

## **BUILDING DEVELOPER'S APPROACH TO SAFETY IN THE CONSTRUCTION INDUSTRY**

**Abubakar S. Mahmoud\*<sup>1</sup>, Mohd. Hamdan Ahmad<sup>2</sup>, Yahya Mohd. Yatim<sup>3</sup>**

<sup>1</sup> PhD Candidate, Universiti Teknologi Malaysia, Johor Bahru, Malaysia.

Phone Number +966534392850 Email Address [sadiqmahmoud2@gmail.com](mailto:sadiqmahmoud2@gmail.com)<sup>1</sup>

<sup>2,3</sup> Professors, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, Johor Bahru, Malaysia. Email address [drmedan@gmail.com](mailto:drmedan@gmail.com)<sup>2</sup> and [b-yahya@utm.my](mailto:b-yahya@utm.my)<sup>3</sup>

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The health and well-being of construction project workers are being threatened by the increasing cases of injuries and casualties recorded at construction sites. Much research has established numerous approaches in order to reduce the frequency of accident. Only a few studies focus on building developers. The main purpose of this paper is to evaluate building developer approaches to safety performance in the construction industry of Nigeria. Data was collected from building developers in the northern part of Nigeria through the aid of questionnaire surveys and interview. The results of the study showed that 58% of the respondent do not address safety at the conceptual project phase. In addition, contractor selection is not influenced by the contractor safety performance. The result of the study may be of potential benefit to the administrators of building developer, designers and policy makers.

*Keywords:* Construction Industry, Management of Building Developer, Construction Safety, Safety performance, Assessment.

*JEL Codes:* D12, D01.

### **1. Introduction**

The construction industry is project-based, thus involves many stakeholders working together (Alarcón et al., 2016). Its uniqueness among other sectors of the economy relates to the contribution of many country's GDP and infrastructures it provides towards enhancing the national development (Abubakar et al. 2015; Tanko, *et al*, 2017). However, due to the complex nature of the activities carried out on construction project sites, various impacts on the safety of workers are recorded with high number of casualties (Ayob et al., 2018; Xia et al., 2018). The construction projects poses a serious threat to workers when compared with other sectors of the economy in many countries (Biswas et al., 2017). As reported by Wachter and Yorio (2014), accident rates in the construction industry are still high. For instance, in Japan, accident are 40% higher than other sectors (Huang & Hinze, 2003), and 50% and 25% in Ireland and the United Kingdom respectively (Agwu & Olele, 2014). Thus, these make the industry highly hazardous and poses highest danger (Fang & Wu, 2013; Hinze et al., 2013).

Similarly, the situations in developing countries are more severe due to the complex and dynamic nature of the industry, which initiate the occurrence of many injuries such as differences in locations and cultural factors (Sanders-Smith, 2007).

High turnover of unskilled workers that are inexperienced with the building process (Fass et al., 2017). High rate of self-employed workers (Pinion et al., 2017) absence of safety awareness and competing demand (Okorie & Ogbu, 2017). Due to inadequate safety concerns from industry stakeholders (Michael et al., 2005). Lack of OSH services and exclusion of safety issues in contract documentation (Zahoor et al., 2016). Thus, construction workers are prone to higher accidental risks. Nigeria still have ineffective laws and regulations on safety practices (Godwin Iroakpo Ido, 2011) Except the “Factories Act of 1990” and “Employee’s Compensation Act of 2011” which were established with the aim of eliminating the recurrence of occupational accidents (Umeokafor, 2017).

However, enforcement of such regulation is generally described as low (Ogunde et al., 2014). A study by Ido and Aluko, (2011) shows that contractors with the best safety records in Nigeria still recorded substantially higher numbers of injuries on their sites, with about 5 injuries per worker and 2 accidents per 100 workers. While, according to Ezenwa, (2001; Umeokafor, Kostis, *et al.*, (2014) these figures are by far higher because of non-reporting or concealment by workers due to fear of retribution from the company. The much desired goal of improving safety performance on the project site by their compliance with the established procedures, guidelines and regulation becomes a challenged (Bong et al., 2015; Umeokafor, Isaac, et al., 2014)

Consequently, much research effort was undertaken to reduce the frequency of accident at construction sites such (Idoro, 2008; Ogbu, 2011; Nnedinma, 2016; Okoye, Okolie and Ngwu, 2017; Umeokafor, 2017). Despite the research efforts made to improve safety performance in Nigeria, the incessant recurrence of accidents at construction sites indicates a low level of safety practices. Though, most of the research is fragmented or geared toward a specific construction industry stakeholder either contractors or subcontractor or did not provide any clear strategy for building developer to commit to safety performance on the project site (Ncube & Kanda, 2018). Thus, not much research was conducted to examine the building developers approach to safety and determine the factors, which might influence safety performance in Nigeria. Jensen et al., (2016) recommend developing safety performance guidelines that support building developers in setting high safety standards on project sites. This clearly indicates lack of regulated approach to safety by building developer and evolve a safety performance guide to improving overall safety in the industry.

