EVALUATION OF THE EFFECTIVENESS OF HEALTH AND SAFETY TRAINING PRACTICES OF CONSTRUCTION FIRMS IN ABUJA, NIGERIA

By

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NIGERIA

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DECLARATION

I declare that the work in this thesis entitled "Evaluation of the effectiveness of health and safety training practices of construction firms" has been carried out by me in the Department of Quantity Surveying, Faculty of Environmental Design, Ahmadu Bello University Zaria.

The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this work has been presented for another degree or post-diploma programme at any Institution.

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CERTIFICATION

This thesis entitled "EVALUATION OF THE EFFECTIVENESS OF HEALTH AND SAFETY TRAINING PRACTICES OF CONSTRUCTION FIRMS" by Umar Shehu ISMA'IL meets the regulations governing the award of the degree of M.Sc. Project Management of the Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This project is dedicated to all the gallant soldiers that fight day and night to liberate our country from all acts of terror.

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ABSTRACT

Given the high proportion of fatal and non-fatal accidents occurring in the construction industry, construction companies constantly seek different and novel strategies to reduce the number of work-related accidents. One such strategy that is mentioned often in the literature is formal, well organized and effective safety training. However, the current safety management literature reported on the effectiveness of health & safety training of large construction firms only operating within developed countries like The U.S, The U.K, and some parts of Europe. However, there is a dearth of research in construction literature in the context of medium construction firms that are typically smaller than the large construction firms and yet they collectively perform a large portion of the construction volume and train a large number of workers on safety issues. The purpose of this study was to evaluate the effectiveness of health and safety training practices of medium & large construction firms in developing countries based on four (4) measures of evaluation namely: reaction, learning, training transfer, and results/impacts. The research objectives were achieved by gathering empirical data from 130 construction firms in Abuja, Nigeria. Descriptive and inferential methods of analysis were used to analyse the data collected in order to achieve the aim of the study. Furthermore, the independent samples t-test was performed in order to see if the differences between the groups are statistically significant at $\alpha = 0.05$. All these statistical analyses were undertaken using the statistical package for social science (SPSS) for Windows version 23. It was established that majority of workmen (10%-51%) in medium construction firms 'strongly disagree or disagree' with 11 out of 16 key components of H & S training as opposed to workmen in large construction firms in which the majority (27%-39%) 'agree or strongly agree' with 15 of the 16 key components of H & S training. It was also established that two H & S training practices that aid learning of safety knowledge by workers are implemented in medium construction firms, while 10 H & S training practices that aid learning of safety knowledge by workers are implemented in

large construction firms. It was also established that two (2) H & S training practices that aid training transfer of the learned knowledge by workers in the job environment, while eight (8) H & S training practices that aid training transfer of the learned knowledge by workers in the job environment are implemented in large construction firms. Finally, it was discovered that the H & S training practices of medium construction firms have results on two (2) key organisational objectives of safety training, while those of large construction firms have results on eight (8) key organisational objectives. Based on the foregoing, the study thus, concludes that the health and safety training practices of large construction firms are more effective than those of medium construction firms in terms of components safety training design and delivery; learning aids of safety knowledge by workers; efficient training transfer of the learned knowledge by workers in the job environment; and impact on key organisational objectives of health and safety training. This therefore, means that the health and safety training practices of large construction firms are more likely to yield better safety outcomes more than building construction firms. The contribution of this study is that it represents an empirical attempt to evaluate the effectiveness of the mechanisms through which medium & large construction firms in Nigeria practice health and safety training to achieve, sustain and improve safety performance within construction. It is useful to construction firms and practicing professionals seeking to improve safety training design and delivery that translates to improved safety performance within construction.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Research in construction safety continues to show alarming deficits in safety knowledge among construction workers. For example, Haslam, Hide, Gibb, Gyi, Pavitt, Atkinson and Duff (2005) found that more than 70% of construction injuries were associated with poor safety knowledge. Estimates has also revealed that only 10–15% of training investments translate into tangible benefits (Baldwin and Ford, 1994; Cromwell and Kolb, 2004). Not surprisingly, most injury investigations recommend more training to prevent injury recurrence (National Institute Occupational Safety and Health, 2015).

Few studies have focused on understanding why training efforts fail in construction. For example, Goldenhar, Moran and Colligan (2001) explains that industry characteristics such as the transient nature of the workforce and the temporal basis of projects discourage employers from adopting comprehensive, more expensive, and resource-intensive training methods. Other common challenges to effective training include schedule constraints and conflicts in projects, language barriers among workers, and difficulty of quantifying and communicating training benefits (Wang, Goodrum, Haas and Glover, 2008).

