London: Pearson.

GOSI – General Organisation for Social Insurance (2015). Annual statistical report 1435H, 2015.Online available from http://www.gosi.gov.sa/portal/web/guest/statistics/view-statistic? StatisticsId=1379226.

Griffin, M. A and Curcuruto, M. (2016). Safety Climate in Organizations. *Annual Review of Organizational Psychology and Organizational Behaviour*, 3:191–212.

Griffin, M. A. and 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: 347–58.

Grill, M., Grytnes, R. and Törner, M. (2015). Approaching safety in the Swedish and Danish construction industry: Professionals perceptions of safety culture differences. *Safety Science Monitor*, 2(6): 1–17.

Guldenmund, F. W. (2000). The Nature of Safety Culture: A Review of Theory and Research. *Safety Science*, 34: 215-257.

Hallowell, M. R., Hinze, J. W., Baud, K. C. and Wehle, A. (2013). Proactive Construction Safety Control: Measuring, Monitoring, and Responding to Safety Leading Indicators. *Journal of Construction Engineering and Management*, 139 (10): 04013010-1 – 8.

Hämäläinen, P., Saarela, K. L. and Takala, J. (2009). Global trend according to estimated number of occupational accidents and fatal work-related diseases at region and country level. *Journal of Safety Research*, 40: 125–139.

Hammer, L. B., Johnson, R. C., Crain, T. L., Bodner, T., Kossek, E. E., Davis, K., Kelly, E. L., Buxton, O. M., Karuntzos, G., L. Chosewood, C. and Berkman, L. (2016). Intervention Effects on Safety Compliance and Citizenship Behaviors: Evidence from the Work, Family, and Health Study. *Journal of Applied Psychology*, 101 (2): 190–208.

Health and Safety Executive (HSE). (2010). Health and safety climate survey tool: Process guidelines, HSE, London.

Hinze, J., Hallowell, M. and Baud, K. (2013). Construction-safety best practices and relationships to safety performance. *Journal of Construction Engineering and Management*, 139(10): 1-8.

Hofmann, D. A. and Morgeson, F. P. (1999). Safety-related behaviour as a social exchange: the role of perceived organizational support and leader-member exchange. *Journal of Applied Psychology*, 84: 286–296.

Hofmann, D. A., Morgeson, F. P. and Gerras, S. J. (2003). Climate as a moderator of the relationship between LMX and content-specific citizenship behaviour: safety climate as an exemplar. *Journal of Applied Psychology*, 88: 170–178.

Hon, C.K.H., Chan, A.P.C. and Yam, M.C.H. (2013). Determining safety climate factors in the repair, maintenance, minor alteration, and addition sector of Hong Kong. *Journal of Construction Engineering and Management*, 139 (5): 519-528.

Hon, C. K. H., Chan, A. P. C. and Yam, M. C. H. (2014). Relationships between safety climate and safety performance of building repair, maintenance, minor alteration, and addition (RMAA) works. *Safety Science*, 65: 10-19.

Hopkins, A. (2005). Safety, Culture and Risk: The organisational causes of disasters. Australia: CCH Limited

HSE – Health and Safety Executive (2014). Consulting workers on health and safety Safety Representatives and Safety Committees Regulations 1977 (as amended) and Health and Safety (Consultation with Employees) Regulations 1996 (as amended).

Hsu, S. H., Lee, C. C., Wu, M. C. and Takano, K. (2008). A cross-cultural study of organizational factors on safety: Japanese versus Taiwanese oil refinery plants. *Accident Analysis and Prevention*, 40(1):24–34.

Huang, X. and Hinze, J. (2006). Owner's Role in Construction Safety. *Journal of Construction Engineering and Management*, 132 (2): 164-173.

Huang, Y. H., Ho, M., Smith, G. S., Chen, P. Y. and Mith, S. (2006). Safety climate and self-reported injury: assessing the mediating role of employee safety control. *Accident Analysis and Prevention*, 38(3):425–33.

ILO – International Labour Convention (1981). C155 - Occupational Safety and Health Convention, 1981 (No. 155). Convention concerning Occupational Safety and Health and the Working Environment (Entry into force: 11 Aug 1983) Adoption: Geneva, 67th ILC session (22 Jun 1981) - Status: Up-to-date instrument (Technical Convention).Convention may be denounced: 11 Aug 2023 - 11 Aug 2024.

