



# Developing Appropriate Safety Culture for Mitigating Construction Accidents and Injuries in Nigeria: A Conceptual Framework

Research Article

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## ABSTRACT

Occupational accident and injury have been described as one of the greatest challenges facing humanity in the 21st century. This is found to be very rampant in the construction industry, accounting for a significant part of all reported cases of occupational injuries. Although much work has been done on how to reduce the phenomenon to the barest minimum, the conclusions drawn from these studies are complex and, thus, difficult to inform policy decision and build theory on safety performance. This paper reviews key concepts relating to construction safety with a view to identifying factors that influence safety performance of building construction organisations. It goes further to develop a conceptual framework for building an all-inclusive model that elucidates understanding of safety culture and its impacts on construction safety and health.

**Keywords:** Construction accident, Construction industry, Injuries, Safety culture, Safety performance.

## 1 Introduction

Construction industry has been described as a vital sector of economy which contributes 5-10 percent to Gross Domestic Product (GDP) in most countries (Ojambati & Anifowose). It accounts for a significant part of global gross capital formation, a little under one-third (Kennyl, 2007). The industry remains a powerful force within the labour market, contributing a significant percentage of workforce globally (Adhikari et al., 2021; Ali, 2021). Perhaps, owing to its on-site, location bound nature and the social importance, virtually every community around the world has firms and labour organisations that are very active in construction industry. About half of these enterprises employ no fewer than fifty workers cutting across different occupations and trades (CIB, 2006).

Despite its economic contribution, the construction industry has been described as a dynamic, high-pressured and potentially high-risk environment that is laden with various forms of hazards (Wong, 1994; Weeks, 2011; Adane et al. 2013). According to International Labour Organisation (ILO-2014), more than 337 million accidents happen on the job every year worldwide, with more than half of these occurring in developing countries. In Nigeria, one out of every ten workers is accidentally injured annually (Adewale & Adhuze, 2017). Although some workplace accidents have relatively minor repercussions which could result in cut or scratch, others can have more serious and potentially fatal consequences. For example, it was reported that more than 50 million accidents result in occupational diseases and about 2.3 million deaths annually. This is said to be highest in the construction industry where there are about 80 accidents per million hours (ILO, 2014; Idoro, 2007). The incidences usually wreck great havoc to both individuals and the society at large: the victims suffer permanent disability; workers productivity becomes low and companies record losses due to time loss and payment of compensation/claims and burial expenses. Owing to the ripple effects of



construction industry on other sectors, a country's GDP is reduced (Anifowose et al., 2006; Arslan & Kivrak, 2010; Adewale et al., 2014; Agwu & Olele, 2014).

A body of research has suggested a safety culture as a major strategy to overcome these challenges. Unfortunately, the concept has not been fully utilised in the construction industry to improve safety performance, probably owing to lack of clarity of its conceptualisations and measurements (Al-Bayati, 2021). Furthermore, most of the current models and measurements do not capture the uniqueness of the construction where, for example, upper management and safety personnel often oversee multiple projects that are geographically dispersed (Al-Bayati, 2019). Apart from this, the supporting evidence for the relationship between safety culture and safety performance in the construction industry suggests inconsistency. The purpose of this paper, therefore, was to develop an all-inclusive framework that elucidates understanding of safety culture and its impacts on construction safety and health. The potential for future empirical research to validate the proposed framework is discussed, particularly in Nigerian context.

## 2 Methodology

Significant works on safety issues in the construction industry were reviewed. The review closely resembled systematic review in that sources selected were based on certain inclusion criteria. These include papers that:

- i. were created to explain safety culture and have shown a good fit
- ii. used a general behavioural theory or model that has been applied to safety culture
- iii. integrated the concepts to a better fit model for safety behaviour.

Articles that concentrated solely on theoretical aspects of safety were not included. The key concepts in safety culture, safety performance and safety behaviour and their indicators were later identified and extracted to construct a conceptual framework for investigating the safety culture and performance of a construction firm.

