

# Key Performance Indicators of Health and Safety on Construction Site in South-Western States of Nigeria

Okedare David Kolawole Olufemi and Olanrewaju Sharafadeen Babatunde Owolabi

Department of Building Technology, School of Environmental Studies, The Federal Polytechnic, P.M.B. 5351, Ado Ekiti, Ekiti State, Nigeria.

**ABSTRACT:** *This study appraised the key performance indicators (PKIs) of health and safety on construction sites in South-Western state. The study examined the factors that affect the health and safety performance on construction sites. The study further assessed the rate of fatal injuries among trades on construction sites and identification of chemical, physical, and other hazards available at the construction work sites. Data for the study were collected through well-structured questionnaire administered randomly within the populace in Lagos, Ogun, Oyo, Osun, Ondo and Ekiti states. Data collected were analysed using percentage, mean and relative significance index. The study revealed that administrative and management commitment ranked first with RSI value of 0.84 (i.e. 84 percent significance) while Poor communication between sites ranked last with RSI value of 0.59 as the factors that affect the health and safety performance on construction sites. The result also showed that all the factors are significant with the least factor having 59 (0.59) percent significance. The level of fatal injuries among traders on construction sites revealed that Masons/Bricklayers ranked first with RSI value of 0.763 (i.e.76.3 percent significance) and Rock workers ranked last with RSI value of 0.597. The masons/bricklayers are most liable to fatal injuries among trade's men on construction site, while the insulators are less exposed to risk or danger. The Relative Significance Index (RSI) in identification of chemical, physical, and other hazards Available at the construction Work Sites. It revealed that Masons/Bricklayers (Cement dermatitis, awkward postures, heavy loads) ranked first with RSI value of 0.733 (i.e.73 percent significance) and insulators (Asbestos, synthetic fibres, awkward postures) ranked last with RSI value of 0.587. The result also showed that all the traders are significant with the least factor having 58.7 (0.587) percent significance. Conclusion and recommendation are made on the report of this work.*

## I. INTRODUCTION

Construction sites are dangerous places, with innumerable hazards and dangers present that can cause illness, injury or death to a site worker. These include dangers like hazardous substances such as dust, chemicals etc, injuries from tools, falling from height, manual handling injuries, being hit by moving construction vehicles, and many more. The increasing level of health and safety legislation over the past two or three decades has placed a great level of responsibility on site managers and supervisors for ensuring that the construction site is as safe as reasonably possible for those who work on it. Health and Safety is an inevitable aspect of construction and this is so because the only time an employee will perform his duties is when the employee is in good health

and is sure of a safety working condition. One of the most important things that an employer should provide to his employee is safety even at a low risk site. At sites where heavy machinery is being used; it is certain that the level is higher because of the mechanical movement of parts of such machinery and therefore for the employee that will be monitoring or operating such machinery will be exposed to accidents. In a case like this, it should be known that the level of safety that will be provided will be much more than that of a site where ordinary hand tools are been used. As well as the emotional side, accidents and illnesses can be extremely costly for a construction firm. A worker who becomes ill or injured as a result of unlawful negligence can sue for compensation, which could turn into a significant amount if it is a serious illness/injury.

A key performance indicator (KPIs) on health and safety on construction site is the measure of a process that is critical to the success of construction sites on the issue of health and safety on construction sites. According to the 1948 Universal Declaration of Human Right and cited by [1], everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including housing, medical care and clothing. In achieving the universal declaration, health and safety is seen as the central hub of everyday living. According to [2], a consideration of health and safety issues in housing and construction sites has been recognized in recent times as an important factor in urban and rural development field especially on construction sites. The concept of safety and security is physiological and a universal phenomenon not to be over sighted in any human endeavour, more so in forum like construction sites where construction activities are taking place. The construction industry is one of the world's major industries. Its achievement in rebuilding areas devastated by both natural and man-made disasters, and in providing power, services and communications to meet the rising needs and expectations of people throughout the world, has conferred great benefits on the human race. Despite mechanization, construction remains a major employer of labour – it often employs between 9 and 12 per cent of a country's working population, and sometimes as much as 20 per cent. According to [3], accidents on building construction sites should be a major concern to everybody in the construction industry. It is a pity that we have not properly addressed the issue and safety in most of the

developing countries. To support this statement is the non-availability of site construction regulations to take care of site personnel in Nigeria.