An evidence based understanding of their approaches is timely and needed so as to identify areas of deficiencies and promote safety performance. Thus, this paper aimed to evaluate building developer’s approaches to safety concerns in the construction industry in Nigeria. The research is expected to offer information for building developers, government and stakeholders on the implementation of safety strategies in their project sites. Similarly the building developer situation is not different in other African countries like Ghana (Kheni et al., 2008), in Ethiopia (Sinesilassie et al., 2017), Tanzania (Jason, 2008), Malawi (Chiocha et al., 2011), and in South Africa (Smallwood, 1998).

## **2. Research Methods**

To accomplish the anticipated aim of this paper, the following activities were carried out:

- An extensive literature review was conducted, and four different dependent variables were identified relevant to the construction safety performance of building developers.
- A total of 31 surveys was administered to building developers in the northern part of Nigeria. 27 valid responses were received across the three states, which represent 87% response feedback. In terms of educational background, 74% of the respondents are bachelor graduate and 26% are master’s graduate. 37% of the respondents have 15 years’ experience while 63% had 5 – 10 years of practice.

- The study further conducted a Skype interview with industry expert to explore further information, which questionnaires could not identify. The Skype interviewed 7 practitioners and 3 academicians.

- Although, the research considers a small sample size based on the study of (Crouch & McKenzie, 2006) who opined that small sample size (less than 20) will foster closer relationship with research respondent thereby facilitating an in-depth inquiry of data that address the research problem. According to (Patton, 2002), it provides “information richness”. Moreover, Savage, Bagnall and Longhurst (2005) in their study of globalization, they use a sample size of 186 within four districts of Manchester. Alan Wolf also uses a sample size of 200 for a study of middle class identify with the US. Accordingly, small sample size has little impact on the research outcome. The entire respondent acknowledged health and safety as their area of proficiency. Finally, quantitative analysis was performed on the valid data.

### **3. Overview of Building Developers**

Many construction stakeholders operate in the industry with different specializations such as consultants, designers, contractor, subcontractors, building developers etc. All with varying objectives. According to (Jensen et al., 2016) the building developers can just be a project owner or both the owner and contractor of a project development. Findlaw, (2016) report that building developer usually develops land through construction and to this end, becomes an owner of the developed land. The developer seeks a profit from development of the land, either by selling the development, such as a tract of residential homes, a shopping mall, or an office building, or by holding the developed property to reap a return on the investment. However, in the delivery of such development, incidence of worker injury have been continually been reported on the developer's construction site (Idoro & Aluko, 2011). In either capacity, a developer has certain obligations that need to be spelled out clearly in all the construction project phases to curtail the occurrence of an accident. If this is done, the probability of a successful completion of a project with less injury record is enhanced. Godwin Iroakpo Ioro, (2012) observed that most construction industry stakeholders in Nigeria focus their attention towards profit making ignoring other obligation such as safety concerns.

HSE, (2006) indicates that if safety concerns in the construction process is omitted, the chances of accident on project sites may increase. Although, there exists certain regulation guarding the operations of the industry in many countries such as Occupational safety and health, OSHA, Health and safety Executive HSE, European and National building regulations were established to regulate safety (Choudhry et al., 2008). The Australian Workplace Health and Safety WHS (Bong et al., 2015). Alkilani, Jupp and Sawhney, (2013) opined that, the situation is different in other part of the world, especially in developing countries due lack of proper regulations.

Construction Industry Institute (1993) suggest that successful construction contract strives to clearly set out the rights and responsibilities of the parties at the inception. In this way, a project can be efficiently and successfully carried out and needless accident may be prevented (Manase & Mahdjoubi, 2010). Khalid *et al.*, (2018) identify building developers lack of health and safety consideration on construction sites and excessive use of heavy machinery where operators are unskilled as some of the concluded parameter that are causing high risk accidents on construction sites. Furthermore, as reported by Khalid *et al.*, (2018), the municipality of Dubai ensures that developers and consultants abide by Occupational, Health & the Safety (OH&S) Laws. The regulations emphasize on developers and contractors to implement best practices in their construction approaches to protect environment and eliminate all kinds of recognized hazards on site.

