JOURNAL 15

International Journal of Strategic Research in Education, Technology and Humanities
ISSN Print: 2465-731X | ISSN Online: 2467-818X
IJSRETH
Vol. 6, No. 1
January, 2019

Influence of Hazard Recognition Measures on Safety Performance of Building Workers in Abuja, Nigeria

'Aisha U. Doko, 'Abdullateef A. Shittu & 'Abdulganiyu A. Oke
[a,b,c]*Department of Quantity Surveying,*
Federal University of Technology Minna

Abstract

The construction industry has a track record of poor cost performance which has been attributed to the effects of risk. Yet clients expect early, firm estimates of what project will cost. The action of risk on project costs has been studied using the risk register methodology in some previous studies, but new and maintenance projects were not examined separately. The paper established the distribution of risks associated with costs of new building and building maintenance projects by focusing on the risk consequences that could be determined from the final accounts of projects only. Project Quantity Surveyors (PQS) were presented with checklists of 19 risk factors collated from the literature, and were asked to associate risk factors with changes to project costs of 69 projects that were found to be suitable for the purposes of this study. Using a 4-order polynomial trend line, it was found that the number of risk events encountered in new buildings peaked at 25% and 68% completion, as opposed to 15% and 45% in the case of maintenance projects. The study concluded that project consultants were responsible for the highest numbers of risk events (70%), and that the majority of additional project costs (81.8%) were associated with very few risks events that had large cost impacts (8.2% of all risk events). It was recommended that clients and architects need to finalize project briefs early in the project lifecycle such that changes to the brief during construction will be minimal.

Keywords: *Building, Costs, Maintenance, Risk, Risk register*

Corresponding Author: Aisha U. Doko

http://internationalpolicybrief.org/journals/international-scientific-research-consortium-journals/ijsreth-vol-6-no-1-january-2019

Background to the Study

Despite improvements in safety management practices, disproportionate injury rates continue to be a universal problem in the construction industry. Globally, more than 60,000 fatal accidents are reported annually from construction projects (Lingard, 2013); 25-40% of fatalities in the global occupation environment are contributed by construction-related activities (International Labour Organization (ILO), 2005). One of the reasons for poor safety performance within construction is the inability of workers to detect hazards in dynamic and rapidly changing work environments (Albert *et al.*, 2013). Haslam *et al.*, (2015) showed that up to 42% of safety incidents can be traced to poor hazard recognition. Despite hazard recognition being one of the most essential steps in the safety management process, Carter and Smith (2006) found that between 10 and 33.5% of hazards remained unrecognized or in adequately assessed in projects. To improve hazard recognition levels several hazard recognition techniques and training programs have developed. Although beneficial, they have not completely addressed the issue of poor hazard recognition within construction (Perlman *et al.*, 2014). Idoro (2011) in a study of 40 contractors in Nigeria revealed that the best safety ratios were 2 accidents per 100 workers and 5 injuries per 100 workers.

Understanding the influence that the level of implementation of hazard recognition measures has on health and safety performance of construction workers remains a major research problem. The results of studies such as this can be used by practitioners to improve potential hazard reception programs that complement existing training methods. The aim of the paper is to examine the influence of level of implementing hazard recognition measures on safety performance of workers on building construction sites in Abuja. The study answered the following research questions: (i) What influence does hazard implementation have on the development of health and safety facilities on construction sites; (ii) To what extent does hazard recognition implementation affect the level of accident on construction site; (iii) What are the effects of hazard recognition implementation on safety performance of workers in terms of cost and time?

Literature Review

Concept of Hazard in the Construction Industry

Hazard is a phenomenon or a process that can endanger human beings and their work environment. MacCollum and Hughes (2005) indicated that dangers are more than a hazardous physical condition and many lie inactive and unsuspected until they cause unavoidable damage. For this reason Hunter(2011) strongly opined that every employee be acquainted with the provisions of the Occupational Safety and Health Administration (OSHA)in order to understand how their actions may constitute harm or injury to them in their workplace. Health and safety hazards are divided into two categories which are physical and ill-health hazards. Hazards resulting from physical injury may lead to death immediately; ill-health is not easily noticed but manifests after a long period as sickness which may later result to death(Sarah, 2012).

