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Assessment of Effectiveness of Health and Safety Systems in Construction Industry: A Case Study Lee Construction Ltd

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Abstract

Purpose:The general objective of the study was to assess theeffectiveness of health and safety systems in construction industry and more specifically in Lee construction Ltd.

Methodology: The study utilized qualitative, descriptive and quantitative research methodologyto assess how employees of Lee construction Ltd experience theeffectiveness of health and safety systems in their organization. The population of the study was 150 permanent and 200 casual employees of Lee Construction Ltd. The final sample size was 100 employees. In which case 40 were permanent and 60 were casual employees. This study used primary data which was collected through use of a questionnaire. SPSS was used to produce frequencies, descriptive and inferential statistics which was used to derive conclusions and generalizations regarding the study.

Results: The study found out that knowledge has a positive influence on health outcome though not significant while management prioritization, attitude and practice have a positive and significant influence on health outcome.

Unique contribution to theory, practice and policy: The study recommend that attention to the detail of regulatory frameworks may be necessary to ensure they meet the requirements of ILO Convention and properly support the activities of health and safety representatives.

Keyword: *health procedures, workers perception, factors*

1.0 INTRODUCTION

Rapid economic growth via industrialization has given not only significant impact in terms of income distributions and quality of life, but it has also resulted in increasing number of accidents at workplace.Building Construction is extremely hazardous workplace where most frequently non-fatal and fatal vocational injuries occur due to its unique nature (Kwon *et al*, 2009) Four (4) per cent of the world‟s Gross Domestic Product GDP is lost as the cost of occupational injuries and diseases (Watfa, 2009). It was observed that iron workers and roofers were the highest risk trades.

Anumba and Bishop (1997) and Mwombeki (2008) observe that, issues of health and safety on construction sites have often received minimum attention. . However, the need for safety awareness among construction companies has greatly increased (Wilson & Koehn, 2000).

Occupational safety and health (OSH) covers activities involved in promotion, prevention as well as identification of risks and hazards at work places. Construction is a dangerous industry, for two reasons: one is the intrinsically hazardous nature of the work; the other is the result of the industry‟s structural and organizational challenges for risk management. These combined factors have created an industry culture in which poor health and safety outcomes have long been the accepted norm. Modern approaches to regulating health and safety management have attempted to address these challenges by improving systematic OHS management and, in the particular case of the industry, by adding provisions that focus on the coordination of health and safety responsibilities in complex, multi-employer, temporary worksites and supply chains. Central to these efforts to improve health and safety management has been worker representation and consultation.

1.2 Problem Statement

Lee Construction Limited has played a pivotal role in the development of infrastructure projects in Kenya. It is the leading indigenous construction company in Kenya. However, Lee Construction is also aware of the challenges which are there in construction industry. It has put in place measures to curb accidents and health related problems (Gibb, 2008). However, it is still not yet known how the systems have fared in terms of effectiveness. Safety practices within the industry leave a lot to be desired and this exposes workers to unnecessary occupational risks. The number of injuries, accidents, and work related illnesses reported on construction sites exceed that of other industries, thus contributing to additional costs and delays on projects (Elbeltagi&Hegazy, 2002).

Highway and street construction workers are at risk of fatal and serious nonfatal injury when working in the vicinity of passing motorists, construction vehicles, and equipment (Pratt *et al.*, 2001). Issues of health and safety on construction sites have often received minimum attention and this has been detrimental to both workers and the nation at large.

Locally few studies have been done in this area; (Amirah *et al.*, 2013)conducted a study on Safety Culture in Combating Occupational Safety and Health Problems in the Malaysian Manufacturing Sectors. The study revealed that many problems which include high accident rate in manufacturing industries which may be due to lack of safety culture and non-compliance of the Malaysian Occupational Safety and Health Act‟s (OSHA‟s) requirements which may inadvertently led to lack of safety culture. The study focused on Malaysian manufacturing sector thus presenting a conceptual gap. Byakika (2015) conducted a study on Occupational Safety and Health Issues on

Road Construction Sites in Sub-Saharan Africa: A Case Study of Uganda. The study revealed that poor handling of materials, and plant and equipment used on road construction sites has posed several injuries to the workers. The study focused on Ugandan economy thus presenting a geographical/contextual gap. Kheni, Dainty, Gibb, (2008) conducted a study on Health and safety management in developing countries: a study of construction SMEs in Ghana. The study found out that lack of safety rules was ranked third among the sources of health hazards of casual construction workers. The study focused on SMEs thus presenting a conceptual gap. In addition there exists a geographical gap since it focused on Ghana economy. It is for this research gaps that this study is conducted to establisheffectiveness of health and safety systems in construction industry and more specifically in lee construction company which is located in Kenya.