## 3 The Concepts of Safety Behaviors, Safety Performance and Safety Culture

Early safety literature considered the personal characteristics of individual workers as the major determinant of safety behaviour of the workers, which in turn, affects the safety performance of a construction firm. The pioneering works in this regard examined the relationship between knowledge and safe work practices basing their studies on information-deficit model (Toole, 2002; Tam & Fung, 2008; Sokas et al., 2011; Abbas et al., 2013; Rahman et al., 2013; Adewale & Adhuzo, 2017). However, there is increasing evidence suggesting that increase in knowledge and awareness does not lead to safety behaviour in most cases (Kollmuss & Agyeman, 2002). To address this limitation, a body of research has employed the Theory of Planned Behaviour/Theory of Reasoned Action to investigate the influence of attitude on health and safety behaviour (Geller, 1998; Sawacha et al., 1999; Mullen, 2004). The findings indicate that individuals' behaviour is primarily governed by their attitudes and values. Current review of safety management practices by researchers and practitioners revealed that this behaviour-based approach also is insufficient to engender effective safety management practices (Biggs et al., 2005; Misman & Mohammed, 2007; Burton, 2009; Pillay et al, 2010; Zou & Sunnidijo, 2010; Zin & Ismail, 2011; Gillen et al., 2013; Khan et al., 2015). They argue that workplace accidents and injuries are caused by both the management and workers of an organisation. A broad, organisation-wide approach to safety management practices is, therefore, a sine qua non for a zero-incident goal. This approach, which is termed safety culture, sees all levels of management and workers contributing to safety performance.

Safety culture is a relatively new concept that was first used by Post-Accident Review Meeting on the Chernobyl Accident to identify the cause of the accident (Lee, 2019). It embodies the policies and principles that guide safety decision. It is a subcomponent of corporate structure which alludes to individual, job and organisational features that affect and influence safety and health (Cooper, 2002). The concept is so complex that it has defied a single definition, resulting in different indicators and measures used in safety culture. For example, Fung et al. (2005) identified four dimensions by which safety culture could be measured; while Zou (2011) used three elements as explanatory variables of safety culture. Available evidence shows that these few constructs are not adequate to account for all the factors that



contribute to the phenomenon. It is, perhaps, on this note that the Centre to Protect Workers' Rights (CPWR) now Centre for Construction Research and Training (Gillen et al., 2013) and Pillay et al. (2010) separately developed models that relatively cover wide avenues of influence. The CPWR model consists of 13 elements which were developed through expert consensus and stakeholder voting at a safety research conference; while the model of Pillay et al. (2010) is made up of 6 factors designed for use in the mining and other related industries. They went further to propose a useful analytical tool (reality gradient of safety) to compare the safety culture of two organisations, departments, etc. According to them, the close examination of the results can help the researchers and practitioners identify the areas that need improvement actions.

#### 4 Conceptual Framework for Safety Culture

From the preceding literature review, the factors that influence the safety performance of a construction firm can be summarised as shown in Tables 1 and 2. The core assumption of the framework is that safety performance of a construction firm can be predicted by the safety culture. This relationship is assumed to be mediated by a safety behaviour of an individual site worker.

The framework, as can be seen in Figure 1, reflects the two domains of safety culture: the organisational and individual determinants. Factors relating to the organisation level explicitly refer to the context and its effect on the safety behaviour of workers and includes variables such as: management commitment; communication and feedback; supervisory environment; supportive environment; work pressure; personal appreciation of risk; training and competence level; safety rule and procedure; workers involvement; and appraisal of work hazards.

Individual determinants bear a direct relationship to the individuals and their behaviour within the organisation. These include: value, belief, attitude, knowledge of safety practices and sociodemographic factors such as age, gender, education, etc. Value represents the importance attached to safety by the individual worker at the expense of other needs. Beliefs can be conceptualised as the opinion of individual workers on safety management practices.

**Table 1:** Organizational Factors in Safety Culture

Domain	Factors	Indicators
Organisation	Management commitment	<ol style="list-style-type: none"><li>1. Top management considers safety to be more important than productivity.</li><li>2. Management acts only after accidents have occurred</li><li>3. Management praises site employees for working safely.</li><li>4. Management penalizes site employees for working safely.</li></ol>
	Communication Feedback	<ol style="list-style-type: none"><li>1. Management communicates lesson from accidents to improve safety performance</li><li>2. Management operates an open-door policy on safety issues.</li><li>3. Management encourages feedback from site employees on safety issues.</li><li>4. Management listens to and acts upon feedback from site employees</li><li>5. Management clearly communicates safety issues.</li></ol>
	Supervisory Environment	<ol style="list-style-type: none"><li>1. Site management and supervisors see themselves as safety role models for all workers.</li><li>2. Supervisor/Safety Officer usually engages in regular safety talks.</li><li>3. Supervisors endeavour to ensure that individuals are not working by themselves under risky or hazardous conditions</li><li>4. Supervisor/Safety Officer is a good resource for solving safety problems</li></ol>



