AN EXPLORATORY FACTOR ANALYSIS OF SAFE ACTS OF WORKERS TOWARDS HEALTH AND SAFETY COMPLIANCE

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ABSTARCT

Workers inability to act according to laid down rules and regulations within the industry have invariably contributed to their unsafe actions leading to accident. The purpose of the study was to determine safe acts of workers towards health and safety (H&S) compliance. Delphi survey method of data collection was adopted for the study. Experts were asked to complete the Delphi questionnaire survey based on the impact of given factors in predicting safe act of workers towards Health and Safety compliance. The ratings were based on either the impact was considered to be very high or high. Data obtained was analysed and results were presented in a table and a chart. Findings from the study show that only three measurement variables (ensure equipment or tools are in good condition before usage, ensure the use of personal protective equipment (PPE) and ensure proper positioning of tasks) were considered by the experts to have reached consensus with IQD cut-off (IQD ≤1) score. Further findings showed strong consensus with very high impact (VHI: 9.00-10.00).Results from the Exploratory Factor Analysis (EFA) showed that only five indicator variables (SAW10,SAW 16,SAW7, SAW8 and SAW9) were considered as determinant of Health and Safety compliance. Further findings showed that one indicator variable (PPE) was found to be common in the Delphi survey and EFA results.The factor loadings for all items were greater than 0.5593.This findings indicate that high priority was given to SAW 10 in determining Health and Safety compliance in the construction industry.

Keywords: Exploratory factor analysis, safe acts of workers, compliance, health and safety.

INTRODUCTION

The construction industry is among the industries with unreasonable rates of accidents both permanent and non-permanent disabilities and even fatalities. Mustapha et al. (2015) were of the view that not all accidents are preventable, since risk is beyond the human intervention. Mustapha et al., (2015) opined that majority of accidents happen when workers do not abide by safety rules leading to their unsafe acts. Moreover, when management are adamant to unsafe conditions within the work environment. Health and safety in the construction involves all level of the workforce. Boshoff (2015) asserted that in creating a positive safety culture in any work environment requires participation of all workforce, effective communication and trust between the all role players. This implies that culture is very paramount in any work environment. Othman (2012) argued that "technical failure and inadequate training coupled with harsh work environment and unsafe methods of working inter alia are among the causes of non-compliance with OSH regulations in developing countries". Idubor and Osiamoje (2013); Windapo and Oladapo (2012) and Adenuga et al.(2007) supported this argument with lack of adequate training as a hindrance to OSH regulations compliance and further indicated that safe work environment can determine how issues of compliance with OSH regulations are taken care of by construction firms. Idubor and Osiamoje (2013) posits that adequate Occupational Health and Safety (OSH) training and education enhance the OSH performance e.g., compliance with OSH regulation.When all the necessary OHS requirements are met, then workers will perform their duties diligently to prevent any accident from occurring or minimise it. The paper attempts to enumerate how safe act workers will contribute to H&S compliance in the construction industry in Ghana.

RESEARCH DESIGN/METHODOLOGY

Twenty (20) experts made up of academicians and construction professionals from Building Technologists, quantity surveyors were selected at random from West African Built Environment Research (WABER), International Conference on Infrastructure Development in Africa (ICIDA) and Applied Research Conference in Africa (ARCA) were invited during the first stage of the study. Thirteen (13) experts responded to participate and completed the first round, but only nine (9) experts remained throughout the study. The nine experts were considered adequate based on literature recommendations from scholars who have previously used the technique. Hallowell and Gambatese (2010) suggested a minimum of eight panellist since most studies incorporate between eight and sixteen panellists. The size of a panel is also related to the characteristics of the study, number of experts' available, geographical representation and capacity of the facilitator. The experts were made up of academics and construction professionals. The rating of the questionnaires was based on the impact of other factors in predicting safe act of workers towards H&S compliance. Microsoft EXCEL, spread-sheet software was used in the analysis of the data obtained. The results were presented in a form of a bar-chart.