1.3 Research Objectives

i. To identify and assess effectiveness of health and safety procedures in Lee Construction Ltd ii. To assess the perception of workers about the status of health and safety atLee construction company Ltd

iii. To assess the factors which affect the effectiveness of health and safety system at Lee Construction Ltd

2.0 LITERATURE REVIEW

2.1 Theoretical Literature Review

2.2.1 Accident causation theories

An accident is any unplanned and uncontrolled event caused by human, situational, or environmental factors, which interrupts the work process, and may or may not result in injury, illness, death, or property damage (Colling, 1990). Various theories of accident causation have been proposed. Each theory emphasizes a specific approach to safety, be it psychological, sociological, or statistical, and has its own benefits and drawbacks. Out of these, Heinrich's Domino Theory and Reason's Human Error Model (commonly known as Reason's Swiss Cheese Model) are two accident causation theories that have made significant contributions to the development of safety management. A brief description of each model is presented below.

2.2.2 Heinrich’s domino theory

Heinrich‟s Domino Theory is the pioneer theory of accident causation in the field of industrial accident safety. According to Heinrich (1941), accidents result from a chain of sequential events, like a line of dominoes falling over. In explaining his theory, Heinrich posited five dominoes in a sequence namely: Social Environment and Ancestry (e.g.: stubbornness, alcoholism, etc.), Fault of the Person (e.g.: carelessness, recklessness, etc.), unsafe act or unsafe condition andaccident and Injury. Heinrich also emphasized that the first three combining factors cause accidents and consequently injuries. Apart from the suggestion by Taylor (2010) that the outcome of the investigation of Chernobyl incident which bring into focus the performance of „the person‟ managing, designing, constructing or operating hazardous facilities, Heinrich had already suggested that 88% of all accidents were indeed caused by unsafe acts of people with the rest 20%

were caused by unsafe machines or conditions and another 2% were caused by acts of God.Heinrich‟s Domino Theory is relevant to the study since it informs the independent variables. This study will assess if there is matching or violation of this law at Lee Construction Company.

2.2.3 James reason's swiss cheese model

In the Swiss Cheese Model, Reason approaches the genesis of human error in four sequential levels: unsafe acts, preconditions for unsafe acts, unsafe supervision, and organizational influences (Reason, 1990). In contrast with Heinrich's Domino Theory, where there is no explanation of how or why the unsafe act happened, the Swiss Cheese Model considers the origins of the unsafe act. Figure 2.1 illustrates the progression from hazard to losses in an almost predictable sequence. This figure depicts how, when all the conditions are aligned, some hazards cannot be prevented from causing injuries or property losses. The "holes" in the cheese slices represent the identified human errors on each level. The occurrence of human error on a given level can cause a lack of understanding of the hazards in the control system. Shappel and Wiegmann (2000) refined the classification of human errors by identifying certain attributes that must exist before these can develop into unwanted events and be controlled at an early stage or level.

2.2 Empirical literature review

Byakika (2015) conducted a study on Occupational Safety and Health Issues on Road Construction Sites in Sub-Saharan Africa and took a case study of Uganda by using descriptive research design. Various accidents and injuries that occur on road construction sites have been studied and remedial measures have been proposed. The study revealed that poor state of hygiene; insufficient training and inefficient safety committees affect the health and safety issues in Ugandan Organizations. The study focused on Ugandan economy thus presenting a geographical/contextual gap.