Construction regulations are constitutional instruments setting out the minimum legal requirement for construction works. The regulations relate mostly to the health, safety and welfare of the workforce which must be taken into account when planning construction operations and during the actual construction period (Famakin and Fawehimi, 2007). Mohammed (2010) also specified that it is mandatory for the client to ensure that the construction stage of any project does not commence unless a health and safety plan has been prepared in accordance with established technical standards. The Occupational Safety and Health Act of 1970 (OSHA) is a comprehensive set of safety and health regulations, inspection procedures, and record keeping requirements. In the United States, the OSHA is the principal authority in charge for regulating occupational and health issue and also for providing safety related training to contractors, (Ahcom, 2004).

Safety on Construction Sites

'Safety is a subject to which most people are quite eager to pay lip service, but which too few are really willing to do something about' (Paulson, 2009). Construction Industry Training Board (CITB) (2009) stated that both employers and employees have responsibilities to guard safety and health in the workplace. The ways by which this is achieved include the provisions of the PPE Procedures 1992 which entail the employer to afford without charge, all apparatus (including clothing affording guard against the climate) which is proposed to be put on or held by a being at place of work and which guards them against one or more dangers to his safety or health. This includes gloves, safety helmets, high-visibility clothing, eye protection, safety footwear and safety harness (Strank, 2006).

Workplace safety is also the subject of the Safety Signs Regulation 1980 under the Safety and Health at Work Act (SHWA) 1974 which made it mandatory that safety signs should follow a customary system with respect to colours and shapes (Strank, 1996). This form of safety promotion helps to mobilize employees, suppliers and visitors to reason safe, feel secured, act secured and be secured (HSE, 2003). A further aspect of safety is training; the Training Regulation 28 under SHWA 1974 offers for a much broader delivery of training for individuals carrying out construction work (Ferret and Hughes, 2007). All personnel must have adequate training, technical understanding or knowledge to decrease the risk of injury to others (HSE, 2003).

Accident on Construction Sites

Accident is any event that occurs suddenly, unintentionally and unforeseen which may cause physical harm or damage to properties and person (Sarah, 2012). Three main types of accidents can be identified as follows: (1) Major non-fatal accidents - Injuries which result in fractures or amputations; usually persons with this type of injury would miss work for around 30 days; such major accidents include slips, trips, dropping from height, transport, machinery, electricity accidents (Nichols, 2006). (2) Minor non-fatal accidents - This type of accidents produces fewer injuries; injuries resulting from minor accidents would result in three (3) or fewer days missed from work; accidents in this class comprise stepping, striking with small tools, objects, strains or even illness. (3) Fatalities - These are accidents that result to deaths from work injuries on site (Wikipedia, 2012).

Costs Resulting from Accidents

Accidents normally affect the output and frequently result in extensive loss to contractors (HSE, 2006) through diverse kinds of costs (both direct and indirect) that are linked with accidents. While these costs of damage have repercussions on contractors (Booth *et al.*, 2005),there are also adverse effects on workers such as social costs (e.g. death, pains and discomfort, permanent disability) that are hard to quantify in financial terms (e.g. loss of output, insurance cost). There are several factors that influence the cost implications of construction health and safety measures. Some of these factors are Legal obligations; Fear of persecution, cost of compliance; Health and safety publicity; Image and credibility; criteria for prequalification; Link to other systems; Reliability, competitiveness and quality; Increase awareness and appreciation of hazard and risks; Indirect costs and direct costs of accidents.

Research Methodology

The methodology followed in the study is summarized in Figure 1.