The improvement of safety, health and working conditions depends ultimately upon people working together, whether governments, employers or workers. Safety management involves the functions of planning, identifying problem areas, coordinating, controlling and directing the safety activities at the work site, all aimed at the prevention of accidents and ill health. Accident prevention is often misunderstood, for most people believe wrongly that the word "accident" is synonymous with "injury". This assumes that no accident is of importance unless it results in an injury.

## II. LITERATURE REVIEW

There are numerous definitions of KPIs available in business textbooks, through services trade associations, or on the Web, each comprised of their own keywords. However, regardless of which definition you ultimately embrace, there are still some conventions that you will need to accept as well. Basically, KPIs are tools that may be used by an organization to define, measure, monitor, and track its performance over time toward the attainment of its stated organizational goals. TheFreeDictionary.com defines Key Performance Indicators as "a set of quantifiable measures that a company or industry uses to gauge or compare performance in terms of meeting their strategic and operational goals". Key Performance Indicators (KPIs) help organisations understand how well they are performing in relation to their strategic goals and objectives. In the broadest sense, a KPI can be defined as providing the most important performance information that enables organisations or their stakeholders to understand whether the organisation is on track or not. A literature review by [4] focused on the influence of the physical work environment of health care on job attitudes; and a relationship between health care human resource management and health care facilities: Expenses related to human resources (HR) are higher than any other necessary expense in construction sites (including medication, devices, supplies, utilities, treatment facility improvements, installation/upgrade of health information technology, and liability coverage) with approximately 66 cents of every dollar of expenditures allocated for caregivers and staff [5]. Therefore, human resources (HR) expenses are a primary target for cost reduction when funding becomes limited [4]. Conversely, strategies that require lower staff levels may not be worthwhile as organisations search for other ways to optimize expenditures without sacrificing their service quality [6]. For an organisation to maintain a lasting competitive advantage, it has to create an organisational resource bundle, which consists of obtaining different types of capital (economic, social, and ecological) and combining them to create resources that produce value [7]; [8]; [9]. Organisational resource bundles contribute to perform

advantage when they are, costly to imitate, and non-substitute [10]; [7]; [11]; [12]. Human capital (employees' knowledge, skills, Abilities, motivation and loyalty) is often an organisation's most unique resource [4].

Research from the disciplines of strategic human resource management and the resource-based view of firms asserts that effective human resources practices convey that the organisation values employee contributions and cares about their wellbeing [4]. In turn, providing for employee socio-emotional needs can lead to higher levels of employee motivation and commitment toward the organisation. When this information is combined with research outcomes that measure how employees are influenced by their work environments, a strong case is presented for health care facilities on construction sites to serve as an influential component of human resources management strategies. Multi-dimensional studies on job satisfaction show that by placing new values on different facets of the job, a person may sustain their satisfaction when certain qualities of the job change ([13]; [14]. For instance, one study reported that employees attempted to compensate for being undercompensated financially by altering their perceptions of the physical work environment; the results found that employees expressed higher levels of satisfaction with the physical work environment [15], [16].

## III. METHODOLOGY

Sixty (60) questionnaires construction sites will be chosen at random for the purpose of achieving the objectives of this key performance indicator (KPIs) of health and safety on construction sites in the South Western states of Nigeria were distributed for collection of data. Data were obtained from both the primary and secondary sources which include interview, questionnaire, textbooks journal publications and internet facilities. The data was analyzed (i.e the mean and standard deviation), using statistical package for social society (SPSS). The statistical tools used for this study include percentage, mean, and relative significance index RSI (also known as Index of Relative Importance, IRI or Relative Importance Index, RII) to determine which of the stated causes of rivalry is the most prevalent among the professionals in the Nigerian construction industry. The relative significance index ranking (RSI) was used for ranking of the factors studied. These methods had been used in construction research by authors such as, [17]-[21] among others.

The Likert scale involving rating on interval scale of 5 and 1 developed for application in social sciences and management researches for quantification of qualitative variable were used. It elicited information from the building construction professionals concerning the causes of rivalries among professionals in Nigeria construction industry. The responses of the items on the questionnaire

were obtained on a 5-point scale ranging from 1 to 5. “Very High” were scored 5, “High” were scored 4, “Average” were scored 3, “Low” were scored 2 and “Very Low” were scored 1.

**IV. DATA ANALYSIS AND RESULTS**

The data were presented using tables for clarification and better interpretation. The analysis tools included both descriptive and inferential statistics.

**A. Respondents Profile**

**Table 1: Sex**

Sex	Frequency	Percentage
Male	46	76.67
Female	14	23.33
Total	60	100.00

Table 1 showed the gender of the respondents. It showed that ninety two percent (76.67%) are male and eight percent (23.33%) are female. The result shows the representation of genders in the construction industry in the study area.