Zeng and Tam (2008) conducted a study on towards occupational health and safety systems in the construction industry of China where they used odd ratio regression method. The study examined the implementation of OHS management systems and the OHSAS 18001 in the construction industry and they found that the OHS status in the construction industry is not satisfactory based on data of recorded accidents from construction activities over the past three years. With regard to the operation of the OHSAS 18001 standard, it is suggested to integrate it with the ISO 9001 quality management system to streamline the process. Based on the similarity and compatibility of the ISO 9001 and the OHSAS 18001, it is believed that an integrated management system could avoid duplication of effort and reduce resource inputs.

Anumba and Bishop (1997) and Mwombeki (2008) conducted a study on health and safety on construction sites in Ghana using content and factor analysis. The study found out that issues of health and safety on construction sites have often received minimum attention. However, the need for safety awareness among construction companies has greatly increased This is due, in part, to the high cost associated with work-related injuries, including workers‟ compensation insurance premiums and costs, indirect costs of injuries, increased chance of liability suits, loss of valuable employee skills, and increased labour recruitment and training costs

Teoand Ling (2006) conducted a study on developing a model to measure the effectiveness of safety management systems of construction sites by using the Analytic Hierarchy Process (AHP) and

Factor Analysis were used to assist in identifying the most crucial factors and attributes affecting safety. The model was developed by means of the multi-attribute value model (MAVT) approach. It was also subject to validation via site audits. Using the model, a Construction Safety Index (CSI) can be calculated. It is concluded that the CSI can act as an objective measure of different sites for management and appraisal purposes.