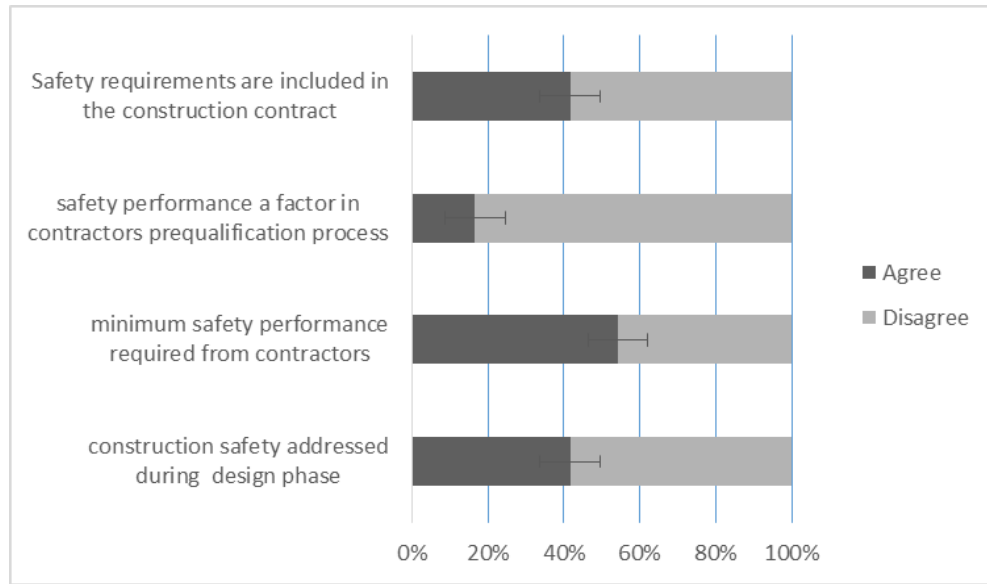
It can be inferred from the study that, developers are to establish the procedures for the work environment. The industry is yet to identify comprehensive guidelines to guarantee a safe working environment. Attempts have been made at different levels, such as design guidelines for safety (Gambatese et al., 1997), construction worker safety (Chuks & Uchenna, 2012) safety culture and BBS (Choudhry, 2014). Also, safety performance tools”, were developed to enhance safety performance (Toole & Gambatese, 2008). However, these tools and guidelines were either too complex to be implemented on the site, or did not provide any clear strategy for building developer to commit to safety performance on the project site. Shea *et al.*, (2016) opined that projects are often one-of-a-kind, on-site production takes place according to the peculiarity of the location. Moreover, Li *et al.*, (2015) maintain that researchers and practitioners uphold that the type and method of construction will affect the level of site safety to a reasonable extent.

A number of research studies have pursued to identify indicators that will ensure proactive safety performance for the various stakeholders in the construction industry. Gambatese, (2000); Teo, Ling, & Chong, (2005) indicate planning, procurement and design phase influence the safety performance in construction site. Also, (Umeokafor, Kostis, et al., 2014; van der Molen et al., 2018) acknowledged that safety training and enlightenment, administration of safety processes, have great influence on the level of safety performance. Thus, Teo, Ling and Chong, (2005); Vinodkumar *et al.*, (2011); El-Nagar, Hosny and Askar, (2015) indicate, incentive and disincentives for project stakeholders as important factors for ensuring reduced accident rate on construction sites. These are considered one of a very important factors which influences safety performance. Therefore, the assessment performed in this study considers the factors as dependent variables and analysis were presented in the following section.