Irumba, R. (2014). Spatial analysis of construction accidents in Kampala, Uganda. *Safety Science*, 64: 109–120.

Jamal-Khan, M. K. (2003). Determinants of Occupational Safety and Health Performance in Small and Medium Manufacturing Settings. *PhD Thesis*. Sintok, Kedah; University Utara Malaysia.

Janackovic, G. L. Savic, S. M. and Stankovic, M. S. (2013). Selection and Ranking of Occupational Safety Indicators Based on Fuzzy AHP: A Case Study in Road Construction Companies. *South African Journal of Industrial Engineering*, 24 (3): 175-189.

Jiang, L. and Probst, T. M. (2015). The relationship between safety-production conflict and employee safety outcomes: testing the impact of multiple organizational climates. *Work Stress*, 29(2):171–89.

Khdair, W. A., Subramanim, C. and Shamsudin, M. S. (2011) Improving Safety Performance by Understanding Relationship between Management Practices and Leadership Behaviour in the Oil and Gas Industry in Iraq: A Proposed Model. College Of Business, Universiti Utara Malaysia, 06010 Uum Sintok. International Conference on Management and Artificial Intelligence IPEDR, 6: 85-93.

Kines, P., Andersen, D., Andersen, L., Nielsen, K. and Pedersen, L. (2013). Integrated injury prevention and safety communication in small metal industry enterprises. *Journal of Safety Research*, 44: 87-95.

Laryea, S. (2010). In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Proceedings of the West Africa Built Environment Research (WABER) Conference, 27-28 July 2010, Accra, Ghana: 215-226.

Law, W. K., Chan, A. H. S. and Pun, K. F. (2006). Prioritising the safety management elements. *Industrial Management & Data Systems* [e-journal], 106 (6): 778-792.

Lee, S. and Dalal, R. S. (2016). Climate as situational strength: Safety climate strength as a cross-level moderator of the relationship between conscientiousness and safety behaviour. *European Journal of Work and Organizational Psychology*, 25(1): 120–132.

Lind, S., Nenonen, S. and Kivistö-Rahnasto, J.(2008). Safety risk assessment in industrial maintenance, *Journal of Quality in Maintenance Engineering*, 14 (2): 205-217.

Ling, F. Y. Y., Dulaimvmi, M. F. and Ho. P. J. (2012). Strategies to Overcome Challenges Faced in Managing Construction Projects in The United Arab Emirates, *World Construction Conference 2012–Global Challenges in Construction Industry*, Colombo, Sri Lanka, 229-236.

Lingard, H., Cooke, T. and Blismas, N. (2011). Coworkers' response to occupational health and safety- an overlooked dimension of group-level safety climate in the construction industry? Engineering, *Construction and Architectural Management*, 18 (2): 159-175.

Lipshitz, R., Klein, G. and Orasanu, J. (2001). Taking stock of naturalistic decision making. *Journal of Behavioural Decision Making*, 14: 331–352.

Lipstein, S. H. and Kellermann, A. L. (2016). Workforce for 21st-Century Health and Health Care. *Journal of American Medical Association* (JAMA), 316(16): 1665-1666.

Lu, M., Cheung, C. M., Li, H. and Hsu, S. C. (2016). Understanding the relationship between safety investment and safety performance of construction projects through agent-based modeling. *Accident Analysis and Prevention*, 94: 8-17.

Maano, N. E. and Lindiwe, Z. (2017). Occupational accidents and injuries among workers in the construction industry of Windhoek, Namibia. *International Journal of Health*, 5 (1): 55-59.

Macey, W. H. and Schneider, B. (2008). The meaning of employee engagement. *Industrial and Organizational Psychology*, 1: 3–30.

Mahmoudi, S., Ghasemi, .F, Mohammadfam, I. and Soleimani, E. (2014). Framework for Continuous Assessment and Improvement of Occupational Health and Safety Issues in Construction Companies. *Safety and Health at Work*, 5 (3): 125–130.