2.5 Conceptual & Theoretical Framework

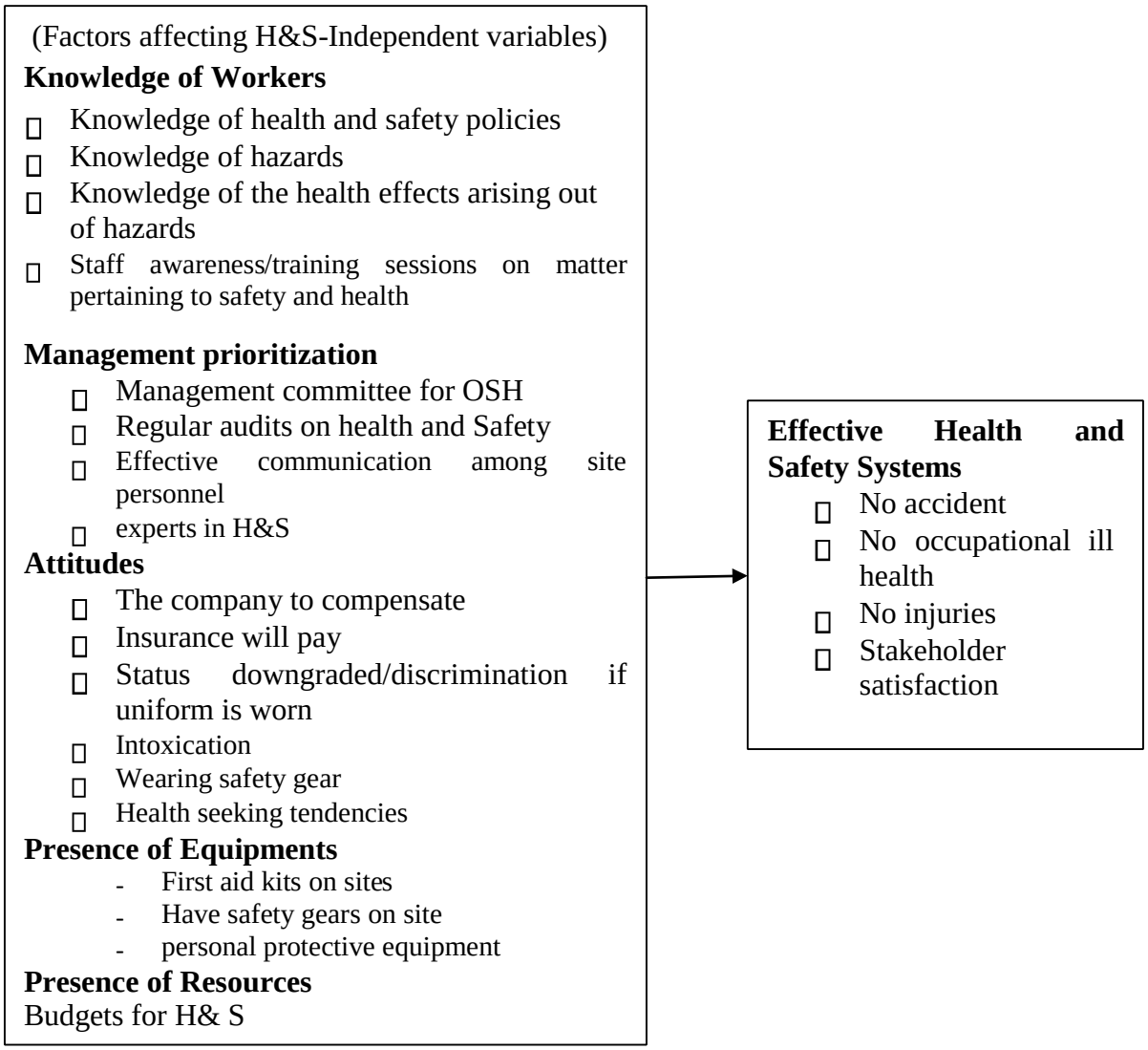

Figure 1: Conceptual framework

3.0 RESEARCH METHODOLOGY

The research design was a correlation research design. The population of the study was 150 permanent and 200 casual employees of Lee Construction Ltd. This implied that the population was 350 employees.

The reason for sampling in this study was to lower cost, accessibility of study population and the greater speed of data collection.Four was added to 96 to make the sample 100 just in case there was an unresponsive on the side of respondents. The final sample size was 100 employees. In which case 40 were permanent and 60 were casual employees.

Primary data was obtained from questionnaires.A questionnaire was administered to permanent and casual employees who were skilled while a key informant interview were administered to safety officers. The questionnaire responses were input into statistical package for social sciences (SPSS) and Cronbach‟s alpha coefficient generated to assess reliability.These respondents were not included in the final study sample in order to control for response biasness.This study used both construct validity and content validity. For construct validity, the questionnaire was divided into several sections to ensure that each section assessed information for a specific objective, and also ensured that the same closely ties to the conceptual framework for this study. To ensure content validity, the questionnaire was subjected to thorough examination by two randomly selected permanent staff.The regression analysisis written as:

$Y= b_0 + x_1 b_1 + x_2 b_2 + x_3 b_3 + x_4 b_4 + \mu$, Where b_0 is the Y-intercept, $b_1 – b_4$ are the Beta coefficients of X_1-X_4 which are the independent variables and μ is the error term. X_n variables are defined as follows X_1- knowledge of workers

X_2- Management prioritization

X_3- attitude of workers

X_4- practices

4.0 RESULT FINDINGS

4.1Demographic data

4.1.1 Gender of the respondents

The respondents were asked to indicate their gender as in figure 2.

Figure 2: Gender of Respondents

Majority of the respondents were male who represented 64% of the sample while 36% were female. This implies that the casual and permanent employees of Lee construction company is male dominated. As far as this title of study is concerned, the results imply health and safety system is of more concern on male gender than female gender.

4.1.2: Years in the operation

On the question of how many years the respondents had been working in Lee construction company, majority of respondents (34%) indicated that they have been in the company for 3 to 5 years. 32% of the respondents indicated that they have been in the organization for a period of more than 5 years. 28% indicated that they have been working in the company for a period of 1 to 2 years while 6% of the respondents who were the list indicated that they have been in the company for a period less than a year.