#### **4. Result and Discussion**

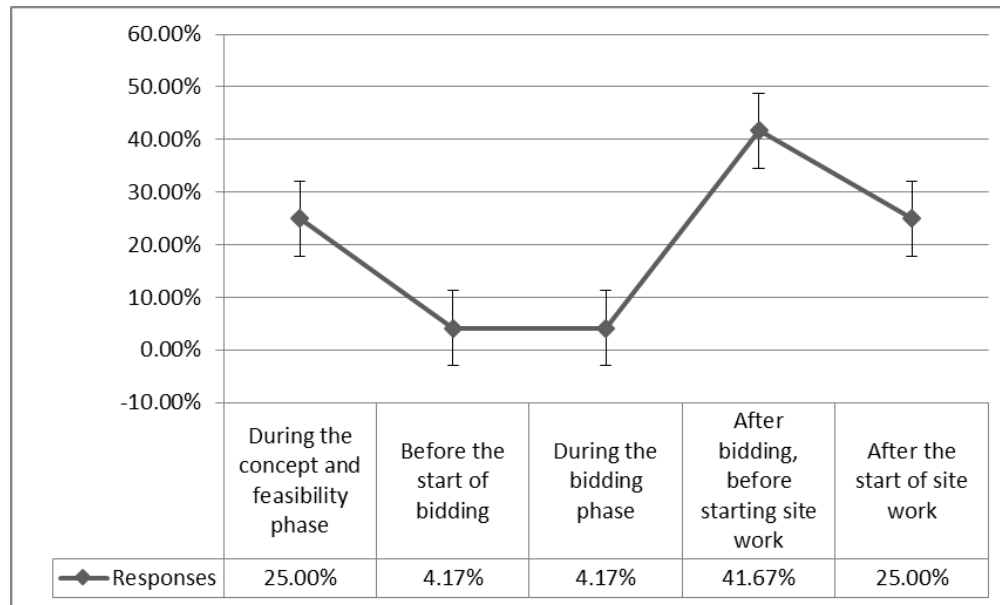
This paper primarily examines building developer’s approach to safety in the construction industry of Nigeria. Quantitative method was used. The survey contains 21 independent variables adapted from the study of (Ali et al., 2013; Teo, Ling, & Chong, 2005; Umeokafor, 2017) organize under 4 dependent variables, these include: safety concerns during conceptual and feasibility phase, safety administration and procedures, safety training and orientation, incentives and disincentives for project stakeholders. A summary of the 4 evaluated criteria’s is being discussed below.

The involvement of building developer at all project phases is a fundamental requirement for achieving improved safety performance and reduce injury record on the project site. Gambatese and Hinze, (1999); Bong *et al.*, (2015) who opined that addressing safety during the design phase is a requisite to achieving improved safety performance. Analysis of the survey indicates a low level of safety concerns at the conceptual phase as shown in Figure 1, with more than 50% of the respondents indicating not addressing safety at the conceptual phase. Similarly, the study confirms safety performance of contractor not a factor during the prequalification process. Similarly, Alzahrani and Emsley (2013) uphold that selecting contractors with consideration to safety significantly improved the overall level of safety performance on the project site. As indicated in figure 2, 70% of the building developers do consider safety after prequalification with the low bidder winning irrespective of their safety performance. Contrary to the assertion of many researchers that more than 60% of accident could be eliminated if safety are considered before prequalification.



**Figure 1. Conceptual project phase**

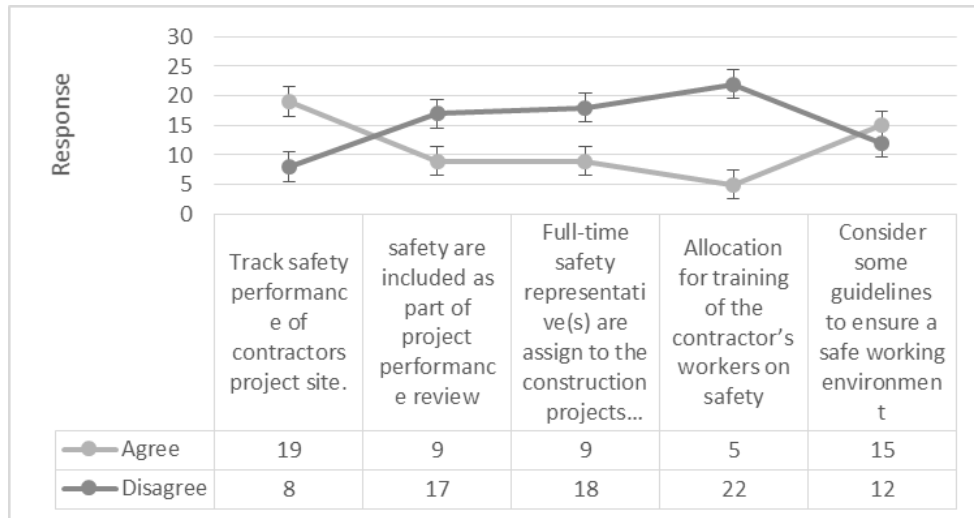
Expert interview reveals that contractor’s safety record, safety program and the rate of injury on site hardly form a base for the selecting contractor, similarly building developers that consider safety during design usually share and assume responsibilities and liability of safety with the contractor, in some instances, contractors takes full responsibilities of safety issues on site. Therefore, building developer approaches are fragmented, making it difficult for to select the appropriate safety enhancement strategy.