Marín, L. S., Lipscomb, H., Cifuentes, M. and Punnett, L. (2017). Associations between safety climate and safety management practices in the construction industry. *American Journal of Industrial Medicine*, 60 (6): 557–568.

Mashi, M. S., Subramaniam, C. and Johari, J. (2016). The Effect of Safety Training and Workers Involvement on Healthcare Workers Safety Behaviour: The Moderating Role of Consideration of Future Safety Consequences. *International Journal of Business Management* (IJBM), 1 (2): 46-81.

McCabe, B. Y., Alderman, E., Chen, Y., Hyatt, D. E. and Shahi, A. Safety Performance in the Construction Industry: Quasi-Longitudinal Study. *Journal of Construction Engineering and Managemen*t, 143 (4). Article number 04016113.

McLain, D. L. and Jarrell, K. A. (2007). The perceived compatibility of safety and production expectations in hazardous occupations. *Journal of Safety Research*, 38(3): 299-309.

Mearns, K., Whitaker, S. M. and Flin, R. (2003). Safety climate, safety management practice and safety performance in offshore environments. *Safety Science*, 41 (8): 641–680.

Michael, J. H., Evans, D. D, Jansen, K. J. and. Haight, J. M. (2005). Management commitment to safety as organizational support: Relationships with non-safety outcomes in wood manufacturing employees. *Journal of Safety Research*, 36: 171 – 179.

Mohamed, S. (2002). Safety climate in construction site environments. *Journal of Construction Engineering and Management*, 128 (5): 375-384.

Mosly, I. (2015). Safety Performance in the Construction Industry of Saudi Arabia. International Journal of Construction Engineering and Management, 4 (6): 238-247.

Mouleeswaran, K. (2014). Evaluation of Safety Performance Level of Construction Firms In And Around Erode Zone. *International Journal of Innovative Research in Science, Engineering and Technology*, 3: 1587-1596.

Mullen, J., Kelloway, E. K. and Teed, M. (2017). Employer safety obligations, transformational leadership and their interactive effects on employee safety performance. *Safety Science*, 91: 405-412.

Nadhim, E. A., Hon, C. and Xia, B., Stewart, I. and Fang, D. (2016). Falls from Height in the Construction Industry: A Critical Review of the Scientific Literature. *International Journal of Environmental Research and Public Health*, 13(7): 638-658.

Nahrgang, J.D., Morgeson, F.P. and Hofmann, D.A. (2011). Safety at work: a meta-analytic investigation of the link between job demands, job resources, burnout, engagement, & safety outcomes. *Journal of Applied Psychology*,96 (1): 71–94.

National Bureau of Statistics (2015). Labour Force Survey. Statistical News Labour Force Statistics. Paper presentation of Labour Statistics based on revised Concepts and Methodology for Computing Labour Statistics in Nigeria, by Mr. Isiaka Olarewaju, Head (Real Sector & Household Statistics.

Neal, A. and Griffin, M. A. (1997). Linking theories of work performance and safety climate, *12th Annual conference of the Society for Industrial Psychology*, St. Louis, Missouri. April, 1997.

Neal, A. and Griffin, M. A. (2006). A study of the lagged relationships among safety climate, safety motivation, safety behaviour, and accidents at the individual and group levels. *Journal of Applied Psychology*, 91 (4): 946-953.

Neal, A., Griffin, M. A., Hart, P. M. (2000). The impact of organizational climate on safety climate & individual behaviour. *Safety Science*, 34 (1–3): 99–109.

Okoye, P. (2016). Optimising the Capacity of Nigeria Construction Sector for Socio-economic Sustainability. *British Journal of Applied Science & Technology*, 16(6): 1-16.

Okoye, P. U. (2016). Optimising the Capacity of Nigeria Construction Sector for Socio-economic Sustainability. *British Journal of Applied Science & Technology*, 16(6): 1-16.

Oyan, T. (2000). Putting optimism into your safety program. *Occupational Hazards*, 62 (1): 66-69.

Phoya, S. (2012). The Practice of Risk Assessment, Communication and Control health and safety risk management in building construction sites. *Degree thesis*. Chalmers University of technology. Gothenburg, Sweden.

Pousette, A., Larsson, S. and Törner, M. (2008). Safety climate cross-validation, strength and prediction of safety behaviour. *Safety Science*, 46 (3): 398-404.