Besides these industry challenges, training efforts fail for a variety of reasons such as ineffective instructional methods, incompetent instructors, and improper training material (Demirkesen and Arditi, 2015). Most safety training programs within construction use conventional classroom techniques that do not sufficiently engage workers (Wilkins, 2011). According to Haslam *et al.* (2005), such passive and ineffective instructional methods have limited value, and can sometimes instigate negative attitudes among workers to safety issues.

To improve safety training effectiveness, Wilkins (2011) recommends replacing traditional classroom-type training with andragogical approaches that are more effective in engaging adult learners. More recently, Mostafa, Alex, Carlos and Nagaya (2016) argued that engaging safety training methods that facilitate dialogue, feedback and action can result in higher learning gains.

1.2 Statement of the Problem

Given the high proportion of fatal and non-fatal accidents occurring in the construction industry, construction firms constantly seek different and novel strategies to reduce the number of work-related accidents. One such strategy that is mentioned often in the literature is formal, well organized and effective health and safety training (Tam and Fung, 1998; Toole, 2002; Burke, Sarpy, Smith-Crowe, Chan-Serafin, Salvador, and Islam, 2006; Business Legal Reports, 2007; Aksorn and Hadikusumo, 2008; Han, Park, Jin, Kim and Seong, 2008; Burke and Hutchins, 2011; Evia, 2011; Wilkins, 2011; Li, Chan and Skitmore, 2012; Occupational Safety and Health Administration, 2012; Ruttenberg, 2013; Hinze and Li, 2013; Demirkesen and Arditi, 2015).

Extensive review of the literature however, reveals that a variety of studies in the construction safety management literature have investigated the construction health and safety training within developed countries (Wilkins, 2011; Li *et al.*, 2012; Hinze *et al.*, 2013; Ruttenberg, 2013; Demirkesen and Arditi, 2015; Mostafa, Alex, Carlos and Nagaya, 2016; Namian, Albert, Carlos and Nagaya, 2016). In the majority of these studies, researchers have evaluated the effectiveness of health and safety training practices of large construction firms only which operate in highly developed countries.

However, there is a lack of research in construction literature in the context of medium construction firms that are typically smaller than the large construction firms and yet they collectively perform

a large portion of the construction volume and train a large number of workers on safety issues. Hence, the need for the study.

This study intends to fill this gap by evaluating the effectiveness of health and safety training practices of medium and large construction firms in a developing economy.

1.3 Justification for the Study

The effectiveness of health and safety training practices is an important aspect of safety management on construction sites. To improve safety performance, construction firms invest several million dollars in designing, developing, and delivering health and safety training programs. The goal of these training programmes is to equip workers with the skills necessary to recognise and manage hazards in complex environments (Hinze and Gambatese, 2003). This research represents the first attempt to evaluate the mechanism through which medium and large construction firms adopt health and safety training to achieve, sustain and improve construction safety performance. The findings of this study can significantly advance theory and practice in the area of construction safety and health and safety training design and delivery. The results of the study will be beneficial to construction firms and practicing professionals who are interested in designing health and safety training programs that translate to improved safety performance of construction firms.

1.4 Aim and Objectives

1.4.1 Aim

The aim of this research is to evaluate the effectiveness of health and safety training practices of construction firms with a view to proffering strategies for designing, developing, and delivering

effective health and safety training programmes in medium and largeconstruction firms in a developing economy.

1.4.2 Objectives

The objectives through which the above stated aim was achieved were to;

i. establish appropriate measures for the evaluation of the effectiveness of health and safety training practices in construction firms.
ii. evaluate reactions of workmen on key components of health and safety training design and delivery in construction firms.
iii. evaluate health and safety training practices of construction firms in achieving learning of safety knowledge by workers in health and safety training.
iv. evaluate health and safety training practices of construction firms in ensuring training transfer of the learned safety knowledge by workers in the job environment.
v. evaluate result of health and health and safety training practices of construction firms on key organizational objectives of safety training.

1.5 Scope and Limitation

1.5.1 Scope

The study intended to evaluate the effectiveness of health and safety training practices of construction firms in Nigeria. For the purpose of this study, medium and large construction firms that engage in building construction and civil engineering works were considered. Medium and large construction firms were chosen considering the nature of construction projects they execute which are complex and technical in nature, requiring the use of heavy machinery and are therefore more likely to practice health and safety training for their employees such that accidents on construction sites are minimized, reduced or eliminated. Considering the nature of data required

to achieve the aim of the study, two sets of respondents were targeted. These respondents are the providers of training (safety managers) and the receivers of training (workmen).