Further, Social Sciences (SPSS) version 20 software Package was used to evaluate the reliability, discriminant validity and convergent validity of the instrument. The Exploratory Factor Analysis (EFA) was based on269 cases and discussion on Safe Act of Workers (SAW) With five (5) indicator variables as shown in Table 2. The factor extraction method used to determine the unidimensionality of the elements during the EFA was Principal Axis Factoring with Oblimin Rotation (PAF Oblimin).The Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was based on the method used by Farrington et al. (2009) to assess the factor-analysability of data. KMO should range from 0 to 1 and a minimum value of 0.60 was suggested as good for factor-analysis (Tabachnick & Fidell, 2007). A value greater than 0.50 as a minimum cut-off value and a desirable cut-off value of 0.80 or higher was recommended by Kaiser (1970).Hair et al.(2006) suggested a cut off value of KMO greater than or equal to 0.70.

Instruction for Experts

If the impact is considered to be high, then **'X'** should be marked under the **'7'** or **'8'** box depending on whether your opinion is inclined more towards high or very high impact.Please use your experience, expertise and judgement to rate what you perceive the average negative or positive influence of the various features are for Health and Safety compliance and the Ghanaian SMEs contractors at large would be if the described elements were lacking or present.

Table 1. Impact scale

No impact		Low impact		Medium impact		High impact		Very high impact	
1	2	3	4	5	6	7	8	9	10

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Workers are responsible for their health and safety and any unsafe act of a worker may not negatively impact or endanger others (Boshoff, 2015).Hence, workersare expected to act according to laid down rules and regulations within the industry to any unforeseen.The OHS Act enshrined all employers to provide and maintain a safe and healthy work environment that has no risk to employees (Boshoff, 2015). Smallwood et al. (2008) asserted that compliance with OSH regulations brings about benefits not limited to avoiding direct and indirect costs. Therefore, it is the duty of the employer to ensure that workers are provided with everything required in relation to OHS and all benefits to encourage them to perform safe acts within their work environment

FINDINGS AND DISCUSSION

From the sixteen measurement variables shown in Figure 1, only three attributes (ensure equipment /tools are in good condition before usage, ensure the use of personal protective equipment (PPE) and ensure proper positioning of tasks) were considered by the experts to have reached consensus with IQD cut-off (IQD ≤1) score. This score implies the measurement variables have very high impact (VHI: 9.00-10.00) on safe act of workers towards H&S compliance and indicates strong consensus. Consensus was also reached on nine other measurement variables with IQD cut-off (IQD≥1.1≤2) score. The IQD score indicates good consensus for the nine measurement variables and the impact on H&S compliance was high (HI: 7.00-8.99). Four measurement variables reached consensus with IQD cut off (IQD≥2.1≤3) score, which indicates weak consensus on the measurement variables and impact on H&S was medium (MI:5.00-6.99).

Using the median as a means of reaching consensus, fourteen (14) attributes were considered to have reached consensus, with the exception of two measurement variables (avoid annoyance and horseplay at the workplace and do not service equipment that is in operation) which did not reach consensus as shown in Figure 1.
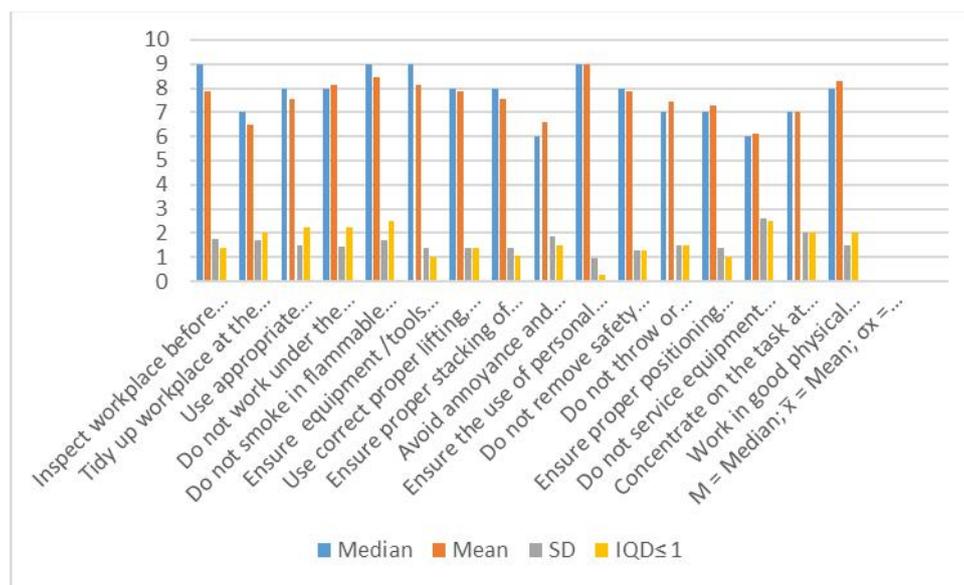