Raheem A. A. and Issa, R. A. (2016). Safety implementation framework for Pakistani construction industry. *Safety Science*, 82: 301-314.

Randles, B., Jones, B., Welcher, J., Szabo, T., Elliott, D. and MacAdams, C. (2010). The Accuracy of Photogrammetry vs. Hands-On Measurement Techniques Used in Accident Reconstruction, *SAE 2010 World Congress & Exhibition*, 2010.

Raviv, G., Shapira,A. and Fishbain, B. (2017). AHP-based analysis of the risk potential of safety incidents: Case study of cranes in the construction industry. *Safety Science*, 91: 298-309.

Reason, J. (2002). Managing the risk of organizational accidents. Burlington, USA: Ashgate Publishing Ltd.

Rémi-Kouabenan, D., Ngueutsa, R. and Mbaye, S. (2015). Safety climate, perceived risk, and involvement in safety management. *Safety Science*, 77: 72-9.

Rodriguez, M., Bell, J., Brown, M. and Carter, D. (2017). Integrating behavioural science with human factors to address process safety. *Journal of Organizational Behaviour Management*, 37(3–4): 301–315.

Santos, G., Barros, S., Mendes, F. and Lopes, N. (2013). The Main Benefits Associated with Health and Safety Management Systems Certification in Portuguese Small and Medium Enterprises Post Quality Management System Certification. *Safety Science*, 51: 29-36.

Saunders, M., Lewis, P. and Thornhill, A. (2003). *Research method for business students*, 3rd edition. New York: Prentice Hal

Schaufeli, W. B., Bakker, A. B. and Salanova, M. (2006). The measurement of work engagement with a short questionnaire: a cross-national study. *Educational and Psychological Measurement*, 66: 701–716.

Schaufeli, W. B., Salanova, M., Gonzalez-Roma, V. and Bakker, A. B. (2002). The measurement of engagement and burnout: a confirmative analytic approach. *Journal of Happiness Studies*, 3: 71–92.

Schwatka, N. V. and Rosecrance, J. C. (2016). Safety climate and safety behaviors in the construction industry: The importance of co-workers commitment to safety. *Work*, 54(2): 401-13.

Sekaran, U. and Bougie, R. (2010). Research Methods for Business: A Skill Building Approach: John Wiley & Sons.

Shaheen, S., Bashir, S., Shahid, S. A., Yasin, G., Tariq, M. N. and Qidwai, S. A. (2014). Impact of safety climate on safety performance: Evidence from textile dyeing industries of Pakistan. *Int. J. Chem. Biochem. Sci*., 6: 50–55.

Shattuck, L. and Miller, N. T. (2006). Extending naturalistic decision making to complex organizations: a dynamic model of situated cognition. *Organization Studies*, 27: 989–1009.

Shin, M., Lee, H. S., Park, M., Moon, M. and Han, S. (2014). A system dynamics approach for modeling construction workers' safety attitudes and behaviors. Accident Analysis & Prevention, 68: 95-105.

Silva, S., Lima, M. L. and Baptista, C. (2004). OSCI: An organisational and safety climate inventory. *Safety Science*, 42: 205–220.

Sinelnikov, S., Inouye, J., and Kerper, S. (2015). Using leading indicators to measure occupational health and safety performance. *Safety Science*, 72: 240-248.

Siu, O., Phillips, D. R. and Leung, T. (2004). Safety climate and safety performance among construction workers in Hong Kong: the role of psychological strains as mediators. *Accident Analysis & Prevention*, 36 (3): 359–366.

Sousa, V., Almeida, N. M. and Dias, L. A. (2014). Risk-based management of occupational safety and health in the construction industry – Part 1: Background knowledge. *Safety Science*, 66: 75-86.

Sousa, V., Almeida, N. M. and Dias, L. A. (2014). Risk-based management of occupational safety and health in the construction industry – Part 1: Background knowledge. *Safety Science*, 66: 75-86.

Stave, C., Pousette, A. and Torner, M. (2008). Risk and safety communication in small enterprises-How to support a lasting change towards work safety priority. *Journal of Risk Research*, 11(1-2): 195-206.