**Table 2: Length of service**

Years	Midpoint (x)	Frequency (f)	Fx	Percentage
1-5	6	14	84	10.62
6-10	8	11	88	11.13
11-15	13	10	130	16.43
16-20	18	12	216	27.31
above 21	21	13	273	34.51
<b>Total</b>		<b>60</b>	<b>791</b>	<b>100.0</b>

$Mean = \sum fx / \sum f = 791 / 60 = 13.18$

Table 2 shows the respondents mean year of experience estimated at approximately thirteen years (13yrs). With this average working experience of thirteen years, respondents are deemed experienced enough to supply reliable data for the research.

**Table 3: Professional qualification**

Educational Qualification	Frequency	Percentage (%)
NIOB	32	53.33
NIQS	10	16.67
NIA	8	13.33
NSE	6	10
Others	4	6.67
<b>Total</b>	<b>60</b>	<b>100</b>

Table 3 represents the educational qualification obtained by the respondents. 53.33% is registered with NIOB, while 16.67% is registered with NIQS, 13.33% is

registered with NIA, 10% with NSE and 6.67% with other professional bodies. The result shows that all respondents possess registration of their various professional bodies in Nigeria and adequate professional training to supply reliable data for the study.

**Table 4: Factors that affect the Health and Safety performance on Construction sites**

FACTOR DESCRIPTOR	1	2	3	4	5	Total	RS	RAN
Administrative and Management commitment	0	6	7	1	3	60	0.8	1
Role of Government and Professional Bodies	1	1	8	2	2	60	0.8	2
Nature of project	1	1	5	3	1	60	0.7	4
Historic, human and psychological climate	5	1	1	1	7	60	0.6	7
Application of health and safety factors in organisation	2	1	5	1	2	60	0.7	3
Project location is safe to reach	1	3	9	2	1	60	0.7	5
Poor planning and co-ordination	1	8	6	2	9	60	0.6	6
Poor communication between sites	1	1	1	1	8	60	0.5	8

Table 4 above showed the Relative Significance Index (RSI) of the level of factors that affect the health and safety performance on construction sites. It revealed that Administrative and Management commitment ranked first with RSI value of 0.84 (i.e. 84 percent significance), Role of Government and Professional Bodies ranked second with RSI value of 0.80 and application of health and safety factors in organisation ranked third with RSI value of 0.79. While Poor communication between sites ranked last with RSI value of 0.59. The result also showed that all the factors are significant with the least factor having 59 (0.59) percent significance.

**Table 5: The Rate of Fatal Injuries among Trades on Construction Sites**

TRADES	1	2	3	4	5	Total	RSI	Rank
Masons/Bricklayers	8	7	3	1	3	60	0.763	1
Concrete workers	1	8	4	1	2	60	0.683	5
Crane Drivers	1	8	5	2	1	60	0.677	7
Drivers	9	7	4	3	9	60	0.680	6
Insulators	6	1	3	4	1	60	0.607	11
Machine Operators	7	9	1	2	8	60	0.647	10
Plumbers	8	1	9	1	1	60	0.683	5
Tilers	7	9	9	1	2	60	0.720	3
Painters	9	8	9	1	1	60	0.690	4
Rock workers	1	1	1	9	1	60	0.597	12
Structural steel workers	4	7	1	1	1	60	0.727	2
Sheet metal workers	9	1	1	1	1	60	0.660	8
Wood workers/Carpenters	9	1	1	1	1	60	0.653	9

Table 5 above showed the Relative Significance Index (RSI) of the level of fatal injuries among traders on construction sites. It revealed that Masons/Bricklayers ranked first with RSI value of 0.763 (i.e.76.3 percent significance), Structural steel workers ranked second with RSI value of 0.727, Tilers ranked third with RSI value of 0.72. While Rock workers ranked last with RSI value of 0.597. The masons/bricklayers are most liable to fatal injuries among trade's men on construction site, while the insulators are less exposed to risk or danger.