**Figure 2. Level of safety emphasize at projects sites**

Equally, safety procedures are principal factors in evaluating management commitment to worker safety (Choudhry & Fang, 2008; Zahoor et al., 2016). This research uses 5 variables to assess

administrative procedures of building developers as indicated in figure 3, though, safety performance is tracked with the use of established guidelines within the company. However, expert observed that the tracked safety performance mostly emphasis or focus on project completion this, explains why building developers that tracked safety fail to consider safety during the review process since the focus is on project completion. Another identified practice by building developers as mention by an expert, which has the least priority, is the non-availability of funds for contractor OSH services such as provision of protective equipment PPE. So, building developers approach to implementation of safety administrative procedures, clearly indicate the lack of logical approach that will guarantee the safety of all operators on site.



**Figure 3. Safety Administration and Procedures**

Subsequently, training and orientation play a significant role in changing workers' behavior on the site and mitigate the potential risk of hazards (Teo, Ling, & Ong, 2005). The effectiveness of the evaluated building developer’s safety training were inadequate in line with best practices. Moreover, site orientations that are performed mostly are geared toward general site orientation, as 30% of the building developers indicates non-attendance of orientation and site safety meetings. Tam, Zeng and Deng, (2004) maintain that essential for effective safety performance is the regular safety orientation and safety site meetings. Choudhry, (2014) upholds that safety meetings is important in modifying workers behaviours, thus, reducing accident. Building developers in Nigeria are saddled with many records of injury due to inadequate worker training and allocation of funds for proactive measures.

Safety incentives are a method used in the construction industry to motivate workers to foster safety procedure and worker behavior, though expensive and appropriate for short term (Fass et al., 2017). However, Hinze, (2002) argues that financial incentive do not positively influence safety performance. This study observes that about 14% of developers have provision for incentives as indicated in figure 4 with a reasonable sanction for contractors. However, the developers that agree to provide incentives ignore manager’s performance in terms of safety achievement on site. Thus, the conflicting opinion as shown in figure 4, implies lack of proper monitoring of safety on site. While developers that disagree to the provision incentives, but impious, sanctions are of the opinion that the funds are not adequate to improve workers' performance. Expert further identified contractual document fails to clarify responsibilities and liabilities of stakeholders.



**Figure 4. Incentives and Disincentives for project stakeholder**

Moreover, the interview confirmed the lack of willingness of building developers to control site operation toward preventing accident by taking lead liability with more than 80% negotiating liability with contractors or avoid as much responsibility of safety issues mainly due to cost. The study evidently demonstrates the lack of objective attitude of building developers to safety performance.

## 5. Conclusion

The crucial factors for the never-ending recurrence of high magnitude accidents on construction are timely. Building developer`s should proactively engage in all phases of project execution by demonstrating through contractor selection and documentation. The outcome of the analysis shows about 70% of respondent`s emphasis safety on site after prequalification of contractors with only 25% after the start of work. Besides, the safety administration and procedures indicate the provision of personal protective equipment, PPE for workers as an approach to safety. This study observes that reasonable sanction for contractors are imposed to non-compliant contractors with many respondents agreeing to track safety on site, but with only 32% of respondents indicate having safety personnel to monitor safety activities. Safety training and orientation is available that focus on general site orientation, thus, most of the issues identified in the study principally do have some level of safety, but with no consideration to guiding and methodical approach to safety performance from the building developer`s perspective.

The research contributes to the body of knowledge by providing an understanding of the various approaches of building developers to safety in Nigeria and demonstrate the timely need for interventions to mitigate construction accident.

But, assessing the approaches of building developers with the sample size used in the study may not be considered thorough from the industry wide perspective. For that reason, further work should be conducted to consider wide sample range and establish safety guidelines for building developer`s to streamline their project objectives with safety performance.