Stock, G. and Mcfadden, K. L. (2017). Improving service operations: linking safety culture to hospital performance. *Journal of Service Management*, 28(1): 57-84.

Strickoff, R. S. (2000). Safety performance measurement: Identifying prospective indicators with high validity. *Professional Safety*, 45: 36-39.

Tholen, S. L., Pousette, A. and Törner, M. (2013). Causal relations between psychosocial conditions, safety climate and safety behaviour – a multi-level investigation. *Safety Science*, 55: 62-69.

Tinmannsvik, R. K. and Hovden, J. (2003). Safety diagnosis criteria–development and testing. *Safety Science*, 41: 575-590.

Topf, M. D. (2000). General next? *Occupational Hazards*, 62, 49 – 50.

Vecchio-sadus, A. M. (2007). Enhancing Safety Culture through Effective Communication. *Safety Science Monitor*, 11(3): 1–9.

Vinodkumar, M. N. and Bhasi, M. (2010). Safety management practices and safety behaviour: assessing the mediating role of safety knowledge and motivation. Accident Analysis and Prevention, 42(6): 2082–93.

Vredenburgh, A. G. (2002). Organizational safety: which management practices are most effective in reducing employee injury rates? *Journal of Safety Research*, 33 (2): 259-276.

Vroom, V. H. (1964). Work and motivation. New York: Wiley.

Wachter, J. K. and Yorio, P. L. (2014). A system of safety management practices and worker engagement for reducing and preventing accidents: an empirical and theoretical investigation. *Accident Analysis and Prevention*, 68: 117-30.

Wallace, J. C., Popp, E. and Mondore, S. (2006). Safety climate as a mediator between foundation climates and occupational accidents: a group-level investigation. *Journal of Applied Psychology*, 91 (3): 681–688.

Williamson, A. M., Feyer, A., Cairns, D. and Biancotti, D. (1997). The development of a measure of safety climate: the role of safety perceptions and attitudes. *Safety Science*, 25: 15–27.

Wu, T. C., Chen, C. H. and Li, C. C. (2008). A correlation among safety leadership, safety climate and safety performance. *Journal of Loss Prevention in the Process Industries*, 21: 307–318.

Yule, S. Flin, R. and Murdy, A. (2007). The Role of Management and Safety Climate in Preventing Risk Taking at Work. *International Journal of Risk Assessment and Management*, 7(2): 137-151.

Zohar D. (2014). Safety climate: conceptualization, measurement, and improvement. See Schneider & Barbera 2014, pp. 317–34.

Zohar, D. (1980). Safety climate in industrial organizations: theoretical and applied implications. *Journal of Applied Psychology*, 65: 96–102.

Zohar, D. (2000). A group-level model of safety climate: testing the effect of group climate on micro-accidents in manufacturing jobs. *Journal of Applied Psychology*, 85: 587–596.

Zohar, D. (2008). Safety climate and beyond: a multi-level multi-climate framework. *Safety Science*, 46(3): 376–87.

Zohar, D. (2010). Thirty years of safety climate research: Reflections and future directions. *Accident Analysis and Prevention*, 42 (5): 1517-1522.

Zohar, D. and Hofmann, D. (2012). Organizational culture and climate. In S. Kozlowski (Ed.), Handbook of industrial and organizational psychology (pp. 643–666). New York: Oxford University Press.

Zohar, D. and Luria, G. (2005). A multilevel model of safety climate: cross-level relationshipsbetween organization and group-level climates. *Journal ofApplied Psychology*, 90: 616–628.

Zohar, D. and Polachek, T. (2014). Discourse-based intervention for modifying supervisory communication as leverage for safety climate and performance improvement: a randomized field study. *Journal of Applied Psychology*, 99(1):113–24.

Zohar, D., Huang, Y. H., Lee, J. and Robertson, M. (2014). A mediation model linking dispatcher leadership and work ownership with safety climate as predictors of truck driver safety performance. *Accident Analysis and Prevention*,62:17–25.

Zohar, D., Huang, Y. H., Robertson, M. and Lee, J. (2011). Organizational climate for lone workers: antecedents and consequences of safety climate for long-haul truck drivers. Hopkinton, MA: LM Research Institute for Safety.