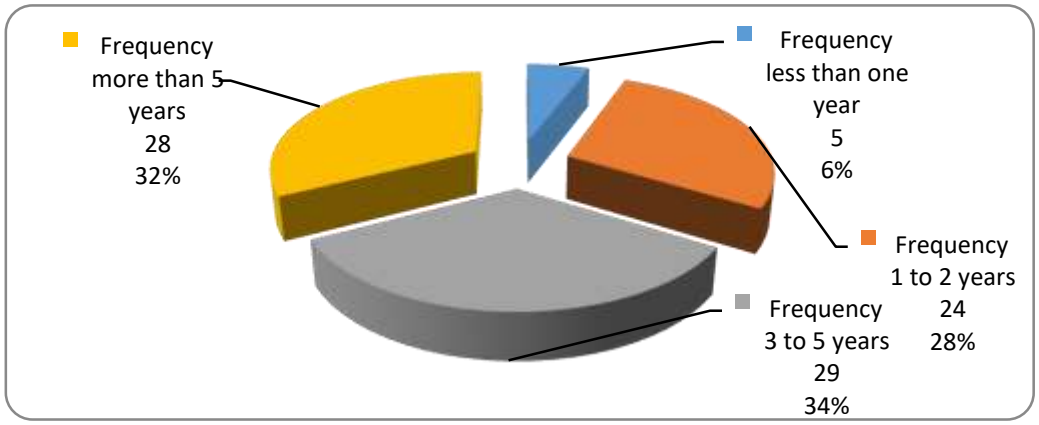

Figure 3: Years in the operation

This implies that majority of the respondents had been in operation for a satisfactory period of time.In as far as the title of study is concerned, the result implies that the respondents was aware of the operations of health and safety system since majority of them had served in the company of greater period of time, thus they were more experienced.

4.1.3: Position of the respondents

The respondents were asked to indicate their position as in figure 4.

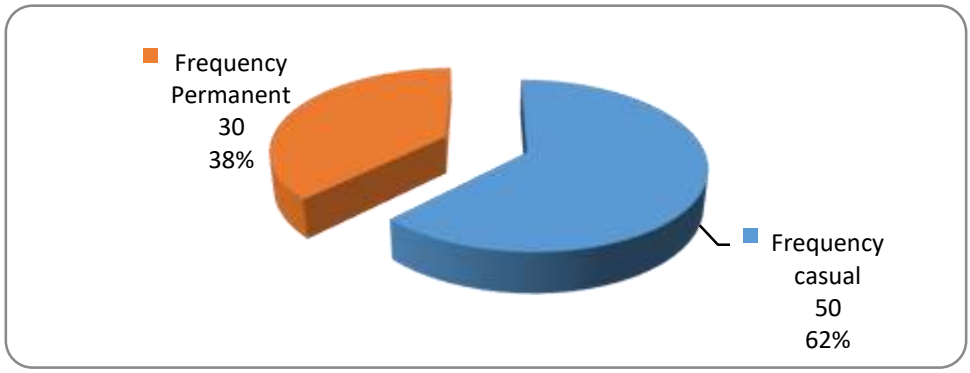

Figure 4: Position of respondents

Majority of the respondents were casuals who represented 62% of the sample while 38% were permanent employees (management). This implies that Lee Construction Company has more casuals on hire. In as far as the title of study is concerned, the result implies that health and safety is of more concern on the casual employees since they are the ones working on the sites than their counter parts.

4.2.3 Age of the Respondents

On the question of ages of the respondents, majority of the respondents (35%) indicated that they were of age bracket of 41-50 years, 29% indicated that they were of age bracket of 31-40 years. 19% of the respondents indicated 21-30 years while 17% indicated that age bracket of above 51years. Managers were in higher age brackets as compared to the casuals.In as far as the title of study is concerned, the result implies that those who are at risk on health hazards are older employees as compared to young employees.