**Table 6: Identification of Chemical, Physical, and other Hazards Available at the Construction Work Sites**

TRADES/HAZARDS	1	2	3	4	5	Total	RSI	Rank
Masons/Bricklayers (Cement dermatitis, awkward	1	2	9	1	2	60	0.733	1

postures, heavy loads)								
Concrete workers (Awkward posture)	1	3	9	2	1	60	0.667	4
Crane Drivers (Stress, isolation)	4	1	1	2	7	60	0.650	8
Drivers (Whole-body vibration, diesel engine exhaust)	5	1	1	1	1	60	0.667	4
Insulators(Asbestos, synthetic fibres, awkward postures)	1	5	2	1	8	60	0.587	12
Machine Operators (Noise, whole-body vibration, silica dust)	1	6	8	1	1	60	0.647	9
Plumbers(Lead fumes and particles, welding fumes)	1	4	1	2	7	60	0.630	10
Tilers(Knee trauma, awkward postures, glue and glue vapour)	1	6	7	1	2	60	0.697	3
Painters (Solvent vapours, toxic metals in pigments, paint additives )	4	1	1	1	1	60	0.713	2
Rock workers (Silica dust, whole-body vibration, noise)	3	1	1	2	9	60	0.667	7
Structural steel workers (Awkward postures, heavy loads, working	1	4	8	2	1	60	0.663	6

at heights)									
		1	1	9	2	7	60	0.6	11
Sheet metal workers (Awkward postures, heavy loads, noise)		4	4		6			27	
		5	1	1	1	1	60	0.6	3
Wood workers/Carpenters (Wood dust, heavy loads, repetitive motion)			2	0	5	8		97	

Table 6 above showed the Relative Significance Index (RSI) in identification of chemical, physical, and other hazards Available at the construction Work Sites. It revealed that Masons/Bricklayers (Cement dermatitis, awkward postures, heavy loads) ranked first with RSI value of 0.733 (i.e.73 percent significance), Painters (Solvent vapours, toxic metals in pigments, paint additives) ranked second with RSI value of 0.713, Tilers (Knee trauma, awkward postures, glue and glue vapour) and Wood workers/Carpenters (Wood dust, heavy loads, repetitive motion) are ranked third with RSI value of 0.697. While Insulators (Asbestos, synthetic fibres, awkward postures) ranked last with RSI value of 0.587. The result also showed that all the traders are significant with the least factor having 58.7 (0.587) percent significance.

### V. DISCUSSION OF FINDINGS

The findings of the analysis of the questionnaires distributed to professionals in the construction industry to study the key performance indicators (PKIs) of health and safety on construction sites in Nigeria.

With the use of statistical tools, the study was able to assess key performance indicators of health and safety on construction site in south-western states of Nigeria. It also presents the recommendations based on the findings of this study. The study revealed that administrative and management commitment ranked first with RSI value of 0.84 (i.e. 84 percent significance) while Poor communication between sites ranked last with RSI value of 0.59 as the factors that affect the health and safety performance on construction sites. The result also showed that all the factors are significant with the least factor having 59 (0.59) percent significance. The level of fatal injuries among traders on construction sites. It revealed that Masons/Bricklayers ranked first with RSI value of 0.763 (i.e.76.3 percent significance) and Rock workers ranked last with RSI value of 0.597. The masons/bricklayers are most liable to fatal injuries among

trade’s men on construction site, while the insulators are less exposed to risk or danger. The Relative Significance Index (RSI) in identification of chemical, physical, and other hazards Available at the construction Work Sites. It revealed that Masons/Bricklayers (Cement dermatitis, awkward postures, heavy loads) ranked first with RSI value of 0.733 (i.e.73 percent significance) and insulators (Asbestos, synthetic fibres, awkward postures) ranked last with RSI value of 0.587. The result also showed that all the traders are significant with the least factor having 58.7 (0.587) percent significance. Conclusion and recommendation are made on the report of this work.

### VI. CONCLUSION

The research concludes that administrative and management commitment as the most significant constant factors that affect the health and safety performance on construction sites, contact with objects or equipment (Struck by an object or caught in machinery or material) is the most significant factor of the level of fatal injuries among construction workers on construction sites, Masons/Bricklayers is the most significant factor of fatal injuries among traders on construction sites, Insulators( Asbestos, synthetic fibres, awkward postures) is the most significant chemical, physical, and other hazards Available at the construction Work Sites

### VII. RECOMMENDATION

The following recommendations are hereby made:

- i. There should be orientation to educate the traders and skilled labourers on the use of health and safety precautions and materials/equipment used on construction site.
- ii. Workers should always wear or use their various safety equipment/material to prevent contact with objects or equipment, so as to avoid fatal injuries among construction workers on construction sites.
- iii. Proper attention should be paid to the Masons/Bricklayers during their work, since they more exposed to injury, they should wear or use recommended safety precaution material.
- iv. Adequate prevention should be taken when in-contact with chemical substance/hazardous substance on the construction site.