Figure 1: Safe Acts of Workers (SAW)

Results from the study revealed that the following sixteen factors or measurement variables were considered by the experts to have varying impact on the safe acts of workers towards Health and Safety compliance.

1. Inspect workplace before commencing any activity (HI)
2. Tidy up workplace at the end of any activity (HI)
3. Use appropriate tools/equipment (MI)

4. Do not work under the influence of alcohol and other drugs (MI)
5. Do not smoke in flammable materials store (MI)
6. Ensure equipment /tools are in good condition before usage (VHI)
7. Use correct proper lifting, handling or moving of objects (VHI)
8. Ensure proper stacking of objects /materials in safe locations (HI)
9. Avoid annoyance and horseplay at the workplace (HI)
10. Do not service equipment that is in operation (MI)
11. Ensure the use of personal protective equipment (PPE) (VHI)
12. Do not remove safety guards from the workplace or equipment (HI)
13. Do not throw or accidentally drop objects from high levels
14. Ensure proper positioning of tasks (VHI)
15. Concentrate on the task at hand (HI)
16. Work in good physical conditions (HI)

From the impact ratings of the factors, findings revealed that three of the factors or measurement variables have a very high impact (VHI: 900-10.00), while nine other factors or measurement variables have high impact (HI: 7.00-8.99) and four other factors or measurement variables have medium impact.

The measures of reliability, convergent and discriminant validity for each of the five items of Safe Acts of Workers (SAW) realised through EFA (Table 2) are discussed. Table 2 shows that the corrected item-total correlation was greater than the suggested cut-off value of 0.30. This implies that the items were good measures of the element and the Cronbach alpha was greater than0.739 at 0.800indicating acceptable internal reliability (Nanually and Bernstein, 1994). The Kaiser-Meyer-Olkin (KMO) of 0.886 with Bartlett's Test of Sphericity of $p<0.000$ were also obtained, indicating consistency with the recommended KMO cut off value of 0.70 and Bartlett's Test of Sphericity of $p<0.05$ suggested by Hair et al., (2006). These results suggested that factor analysis could be conducted with the data. The communality were also above 0.3 and the in Total Variance Explained fourteen (14) factors were above 1.00. Eleven items (SAW 1 – SAW 6 and SAW 11-SAW 15) were dropped during the EFA. The factor loadings for all items were greater than 0.5593 as reported in Table 2, which were greater than the recommended value of 0.40 as suggested by (Field, 2005; Hair et al. 2002).