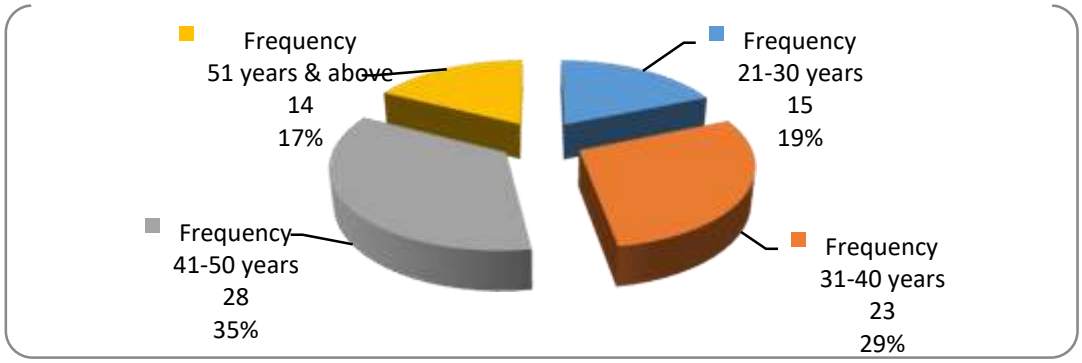

Figure 5: Age brackets of respondents

4.2: Descriptive statistics

4.2.1: Effectiveness of health and safety procedures

DThe first objective of the study was to establish the effectiveness of health and safety procedures at Lee Construction Company. The responses were rated on a two likert scale of agree and disagree criterion and the results presented in Table 1.

Table 1: Effectiveness of health and safety procedures

	agree	disagree	Mean	Std. Dev.
The company has a Management committee who are responsible for health and safety system management The company has an audit committee who are responsible for auditing health and safety system.	38.00%	62.00%	1.62	0.49
The company has a Staff awareness sessions on matter pertaining to safety and health	42.00%	58.00%	1.58	0.50
Setting up a safety and health management system is one of the Key concerns of the company	40.00%	60.00%	1.6	0.50
The company have a Staff awareness/training sessions on matter pertaining to safety and health	34.00%	66.00%	1.66	0.48
Average	38.00%	62.00%	1.62	0.49
			1.62	**0.49**

Majority of 62% of the respondents disagreed that the company has a management committee who are responsible for health and safety system management, 58% disagreed that the company has an audit committee who are responsible for auditing health and safety system, 60% of the respondents disagreed that the company has a staff awareness sessions on matter pertaining tosafety and health, 66% disagreed that setting up a safety and health management system is one of the Key concerns of the company while 62% of the respondents disagreed that The company have a staff awareness/training sessions on matter pertaining to safety and health.Majority of the respondents disagreed on the effectiveness of the health and safety procedures. These results imply that there is still a greater challenge on the health and safety procedures in Lee Construction Company. The result also implies that Lee Construction Company has not been upholding health and safety standards. The casual employees have not been trained well on health and safety and thus they are exposed to risks on the construction site.

On a two point scale, the average mean of the responses was 1.62 which means that majority of the respondents were disagreeing to the statements in the questionnaire; however the answers were varied as shown by a standard deviation of 0.49.

4.2.2: Managers responses on effectiveness of heath systems

The managers were asked to indicate if they budget for health and safety in terms of management sitting allowances.90% affirmed that they budget for management sitting allowance while only 10% responded that they did not budget for management sitting allowance as indicated in figure

4.6.

This implies that though the management may not have fully upheld health and safety standards, it recognizes health and safety as an issue in construction site and that is why it allocates some resources for health and safety management .Therefore, most of them have a budget for health and safety.

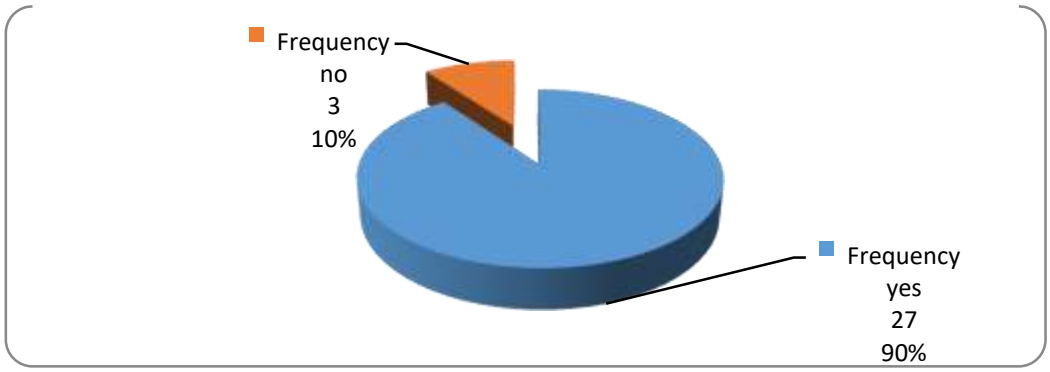

Figure 6: Management sitting allowance

4.3: Inferential Statistics

4.3.1:Correlation Analysis

The Table 2 below presents the results of the correlation analysis. The results presented in the Table 4.12 shows that knowledge and health outcome are positively and insignificant related (r=0.064, p=0.660). The table further indicates that management prioritization and health outcome are positively and significant related (r=0.401, p=0.004). It was further established that attitude and health outcome were positively and significantly related (r=0.346, p=.0014). Similarly, results showed that practice and health outcome were positively and significantly related (r=0.128, p=.00376).