## References

- Abubakar Muhammad, B., Abdulateef, I., & Dorothy Ladi, B. (2015). Assessment of Cost Impact in Health and Safety on Construction Projects. *American Journal of Engineering Research*, 4(3), 2320–2847. [www.ajer.org](http://www.ajer.org)
- Agwu, M. O., & Otele, H. E. (2014). Fatalities in the Nigerian Construction Industry : A case of poor safety culture. *British Journal of Economics, Management & Trade*, 4(3), 431–452.
- Alarcón, L. F., Acuña, D., Diethelm, S., & Pellicer, E. (2016). Strategies for improving safety performance in construction firms. *Accident Analysis & Prevention*, 94, 107–118. <https://doi.org/10.1016/j.aap.2016.05.021>
- Ali, H. A. E. M., Al-Sulaihi, I. A., & Al-Gahtani, K. S. (2013). Indicators for measuring performance of building construction companies in Kingdom of Saudi Arabia. *Journal of King Saud University - Engineering Sciences*, 25(2), 125–134. <https://doi.org/10.1016/j.jksues.2012.03.002>
- Alkilani, S. Z., Jupp, J., & 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. <https://doi.org/10.5130/ajceb.v13i3.3301>
- Ayob, A., Shaari, A. A., Zaki, M. F. M., & Munaaim, M. A. C. (2018). Fatal Occupational Injuries in the Malaysian Construction Sector – Causes and Accidental Agents. *Earth and Environmental Science PAPER*. <https://doi.org/10.1088/1755-1315/140/1/012095>
- Biswas, G., Bhattacharya, A., & Bhattacharya, R. (2017). Occupational health status of construction workers: A review. *International Journal of Medical Science and Public Health*, 6(4), 1. <https://doi.org/10.5455/ijmsph.2017.0745302112016>
- Bong, S., Rameezdeen, R., Zuo, J., Li, R. Y. M., & Ye, G. (2015). The designer's role in workplace health and safety in the construction industry: Post-harmonized regulations in South Australia. *International Journal of Construction Management*. <https://doi.org/10.1080/15623599.2015.1094850>
- Chiocha, C., Smallwood, J., & Emuze, F. (2011). Health and safety in the Malawian construction industry. *Acta Structilia 2011:18(1)*, 18(1), 68–80. <https://doi.org/10.1177/146642407909900401>
- Choudhry, R. M. (2014). Behavior-based safety on construction sites: A case study. *Accident Analysis and Prevention*, 70, 14–23. <https://doi.org/10.1016/j.aap.2014.03.007>
- Choudhry, R. M., & Fang, D. (2008). Why operatives engage in unsafe work behavior: Investigating factors on construction sites. *Safety Science*. <https://doi.org/10.1016/j.ssci.2007.06.027>
- Choudhry, R. M., Lingard, H., Management, P., Blismas, N., & Management, P. (2008). *Designing for Safety : Perspectives from European Union, United Kingdom, Australia and United States Pertaining to Safety and Health in Construction*. 1–10.
- Chuks, O. K., & Uchenna, P. (2012). *Appraising the Influence of Cultural Determinants of Construction Workers Safety Perception and Behaviour in Nigeria. March 2013*, 11–24.
- Crouch, M., & McKenzie, H. (2006). The logic of small samples in interview-based qualitative research. *Social Science Information*. <https://doi.org/10.1177/05390184060609584>
- El-nagar, R., Hosny, H., & Askar, H. S. (2015). Development of a Safety Performance Index for Construction Projects in Egypt. *American Journal of Civil Engineering and Architecture*, 3(5), 182–192. <https://doi.org/10.12691/ajcea-3-5-5>
- Ezenwa, A. O. (2001). A study of fatal injuries in Nigerian factories. *Occupational Medicine*. <https://doi.org/10.1093/occmed/51.8.485>
- Fang, D., & Wu, H. (2013). Development of a Safety Culture Interaction (SCI) model for construction projects. *Safety Science*. <https://doi.org/10.1016/j.ssci.2013.02.003>
- Fass, S., Yousef, R., Liginlal, D., & Vyas, P. (2017). Understanding causes of fall and struck-by incidents: What differentiates construction safety in the Arabian Gulf region? *Applied Ergonomics*, 58, 515–526. <https://doi.org/10.1016/j.apergo.2016.05.002>
- Findlaw. (2016). *Construction Developer's Responsibilities*. FindLaw.Com. <https://realestate.findlaw.com/owning-a-home/construction-developer-s-responsibilities.html>
- Gambatese, B. J. A., Member, J. W. H., & Member, C. T. H. (1997). *TOOL TO DESIGN FOR CONSTRUCTION WORKER SAFETY*. 3(1), 32–41.



Gambatese, J., & Hinze, J. (1999). *Addressing construction worker safety in the design phase Designing for construction worker safety*.

Gambatese, JA. (2000). Owner involvement in construction site safety. *Construction Congress VI@SBuilding Together for a ....* [https://doi.org/10.1061/40475\(278\)71](https://doi.org/10.1061/40475(278)71)

Hinze, J., Thurman, S., & Wehle, A. (2013). Leading indicators of construction safety performance. *Safety Science*, 51(1), 23–28. <https://doi.org/10.1016/j.ssci.2012.05.016>

Huang, X., & Hinze, J. (2003). Analysis of Construction Worker Fall Accidents. *Journal of Construction Engineering and Management*. [https://doi.org/10.1061/\(ASCE\)0733-9364\(2003\)129:3\(262\)](https://doi.org/10.1061/(ASCE)0733-9364(2003)129:3(262))

Idoro, G I, & Aluko, O. (2011). Construction programming efforts of indigenous and expatriate contractors and their influence on project outcome in Nigeria. *Royal Institution of Chartered Surveyors International Research Conference, COBRA 2011*.