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Table 2: Safe Acts of Workers (SAW)

Item	Variable	Factor loading	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SAW 7			0.573	0.778
SAW 8	Ensure the use of personal protective equipment (PPE)	0.5593	0.487	0.800
SAW 9	Work in good physical conditions	0.6391		
SAW10	Use proper means of lifting, handling or moving of objects	0.7122	0.690	0.739
SAW16	Ensure proper stacking of objects/materials	0.7105	0.666	0.749
	Avoid annoyance and horseplay at the workplace	0.6898	0.567	0.779

CONCLUSION AND FURTHER RESEARCH

The purpose of the study was to examine safe acts of workers that will contribute to Health and Safety compliance. Most of the factors or measurement variables have either very high impact or high impact on safe acts of workers towards Health and Safety compliance. Even though, IQD was used to reach consensus for the study with varying impacts, but the median ranging from (7.00-10.00) can also be used to reach consensus. All the five items had factor loading close to 1.00 indicating consistency. The dropped items had their total correlation less than the suggested cut-off value of 0.30 which suggested that the items were poor measures of the element SAW for CFA to be conducted. Further research will be conducted to evaluate the validity of the factors.

REFERENCES

Adenuga, O. A., Soyingbe, A. A. and Ajayi, M. A. (2007) A study on selected safety measures on construction Companies in Lagos, Nigeria, RICS (Cobra).

Boshoff, T. (2015) Health and Safety and the Employment, South African Labour Guide, Available: http://www.labourguide.co.za/ [8 October 2015].

Farrington, D. P., Coid, J. W. and Murray, J. (2009) 'Family factors in the intergenerational transmission of offending', Criminal Behav. Ment. Health, Vol.19 No. 2, pp. 109-124, DOI: 10.1002/cbm.717.

Field, A. (2005) Discovering Statistics Using SPSS (and Sex, Drugs and Rock 'N 'Roll), 2nd Edition, London: Sage.

Hallowell, M.R. and Gambatese, J.A. (2010) 'Qualitative research: application of the Delphi method to CEM research', Journal of Construction Engineering and Management, ASCE, Vol. 136 No. 1, pp. 99-107.

Hair, J.F., Black, W.C., Babin, J.B., Anderson, R.E. and Tatham, R.L. (2006) Multivariate data analysis 6th Edition, Upper Saddle River, New Jersey: Pearson/Prentice Hall.

Hair, J., Bush, R. and Ortinau, D. (2002) Marketing research: Within a changing information environment, New York: McGraw-Hill/ Irwin.

Idubor, E.E. and Oisamoj, M.D. (2013) 'An exploration of health and safety management issues in Nigeria's effort to industrialise', European Scientific Journal, vol. 9 No.12, pp. 154-169, ISSN: 1857 − 7881 (Print) e - ISSN 1857- 7431 159.

Kaiser, H.F. (1970) 'A second generation little jiffy', Psychometrika, Vol. 35 No. 4, pp. 401−415.

Mustapha, Z. Aigbavboa, C. O. and Thwala, W.D. (2015) 'Application of Modified Statistical Triangle of Accident Causation in Construction Health and Safety', In: Shen et al. (eds.), Proceedings of the 19th International Symposium on Advancement of Construction Management and Real Estate, DOI 10.1007/978-3-662-46994-1_6, pp.57-66. Springer-Verlag Berlin Heidelberg 2015L

Nanually, J.C. and Bernstein, I.R. (1994) 'Psychometric Theory', Journal of Psychological Assessment, New York McGraw Series in Psychology, United States of America, Vol. 17, pp. 275-280, Available: http://psychology.concordia.ca/fac/kline/library/k99.pdf [7 February 2016].

Othman, A. A. E. (2012) 'A study of the causes and effect of contractors' noncompliance with the health and safety regulations in the South African construction industry', Architectural Engineering and Design Management, Vol.8, pp. 180-191.

Smallwood, J., Haupt, T. and Shakantu, W. (2008) 'Construction Health and Safety in South Africa: Status and Recommendation', CIDB report.

Tabachnick, B. and Fidell, L. (2007) Using Multivariate Statistics, 5th Edition, Allyn and Bacon: New York.

Windapo, A. and Oladapo, A. (2012) Determinant of construction firms' compliance with health and safety regulations in South Africa In: Smith, S.D (Ed) Procs 28th Annual ARCOM Conference, 3-5 September 2012, Edinburgh, UK, Association of Researche.

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