Table 2: Correlation Matrix

		Mean health outcome	Mean Knowledge	Mean management prioritization	Mean attitude	Mean practice
Mean health outcome	Pearson Correlation	1.000				
	Sig. (2-tailed)					
Mean Knowledge	Pearson Correlation	0.064	1.000			
	Sig. (2-tailed)	0.660				
Mean						

management prioritization	Pearson Correlation	0.401**	-0.100	1.000		
	Sig. (2-tailed)	0.004	0.490			
Mean attitude	Pearson Correlation	0.346*	0.188	-0.053	1.000	
	Sig. (2-tailed)	0.014	0.190	0.717		
Mean practice	Pearson Correlation	0.128	0.092	-0.029	0.240	1.000
	Sig. (2-tailed)	0.0376*	0.525	0.840	0.094	

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

4.3.2: Regression Analysis

The results presented in table 3 present the fitness of model used of the regression model in explaining the study phenomena.

Table 3: Model Fitness

Indicator	Coefficient
R	0.801
R Square	0.641
Adjusted R Square	0.238
Std. Error of the Estimate	0.29539

Knowledge, management prioritization, attitude and practice were found to be satisfactory variables in explaining health outcome. This is supported by coefficient of determination also known as the R square of 64.1%. This means that Knowledge, management prioritization, attitude and practice explain 64.1% of the variations in the dependent variable which is health outcome. This results further means that the model applied to link the relationship of the variables was satisfactory.

4.3.3: Analysis of variance (ANOVA)

Table 4 provides the results on the analysis of the variance (ANOVA).

Table 4: Analysis of Variance

Indicator	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.685	4	0.421	4.827	0.003
Residual	3.926	45	0.087		
Total	5.611	49			

The results indicate that the overall model was statistically significant. Further, the results imply that the independent variables are good predictors of health outcome. This was supported by an F statistic of 4.827 and the reported p value (0.000) which was less than the conventional probability of 0.05significance level.

4.3.4: Regressions of coefficients

Regression of coefficients results in table 5 shows that knowledge and health outcome are positively and insignificant related (r=0.055, p=0.781). The table further indicates that management prioritization and health outcome are positively and significant related (r=0.789, p=0.001). It was further established that attitude and health outcome were positively and significantly related (r=0.555, p=.001). Similarly, results showed that practice and health outcome were positively and significantly related (r=0.088, p=.0036).

Table 5: Regression of Coefficients

Variable	B	Std. Error	t	Sig.
(Constant)	-0.81	0.607	-1.334	0.189
Knowledge	0.055	0.196	0.279	0.781
Managementprioritization	0.789	0.233	3.386	0.001
Attitude	0.555	0.207	2.675	0.01
Practice	0.088	0.213	0.415	0.036

Regression results imply that a positive health outcome is determined by; proper enlightment of employees on health and safety, management commitment and prioritization on health and safety, positive attitude of employees towards health and safety and lastly good management and casual employees practices on health and safety.

Thus, the optimal model for the study is;

Health Outcome= -0.81 + (0.055) *Knowledge* +(0.789) *Management Prioritization* +(0.555) *Attitude* + (0.088) *Practice*

4.4 Qualitative analysis

Three Safety officers were provided with interview guide so as to answer questions related to the health and safety system of Lee Construction Company.

One the first question of does the Management committee which is responsible for health and safety system management engages and communicates with casuals regularly? The first respondent answered no and continued to respond that “this has affected the health and safety of casuals and non casuals since the workers do not have up to date information on the health and safety system. Management committee needs to sensitize the workers on the use of safety equipments during construction.”