		<b>5. Supervisors have positive safety behaviour.</b>
Supportive Environment		<ol style="list-style-type: none"> <li>1. The communication between workers and supervisors is effective (no language barrier).</li> <li>2. Co-workers always offer help when needed to perform the job safely.</li> <li>3. Workers always remind each other on how to work safely.</li> <li>4. As a group, workers maintain good working relationships.</li> <li>5. The communication between workers and their co-workers is effective.</li> </ol>
Work Pressure		<ol style="list-style-type: none"> <li>1. Workers always work under a great deal of tension, and not given enough time to get the job done safely.</li> <li>2. Under tight schedule, management tolerates minor unsafe behaviours performed by workers.</li> <li>3. The wages of workers are not determined solely by the amount of work completed by them.</li> <li>4. Productivity targets are in conflict with some safety measures.</li> </ol>
Personal Appreciation	Risk	<ol style="list-style-type: none"> <li>1. Everyone on site is clear about his/her responsibilities for safety.</li> <li>2. Everyone on site is aware that safety is the top priority in his/her mind while working.</li> <li>3. Workers are willing to report the unsafe and the unhealthy conditions on site.</li> <li>4. Workers have the right to refuse to work in unsafe and unhealthy conditions.</li> </ol>

**Source:** Adapted from Tehrani et al. (2019); Lee (2019)

**Table 2:** Individual Factors for Safety Culture

Domain	Factors	Indicators
Individual	Value	<ol style="list-style-type: none"> <li>1. Workmate's lives and well-being are important – people should go home in the same condition they came to work in.</li> <li>2. Doing the right thing is important, including safety practices.</li> <li>3. Overtime is necessary for additional income.</li> </ol>
	Beliefs	<ol style="list-style-type: none"> <li>1. Speaking up about safety won't threaten a job.</li> <li>2. If I do speak out, something will be done.</li> <li>3. If I don't act, I would be responsible if something happens.</li> <li>4. Good construction is about working safely – it is not a separate concern.</li> </ol>
	Attitudes	<ol style="list-style-type: none"> <li>1. My personal safety is more important than money.</li> <li>2. Well-being and personal safety in the workplace are more important than money.</li> </ol>
	Knowledge	<ol style="list-style-type: none"> <li>1. Procedural knowledge</li> <li>2. Impact Knowledge</li> </ol>
	Sociodemographic	<ol style="list-style-type: none"> <li>1. Age</li> <li>2. Educational status</li> <li>3. Working Experience</li> <li>4. Gender</li> </ol>