Idoro, Godwin Iroako. (2008). Health and safety management efforts as correlates of performance in the Nigerian construction industry. *Journal of Civil Engineering and Management*, 14(4), 277–285. <https://doi.org/10.3846/1392-3730.2008.14.27>

Idoro, Godwin Iroako. (2011). Comparing occupational health and safety (OHS) management efforts and performance of nigerian construction contractors. *Journal of Construction in Developing Countries*, 16(2), 151–173.

Idoro, Godwin Iroako. (2012). Influence of project plans on the outcome of construction projects procured by design-build (DB) in Nigeria. *Journal of Construction in Developing Countries*.

Jason, A. (2008). Organizing informal workers in the urban economy. The case of the construction industry in Dar es Salaam, Tanzania. *Habitat International*. <https://doi.org/10.1016/j.habitatint.2007.08.009>

Jensen, P. L., Laustsen, S., & Jensen, E. (2016). *Policy and Practice in Health and Safety Development of the Relationship Between Small Building Contractors and Developers in Order to Meet OSH Requirements Development of the relationship between small building contractors and developers in order to meet*. 3996. <https://doi.org/10.1080/14774003.2010.11667747>

Khalid, S. S., Ahmad, M., Khalid, L. S., & Odimegwu, T. C. (2018). Problems and Factors Affecting Property Developers Performance in the Dubai Construction Industry. *International Journal of Scientific and Research Publications (IJSRP)*. <https://doi.org/10.29322/ijsrp.8.11.2018.p8312>

Kheni, N. A., Dainty, A. R. J., & Gibb, A. (2008). *Health and safety management in developing countries : a study of construction SMEs in Ghana*. November, 1159–1169. <https://doi.org/10.1080/01446190802459916>

Li, H., Lu, M., Hsu, S. C., Gray, M., & Huang, T. (2015). Proactive behavior-based safety management for construction safety improvement. *Safety Science*. <https://doi.org/10.1016/j.ssci.2015.01.013>

Li, Q., Ji, C., Yuan, J., & Han, R. (2017). Developing dimensions and key indicators for the safety climate within China's construction teams: A questionnaire survey on construction sites in Nanjing. *Safety Science*, 93, 266–276. <https://doi.org/10.1016/j.ssci.2016.11.006>

Manase & Mahdjoubi, V. A. (2010). *Accident Prevention On Construction Sites: Towards A New Approach*. Raymond 1995. <http://www.irbnet.de/daten/iconda/CIB14720.pdf>

Michael, J. H., Evans, D. D., Jansen, K. J., & Haight, J. M. (2005). *Management commitment to safety as organizational support : Relationships with non-safety outcomes in wood manufacturing employees*. 36, 171–179. <https://doi.org/10.1016/j.jsr.2005.03.002>

Ncube, F., & Kanda, A. (2018). Current Status and the Future of Occupational Safety and Health Legislation in Low- and Middle-Income Countries. In *Safety and Health at Work*. <https://doi.org/10.1016/j.shaw.2018.01.007>

Nnedinma, U. (2016). Approaches, drivers and motivators of health and safety self-regulation in the Nigerian construction industry: a scoping study. *Architectural Engineering & Design Management*, 12(6), 460–475. <https://doi.org/10.1080/17452007.2016.1195332>

Ogbu, C. P. (2011). *Risk Management Practices of Multinational and Indigenous Construction Companies in Nigeria: a Comparative Analysis*. 9(2), 315–324.

Ogunde, A. O., Owolabi, D. J., & Kukoyi, P. O. (2014). *Evaluation of the level of compliance (CDM 2007) regulations by clients in Nigeria*. 1(1), 42–52.