The second respondent answered that Management committee which is responsible for health and safety system management do not engage and communicate with casuals regularly.”The management needs to hold series of meetings with the workers and create awareness on matter pertaining to safety and health”

The third respondent indicated that Management committee which is responsible for health and safety system management do not engage and communicate with casuals regularly."This has affected the health and safety of the casuals and non casuals". "Setting up a safety and health management system should be one of the Key concerns of the management committee." The second question was: have any member of audit committee come to the site to inquire about the health and safety conditions of the casuals. The first respondent answered yes but less frequent. The second and third respondent also answered yes but less frequent. The third respondent went further to explain that audit committee needs to make frequent audits on health and safety system so as to improve on the transparency and accountability of the health and safety system.

The third question was: how much time in the last one year did the company hold staff awareness sessions on matter pertaining to safety and health. The first respondent answered "the company has held only three awareness sessions in the last one year". Respondent two and three answered that the company has held only two awareness sessions on the matter pertaining to safety and health. This implies that the company still needs to increase the number of awareness sessions since from the response it shows that few sessions have been held by the company which is not satisfactory.

The forth question was; how would you rate the overall safety and health management system in Lee construction. The three respondents rated the overall safety and health management system to be moderate. They indicated that Lee construction company needs to improve on knowledge, management prioritization, attitude and practices among the workers so as to improve on the overall safety and health management system in Lee construction.

5.0 DISCUSSION CONCLUSIONS AND RECOMMENDATIONS

5.1 Findings

The first objective of the study was to assess the effectiveness of health and safety procedure. Majority of the respondents, who were casuals, disagreed on the majority of the questions on the effectiveness of the health and safety procedures. These results imply that there is still a challenge on the health and safety procedures in Lee Construction Company. On the questions addressed to the managers, majority of the managers indicated that they have allocated more money on sitting allowance of management committee, equipments and more budgets on reduction of accidents. This translated to lower accidents cases reported in the last three years.

The second objective of the study was to assess the perception of workers about the status of health. Majority of the respondents disagreed with majority of the questions related to their perception on the status of health. Majorityof the respondents affirmed that there are accidents sustained at the site, though most of them declined that they suffer from occupational disease. Majority of them supported that there are injuries sustained at the site. The third objective of the study was to establish the factors affecting health and safety. Majority of the respondents disagreed with the questions related to knowledge, management prioritization, attitude and practices. This implies that management"s poor safety measures were the main source of health hazards at the construction sites.

Results from the regression analysis showed that knowledge had a positive relationship with health outcome though insignificant. Management prioritization, Attitude and practice had a positive and significant relationship with health outcome.

5.2 Conclusions

Based on the findings above the study concluded that the effectiveness of the health and safety system in Lee Construction Company is moderate. This is supported by the response of the safety officers who said that the overall safety and health management system to be moderate.

The study also concluded that the casuals are not satisfied with the stakeholders‟ way of handling health and safety system. This is supported by the results which indicated that there are accidents sustained at the site, and also there are injuries sustained at the site.

Lastly, the study concluded that the workers do not have full knowledge on health and safety. The management prioritization is poor. The workers have a negative attitude on health and safety. In addition the company has poor practices on health and safety. This is supported by the response of the casuals who disagreed with the majority of the questions.

5.3 Recommendations

The management committee who are responsible for health and safety system management should steer up policies and procedures regarding to health and safety system. The audit committee who are responsible for auditing health and safety system should organize frequent audits on health and safety system.The company should organize series ofstaff awareness sessions on matter pertaining to safety and health and this will shed more light to the workers on health and safety system.The setting up a safety and health management system should be one of the Key concerns of the company so as to improve on the overall effectiveness of health and safety system of the company.

The study also recommends that the managements who are responsible for health and safety system should increase budget allocations to health and safety system. This will work on reducing accidents and injuries reported on the construction sites.Supports for effective representation and consultation on health and safety, such as information, training and time off for representatives to enable them to perform their functions properly, should be better established in the industry and evidence of related good practice disseminated more widely in the sector.

5.4 Suggestions for Further Studies

The study sought to assess of effectiveness of health and safety systems in construction industry.This called for the analysis of Lee construction ltd, thus area for further studies could consider a different industry like manufacturing industry for the purpose of making a comparison of the findings with those of the current study.

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