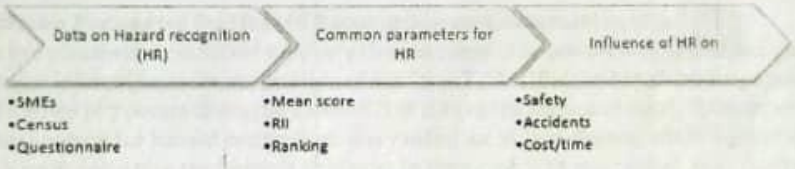

Figure 1: Research methodology flowchart of the study

Data Collection and Analysis

The study population comprised40 of the 126 construction companies that are registered with Federation of Construction Industry (FOCI) (Vanguard, 2015) and who operate in Abuja. The sampling frame consisted of participants in building industry with particular emphasis on project managers, contractors, workers and safety officers. The study was restricted to Abuja metropolis due to proximity to large number of projects and companies found there. It was planned to administer questionnaires to up to three persons in each company; 120 questionnaires were thus prepared. Purposive judgmental sampling technique was adopted because only people involved in health and safety decision making were issued questionnaire. The study employed the use of statistical tools such as Relative Importance Index (RII), Mean Item Scores (MIS), and percentages to analyze the data obtained through questionnaires.

Results and Discussion

Analysis of Respondents' Demographics

Cumulatively 89% of the sample had worked for between 4 and 12 years in the construction industry. This characteristic renders such respondents ideal for providing information on health and safety on the construction sites where they work. Almost half of the sample (46%) did not provide any information as to their professional status. Of the remaining 54% that did, 43% were corporate members of the Nigerian Institute of Quantity Surveyors (NIQS). The balance of 11% belonged to the probationer cadre of the Institute

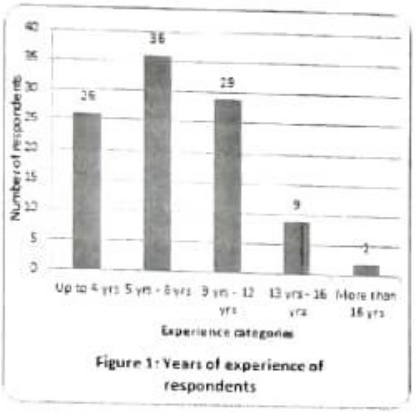

Figure 1: Years of experience of respondents

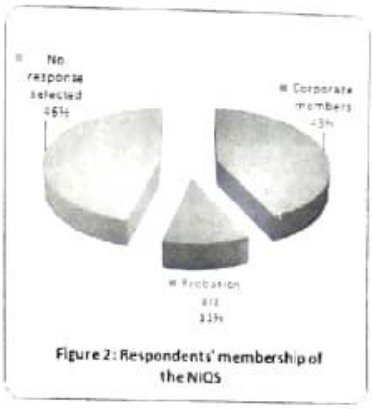

Figure 2: Respondents' membership of the NIQS

Common Parameter for Hazard Recognition on Construction Site

The five parameters examined were very close in terms of importance in hazard recognition. This was inferred from the observation of results in Table 1 that the RII of the five parameters had a range of 7 points (from the lowest RII of 0.85 to the highest at 0.92). Training workers on techniques for hazard recognition was ranked 1st in importance, while the training of workers to recognize the hazards that exist in their own jobs was ranked 2nd. Training on how to use personal protective equipment was ranked 3rd.

Table 1: Hazard recognition parameters

Common parameter for recognition of hazard on construction site	Mean Score	RII	Rank
Train workers on techniques for id entifying hazards	4.61	0.92	1st
Train workers so that they understand and recognize hazards they may encounter in their own jobs	4.55	0.91	2nd
Train workers on how to wear required personal protective equipment	4.41	0.88	3rd
Provide additional training as necessary when a change in facilities, equipments, processes, materials or work organization could increase hazards, and whenever a worker is assigned a new task.	4.29	0.85	4th
Train workers on the proper use of work practice and administrative controls	4.26	0.85	5th