Okorie, V. N., & Ogbu, C. P. (2017). Construction Health and Safety Awareness of Nigerian Undergraduate

- Quantity Surveyors. *Nigerian Journal of Environmental Sciences and Technology (NIJEST) Vol, 1(2)*, 1–11.
- Okoye, P. U., Okolie, K. C., & Ngwu, C. (2017). Multilevel safety intervention implementation strategies for Nigeria construction industry. *Journal of Construction Engineering*, 2017.
- Pinion, C., Brewer, S., Douphrate, D., Whitehead, L., DelliFraine, J., Taylor, W. C., & Klyza, J. (2017). The impact of job control on employee perception of management commitment to safety. *Safety Science*, 93, 70–75. <https://doi.org/10.1016/j.ssci.2016.11.015>
- Sanders-Smith, S. (2007). Hispanic worker safety: Understanding culture improves training and prevents fatalities. *Professional Safety*.
- Shea, T., De Cieri, H., Donohue, R., Cooper, B., & Sheehan, C. (2016). Leading indicators of occupational health and safety: An employee and workplace level validation study. *Safety Science*, 85. <https://doi.org/10.1016/j.ssci.2016.01.015>
- Sinesilassie, E. G., Tabish, S. Z. S., & Jha, K. N. (2017). Critical factors affecting schedule performance: A case of Ethiopian public construction projects - Engineers' perspective. *Engineering, Construction and Architectural Management*. <https://doi.org/10.1108/ECAM-03-2016-0062>
- Smallwood, J. (1998). Client influence on contractor health and safety in South Africa. *Building Research and Information*. <https://doi.org/10.1080/096132198369959>
- Tam, C. M., Zeng, S. X., & Deng, Z. M. (2004). Identifying elements of poor construction safety management in China. In *Safety Science*. <https://doi.org/10.1016/j.ssci.2003.09.001>
- Tanko, B. L., Abdullah, F., & Ramly, Z. M. (2017). Stakeholders Assessment of Constraints to Project Delivery in the Nigerian Construction Industry. *International Journal of Built Environment and Sustainability*, 4(1), 56–62. <https://doi.org/10.11113/ijbes.v4.n1.160>
- Teo, E. A. L., Ling, F. Y. Y., & Chong, A. F. W. (2005). Framework for project managers to manage construction safety. *International Journal of Project Management*. <https://doi.org/10.1016/j.ijproman.2004.09.001>
- Teo, E. A. L., Ling, F. Y. Y., & Ong, D. S. Y. (2005). Fostering safe work behaviour in workers at construction sites. *Engineering, Construction and Architectural Management*. <https://doi.org/10.1108/09699980510608848>
- Toole, T. M., & Gambatese, J. (2008). *The Trajectories of Prevention through Design in Construction*. 39, 225–230. <https://doi.org/10.1016/j.jsr.2008.02.026>
- Umeokafor, N. (2017). An appraisal of the barriers to client involvement in health and safety in Nigeria's construction industry. *Journal of Engineering, Design and Technology*. <https://doi.org/10.1108/JEDT-06-2016-0034>
- Umeokafor, N., Isaac, D., Jones, K., & Umeadi, B. (2014). Enforcement of Occupational Safety and Health Regulations in Nigeria: an Exploration. *European Scientific Journal*, 3(February), 1857–7881.
- Umeokafor, N., Kostis, E., Lundy, S., Isaac, D., Stuart, A., Igwegbe, U., & Boniface Umadi. (2014). The Pattern of Occupational Accidents , Injuries , Accident Causal Factors and Intervention in Nigerian Factories. *Developing Country Studies*.
- van der Molen, H. F., Basnet, P., Hoonakker, P. L. T., Lehtola, M. M., Lappalainen, J., Frings-Dresen, M. H. W., Haslam, R., & Verbeek, J. H. (2018). Interventions to prevent injuries in construction workers. In *Cochrane Database of Systematic Reviews*. <https://doi.org/10.1002/14651858.CD006251.pub4>
- Vinodkumar, M. N., Bhasi, M., Teo, E. A. L., Ling, F. Y. Y. Y. Y., Chong, A. F. W., Tam, C. M. M., Zeng, S. X., Deng, Z. M., Sawacha, E., Naoum, S., Fong, D., Mohamed, S., Lai, D. N. C., Liu, M., Ling, F. Y. Y. Y. Y., Jaselskis, E. J., Anderson, S. D., Russell, J. S., Iii, B. F., ... Shaar, A. (2011). Owner ' s Role in Construction Safety. *International Journal of Project Management*. <https://doi.org/10.1016/j.ijproman.2005.03.009>
- Xia, N., Griffin, M. A., Wang, X., Liu, X., & Wang, D. (2018). Is there agreement between worker self and supervisor assessment of worker safety performance? An examination in the construction industry. *Journal of Safety Research*, 65, 29–37. <https://doi.org/10.1016/j.jsr.2018.03.001>
- Zahoor, H., Chan, A. P. C., Masood, R., Choudhry, R. M., Javed, A. A., & Utama, W. P. (2016). Occupational safety and health performance in the Pakistani construction industry: stakeholders' perspective. *International Journal of Construction Management*. <https://doi.org/10.1080/15623599.2015.1138027>