### REFERENCES

[1] Agbola S.B. (2007): “Housing and Health: A book of readings”: Housing Development and Management, Department of Urban and Regional Planning, University of Ibadan. Malijoe Soft print, Ibadan, Oyo state. pp 499-537.

[5] American Hospital Association (2012): The cost of caring: Drivers of spending on Hospital Care.

- [10] Armstrong, C.E. and Shimizu, K. (2007): A review of approaches to empirical research on the Resource-Based view of the firm. *Journal of Management*; 33 6; 959-986.
- [3] Bamisile, A. (2004): *Building Production Management* Lagos Foresight Press Limited.
- [7] Barney, J. (1991): Firm Resources and Sustained Competitive Advantage. *Journal of Management*; 17 1; 99.
- [11] Dyllick, T and Hockerts, K. (2002): Beyond the business case for corporate sustainability. *Business Strategy and the Environment* (John Wiley and Sons, Inc.) 11 2; 130-141.
- [2] Egunjobi, L. (1997): "The link Between Housing and Health", in Amole, B (ed.) *Habitat Studies in Nigeria: Some Qualitative Dimension*, Ibadan, Shaneson C.I. Ltd, pp. 92-101.
- [6] Filipova, A.A.(2011): Relationships Among Ethical Climates, Perceived Organisational Support, and Intent-to-Leave for Licensed Nurses in Skilled Nursing Facilities. *Journal of Applied Gerontology*; 30 1; 44-66.
- [15] Greenberg, J. (1989): Research Notes. Cognitive reevaluation of outcomes in response to underpayment inequity. *Academy of Management Journal*. 32 1; 174-184.
- [16] Greenberg, J. (2011): *APA Handbook of Industrial and Organisational Psychology*. Vol. III.
- [13] Locke, E.A. (1969): What is Job Satisfaction? *Organisational Behaviour and Human Performance*; 44; 309-336.
- [8] Rumelt, D.P. (1984): Towards a Strategic Theory of the Firm. In R. Lamb (Ed.), *Competitive Strategic Management*. Eaglewood Cliffs, NJ: Prentice-Hall.
- [4] Sadatsafavi, H. and Walewski, J. (2013): Corporate Sustainability: The Environmental Design and Human Resources Management interface in healthcare settings *HERD*; 6 2; 98-118.
- [12] Sirmon, D.G., Gove, S. and Hilt, M.A. (2008): Resource Management in dyadic competitive rivalry: The effects of resource bundling and deployment. *Academy of Management Journal*; 51 5; 919-935.
- [14] Skalli, A., Theodossiou, I. and Vasileiou, E. (2008): Jobs as Lancaster goods: Facets of job satisfaction and overall job satisfaction. *Journal of Socio-Economics*; 37 5; 1906-1920.
- [9] Wright, P.M., McMahan, G.C., and McWilliams, A. (1994): Human Resources and Sustained Competitive Advantage: A Resource-Based Perspective. *International Journal of Human Resource Management*; 5 2; 301-326.
- [17] Bakhary, N, (2005): "Arbitration in Malaysia Construction Industry" Retrieved 12<sup>th</sup> July, 2018 from <http://www.efka.utm.my/thesis/images/4MASTER/2005/2J SBP/Part1/CHOOTZERCHINGMA011138D03TT1.doc>
- [18] Elhag, T.M.S. and Boussabaine, A.H. (1999): "Evaluation of Construction Costs and Times Attributes". *Proceedings of the 15<sup>th</sup> ARCOM Conference, Liverpool John Moore's University, Vol. 2, pp 473-480, 15-17 September, 1999.*
- [19] Faniran, O.O. (1999): "The Role of Construction Project Planning in Improving Project Delivery in Developing Countries: Case Study of the Nigerian Construction Industry.. *Proceedings of the 1<sup>st</sup> Conference of CIB TG 29* on construction in Developing Countries: Construction Industry Development in the New Millennium. The Pan Pacific, Singapore.
- [20] Idrus, A.B. and Newman, J.B. ((2002): "Construction Related Factors Influencing Choice of Concrete Floor Systems", *Construction Management and Economics*, Vol. 20, 13-19, 2002.
- [21] Kangwa, J. and Olubodun, F. (2003): "An investigation into Home Owner Maintenance Awareness, Management and Skilled-Knowledge Enhancing Attributes", *Structural Survey*, 21, 2. Pp. 70-78, 2003.