Influence of Hazard Recognition on Development of Health and Safety Facilities

Hazard recognition was perceived to have the greatest influence on commitment by management to safety, which had an RII of 0.83 and was ranked 1st. Training and education was ranked 2nd in terms of the influence of hazard recognition. This meant that respondent believed that recognition of hazards could serve as a trigger for increased training and education. Communication and consultation was ranked 3rd; this underscores the

selected the 'very significant' and 'significant' option, but the sum of such responses fell short of the 70% required to achieve consensus. Respondents were of the opinion that hazard recognition impacted on the costs of safety through reduction in compensation costs. This was ranked as 1st with mean score of 3.65 and RII of 0.70, ahead of reduction in construction time (ranked 2nd with mean score of 3.72 and RII of 0.68) and savings in operational costs (ranked 3rd; mean score of 3.55 and RII of 0.67).

Table 4: Hazard recognition and safety cost performance

Effect of hazard recognition on Cost performance	Mean Score	RII	Rank
Making job easier for professional	3.75	0.63	4
Saves time in construction site	3.72	0.68	2
Reduces cost for compensation	3.65	0.70	1
Saving operational cost	3.55	0.67	3

The result for the effect of hazard recognition on the safety performance of workers in terms of time is presented in Table 5. None of the opinions expressed by respondents achieved consensus. Respondents were of the opinion that hazard recognition impacted on the construction time through savings in operational costs. This was ranked as 1st with mean score of 3.68 and RII of 0.54, ahead of reduction in compensation costs (ranked 2nd with mean score of 3.34 and RII of 0.48) and reduction in construction time (ranked 3rd; mean score of 3.53 and RII of 0.47).

Table 5: Hazard recognition and safety time performance

Effect of hazard recognition on Time performance	Mean Score	RII	Rank
Saving operational cost	3.68	0.54	1
Making job easier for professional	3.53	0.44	4
Reduces cost for co mpensation	3.53	0.48	2
Saves time in construction site	3.34	0.47	3

Findings and Conclusion

This study has employed descriptive statistics to identify and rank the various aspects of construction safety that hazard recognition can impact. Efforts have been directed at showing the parameters that can indicate the recognition of hazards on sites, the effects of hazard recognition on safety facilities, construction accidents and construction cost/time. The training of workers on techniques for hazard recognition is an indication of site where hazards are recognized. Commitment by management to safety is the most important means through which hazard recognition influences the development of safety facilities. Hazard recognition leads to a reduction in accidents on sites; impacts safety costs through reduction in compensation costs, and improves construction time performance through savings in operational costs.

importance of keeping open the channels of communication with all stakeholders on construction sites. When hazards are identified, it becomes imperative that such knowledge is circulated to all stakeholders on the project. This could help forestall the occurrence of accidents.

Table 2: Influence of hazard recognition on health and safety facilities

Influence of hazard recognition on development of health and safety facilities	Mean Score	RII	Rank
Commitment by management to safety	4.13	0.83	1
Training and education	3.97	0.78	2
Communication and consultation	3.89	0.78	3
Risk management and control of hazards	3.84	0.75	4
An effective OHS management system	3.72	0.72	5

Extent to which Hazard Recognition can affect Level of Accidents on Site

The responses were generally in agreement with the statements made in the research questionnaire. The greater proportion of respondents selected the 'very significant' and 'significant' option. Consensus opinions occurred in four out of the five statements that were presented to respondents. The only statement in which respondents did not reach a consensus was 'Reduces by keeping safety record and follow-ups' which was ranked 5th. From the results presented in Table 3, respondents believed that hazard recognition reduces accidents on sites, judging by a mean score of 4.38 and RII of 0.88. Next in importance to the reduction of accidents was the influence of hazard recognition in the improvement of productivity of workers. In third place was the provision of fire protection programme, based on the types of hazards recognized and identified.