However, as it is not possible to cover the whole of construction firms in Nigeria, only construction firms within Abuja metropolis were covered by the study. Abuja is the capital city of Nigeria and one of the most developed states currently experiencing rapid increase in population and new developmental projects undertaken daily to meet the increasing demand for shelter for both residential and commercial purposes.

1.5.2 Limitations

i. The reliability of the health and safety training practices reported in this study is limited to the accuracy of the data provided by respondents in the self-administered questionnaire survey. This is because some companies who violate health and safety rules may not have given honest answers to questions. Thus, it could be possible that the effectiveness of health and safety training practices of construction firms may be overstated in this study.

ii. The results of the study may not be generalized beyond the boundaries of the population that was employed in the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Role of Safety Training in Construction

Training is defined as the systematic acquisition of knowledge, skills and attitudes in order to develop the competencies necessary for effective performance in the work environment (Salas and Cannon-Bowers, 2001). Effective training involves changing cognition, attitudes and behaviours and consequently the way people conduct themselves at work (Tannenbaum and Yukl, 1992). In the light of work-related injury, research has shown that effective safety training assists in the reduction of these events leading to an improvement in organizational culture (Zohar, 1980; Kinn, Khuder, Bisesi and Whoolley, 2000; Varonen and Mattila, 2000; Gillen, Baltz, Gassel, Kirsch and Vaccaro, 2002; Dong, Entzel, Men, Chowdhury and Schneider, 2004).

Many researchers (such as Wilkins 2011; Demirkesen and Arditi, 2015; Mostafa *et al.*, 2016; Namian *et al.*, 2016) have used empirical methods to evaluate the effectiveness of training in improving safety. A regression analysis of the safety strategies and the site safety records of 45 Hong Kong construction companies identified safety training as one of the four most effective components of a safety programme (Tam and Fung, 1998). A similar analysis of 70 Thai construction projects found that safety inductions were effective in reducing unsafe conditions (Aksorn and Hadikusumo, 2008). Based on a survey of design and construction firms in Pennsylvania with 105 responses, Toole (2002) identified lack of training as one of eight root causes of construction accidents.

However, standards for construction safety training are low. In the UK, Australia and Hong Kong, one day or less of safety training is sufficient for workers to obtain the necessary certification as construction labourers (Li *et al.,* 2012). Wilkins (2011) raised serious questions concerning the

effectiveness and the content of existing modes of construction safety training in the US. A survey of 105 construction personnel who had taken the OSHA 10-hour 'Construction Safety Training Course' revealed dissatisfaction with the ways in which the courses were taught. Wilkins (2011) highlighted the needs for training to cover content covered relevant to the lives of the trainees, for presentation by a trainer knowledgeable about the subject, and for supplementing training with tangible materials that are understandable. In the broader domain of safety training in general, a meta-analysis study of research from 1971 to 2003 that compared the effectiveness of safety training methods has shown that high-engagement training (involving behavioural modification, e.g. hands-on practice in a realistic setting) was on average three times as effective as low-engagement training (e.g. using videos or written material only) (Burke *et al.,* 2006). A similar meta-study, covering the years 1996–2005, also found (inter alia) evidence for the superiority of high-engagement over low-engagement training, although the difference was small (Robson *et al.*, 2010).

2.2 Critical Training Elements

Different authoritative reviews of the general health and safety training literature and job training in particular, emphasize the importance of certain elements as critical to an effective safety training program (Goldstein and Buxton, 1982; Campbell, 1988; Tannenbaum and Yukl, 1992; Cohen *et al., 1998*). The Occupational Safety and Health Administration set of voluntary training guidelines to assist employers in furnishing safety and health information and instruction to workers (OSHA, 1988) mimics most of the same elements within an occupational safety and health context. According to Cohen, Sinclair, Newman, and Schuler (1998), the critical training elements of the OSHA are outlined below.

2.2.1 Needs assessment

According to Philips (1997), training goals presuppose: 1) consistency with organizational goals, 2) the presence of jobs designed to yield performance outputs that meet the organization's goals, and 3) performance levels dependent on knowledge of the job tasks, skill, attentiveness to the work or factors where training can make a difference. Philips (1997) further noted that expecting training to solve problems related to internal organizational conflicts or to overcome deficiencies in equipment or work methods is unrealistic. Job analyses determine which of the relevant performance factors comprise the highest priority training needs either now or in the future Philips (1997). The process includes defining the tasks involved, their order of importance (in terms of frequency, criticality, complexity), and details of the steps necessary to accomplish them.