**Source:** Adapted from Adewale & Adhuze (2017); Lee (2019)

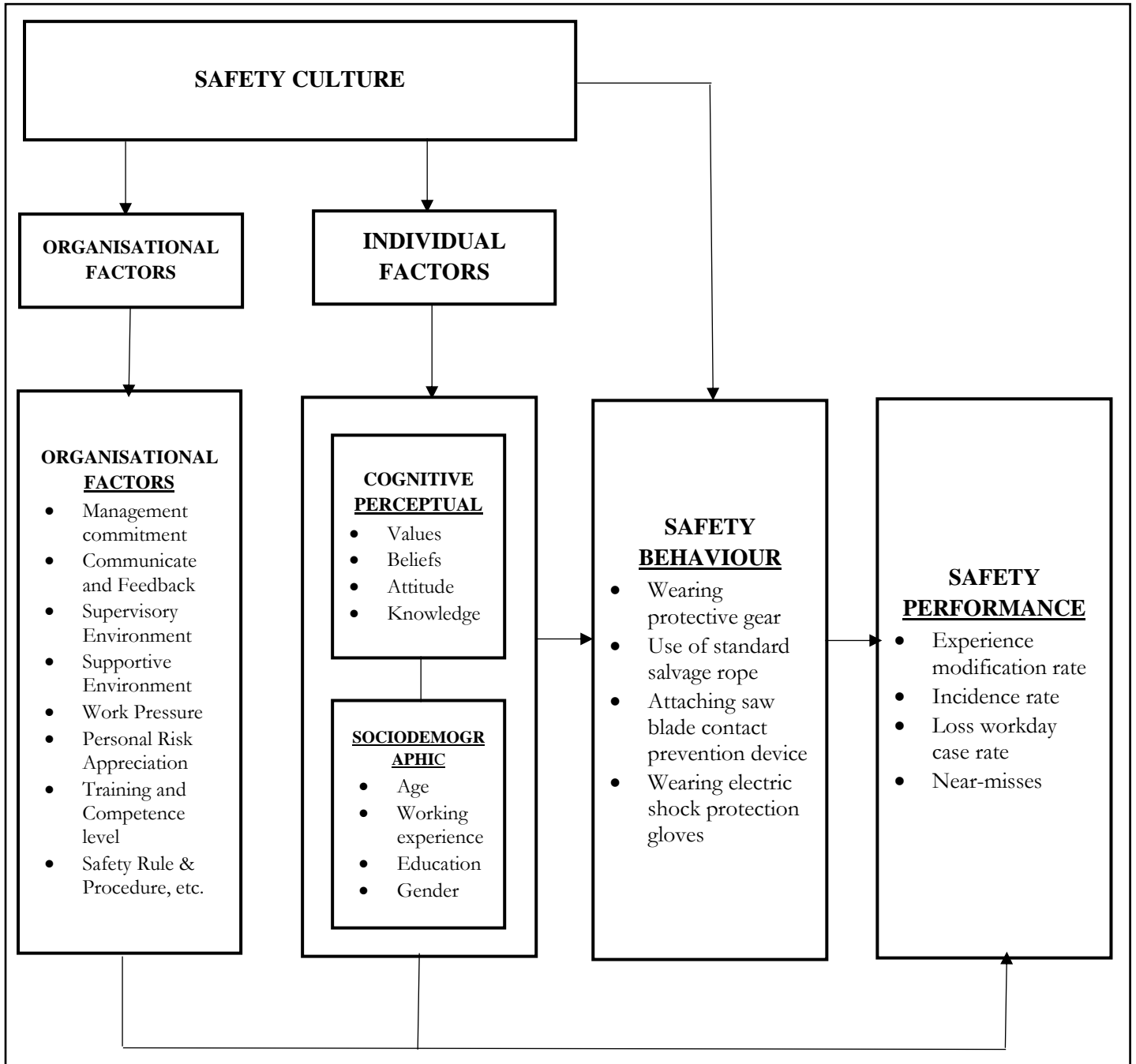


Figure 1: Conceptual Framework Linking Safety Culture, Safety Behaviour and Safety Performance in Nigerian Construction Firms



## 5. Conclusion and Recommendations

This paper is a preliminary study aimed at developing a model that aids better understanding of safety culture that is capable of enhancing safety performance of construction firms in Nigeria. Based on the critical review of the literature, a comprehensive framework for explaining the relationship between safety culture and safety performance was developed. The proposed framework comprises of two levels of safety culture: the organisational and the individual levels.

So far, limited efforts have been made to systematically integrate concepts in safety culture, safety behaviour and safety performance in a framework for theory and implementation. This paper has filled the gap by proposing a framework that considers both organisational and individual aspects of safety culture as a determinant of a safety performance of a construction firm via safety behaviour (safety management practices) of a site worker. The framework, to an extent, is compatible with the dynamic nature of the construction workplaces. This can be used to determine the important factors that influence safety culture, providing a theoretical basis for research in construction safety. It may, therefore, help construction firms select appropriate management techniques while drawing safety and health plan for each project. It will also assist in identifying those factors that need to be improved upon.

The framework could be validated by using questionnaire survey and safety audit as instrument for collecting data. The questionnaire can be administered on the site workers to rate the organisational factors on Likert scale. The same instrument can be used to elicit information on their personal characteristics and safety management practices. Audit tool could be used to measure the safety performance of the company by obtaining performance indices such as experience modification rate, incidence rate, lost workday case rate and near- misses report.

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