Table 3: Effect of hazard recognition on accidents on construction sites

Extent to which hazard recognition can affect level of accidents on site	Mean Score	RII	Rank
Reduces accidents on site	4.38	0.88	1
Improves workers productivity	4.19	0.84	2
And by providing fire protection programme	4.12	0.82	3
Reduces by providing first aid box	3.97	0.79	4
Reduces by keeping safety record and follow -ups	3.69	0.74	5

Effect of Hazard Recognition on Safety Performance of Workers in Terms of Cost and Time

The result for the effect of hazard recognition on the safety performance of workers in terms of cost is presented in Table 4. Although the responses generally agreed that hazard recognition had significant or very significant influence on the costs of safety performance of workers, none of the opinions achieved consensus. The greater proportion of responses

This study has concluded that the recognition of hazards on construction sites can have impact on several aspects of construction such as safety facilities, construction accidents and construction cost/time. It is recommended that in order to be considered as being hazard recognition-compliant, construction contractors must carry out the following: (i) training of workers on techniques for hazard recognition, (ii) training of workers to recognize the hazards that exist in their own jobs and (iii) training workers on how to use personal protective equipment. To improve safety facilities on construction sites, the management of projects must display a commitment to safety, provide training and education, and engage in communication and consultation.

References

Albert, A., Hallowell, M. R., Kleiner, B. M. (2013). Enhancing construction hazard recognition and communication with energy based cognitive mnemonics and safety meeting maturity model: multiple Baseline study. *Journal of Construction Engineering Management 140* (2).

Boot, T. Geargios, D. & Panopoulos, D. G. (2005). Economic aspects of safety in construction industry, 3rd international conference on construction in the 21st century, *(CITC-III) Advanced Engineering, Management and Technology.* 15-17 Athens.

Carter, G., & Smith, S. D. (2006). Safety hazard identification on construction projects. *J. Contr. Eng. Manage.* 10.1061 (ASCE) 0733-9364 (2006) 132:2 (197), 197-205.

Ferret, E. D. & Hughes, P. (2007). *Introduction to health and safety in construction 2nd edition,* UK: Elsevies Ltd.

Haslam, R. A. M et'al (2005) Contributing factors in construction accidents. *Appl. Ergon, 36* (4), 401-415.

HSE (2003). Revitalizing health and safety in construction, http://www.hse.gov.uk/costoverview.asp (accessed 24/10/2005). 224.

HSE (2005). Construction industry, Retrieved on May 25, 2015 from http://www.hse.gov.uk/statistics/industry/construction/indexhtm

Hunter, M. C. (2011). Top 6 construction site hazard, online available. Retrieved on 24th June, 2012 from http://www.safetyrisk.com

Idoro, G. L. (2011). Comparing occupational health and safety (ohs) management efforts and performance of Nigeria construction contractors. *Journals of construction in Developing Countries.*

International Labour Office I. L.O (2005). Prevention. A global strategy promoting safety and health at work. The I.L.O report for world day of safety and health at work, *International Labour Office Geneva,* ISBN 92-2-117107-8

Linguard, (2013). Occupational Health and Safety in Construction Industry, *Constr. Magage. Econ*, 31 (6), 505-514.

McCollum, D. & Hughes, R. (2005). Building design and construction hazards: Lawyers and judges publishing company. Retrieved July 6th, 2012 from http://www.book.google.com.ng/books

Mohammed, I. M. (2010). The importance of efficient construction regulations. Retrieved May 17, 2010 http://www.evancarmichael.com/legal/2112/the importance-of-efficient construction-regulations.html

Perlman, A., Sacks, R., Barak, R. (2014). Hazard Recognition and Risk Perception in construction, *Saf. Sci.*, 64, 22-31.

Serah, P. (2012). Health and safety risk management in building construction sites in Tanzania: the practice of risk assessment communication and control.

Vanguard (2015). FG States, owns construction firms 600billion naira FOCI

Watson, J. (2001). How to determine sample size: T.P sheet #60, University Park, P.A: University Cooperative Extension, Pennsylvania State University. Retrieved from http://www.extension/pdf/t560.pdf on 7/4/2013