2.2.2 Establishing training objectives

According to Philips (1997), the needs assessment provides the information to establish the objectives of the training program. Philips (1997) also highlighted that these training objectives are stated as observable behaviors expected of the trainee after the instruction, and they may acknowledge the conditions under which they should be performed and the required level of proficiency.

2.2.3 Specifying training content and media

According to Kirkpatrick (1998), content represents the knowledge or skill that the trainee must master to be able to meet the behavioral objectives. The judgement of those who know the job demands is the most common approach to specifying training contents. Other approaches may be the products of problem solving exercises, or be based on mistakes people make in using a skill such as to design corrective learning measures (OSHA, 2015). Evidence that one teaching method

such as lectures, televised instruction, computer-aided instruction, or interactive video methods is superior to another is not that clear (Kearsley, 1991). Much depends on the specific training needs, makeup of trainee group and other factors. Why or how a particular method facilitates learning and how it can be made more effective are issues requiring further study (Kearsley, 1991).

2.2.4 Accounting for individual differences

According to Cohen *et al.* (1998), effective training should take account of the characteristics or attributes of the trainees. Aside from differences in aptitude, literacy, or pre-training skill levels, how trainees view the training program in terms of improving their job performance or self-efficacy may dictate variable approaches (Kirkpatrick, 2006). Furthermore, Kirkpatrick (2006) stated that the kind and level of training for new job applicants versus long-term or older workers reassigned to the same tasks also has to be addressed.

2.2.5 Specifying learning conditions

In general, instructional events comprising the training method should not inhibit, conflict with, or be unrelated to the processes that lead to mastery (Cohen *et al.*,1998). If the learning is to develop capabilities in problem-solving techniques, the instructional approach should stress thinking/reasoning approaches not rote memorization (Cohen *et al.*,1998). Training methods should require the trainee to use the training content in active or productive ways, e.g., restating or applying principles rather than just recalling them, or adapting the information to new situations rather than mere repetition in the same one (Kirkpatrick, 2006). The current literature suggests that using learning events that require productive behavior or that provide appropriate feedback (positive/accurate/credible) and opportunities for practice under conditions that promote transfer to the actual job are ideal (OSHA, 2015).

2.2.6 Evaluating training

To make sure that the training program is accomplishing its goals, an evaluation of the training can be valuable (OSHA, 1988). Training should have, as one of its critical components, a method for measuring the effectiveness of the training (Kirkpatrick, 2006). When course objectives and content are developed for a training program, a plan for evaluating the training session(s) should be designed and integrated into the program's other elements (Kirkpatrick, 2006). Kirkpatrick (2006) also highlighted that an evaluation will help employers or supervisors determine the amount of learning achieved and whether a worker's performance has improved on the job.

2.2.7 Revising the training

The evaluation of training as noted by Goldstein and Buxton (1982) offers information as to whether the instruction has had its intended effect on the measures set out for that purpose. Seldom do the data indicate a program was a complete success or a failure, given multiple criteria for gauging the results. Rather, the data may indicate better understanding, retention or application of some course material as compared with others. Gaps or variations in knowledge or competencies resulting from the training may reflect needs to consider more training time, alternative instructional techniques, or more capable instructors (OSHA, 2006).

2.3 Characteristics of Sound Safety Training Programs

Safety management literature on training "best practices" reveals four characteristics that sound training programs have in common (Philips, 1997; Kirkpatrick, 2006; OSHA, 2015). The best training programs are accurate, credible, clear and practical.

2.3.1 Accuracy:

Training materials should be prepared by qualified individuals, updated as needed, and facilitated by appropriately qualified and experienced individuals employing appropriate training techniques and methods (Philips, 1997).

2.3.2 Credibility:

Training facilitators should have a general safety and health background or be a subject matter expert in a health or safety related field (Kirkpatrick, 2006). Furthermore, they should have experience training adults or experience working with the target population. Practical experience in the field of safety and health as well as experience in training facilitation contribute to a higher degree of facilitator credibility (Kirkpatrick, 2006).

2.3.3 Clarity:

Training programs must not only be accurate and believable, but they must also be clear and understandable to the participant (OSHA, 2015). If the material is only understandable to someone with a college education or someone who understands the jargon, then the program falls short of meeting workers' needs. Training materials should be written in the language and grammar of the everyday speech of the participants (OSHA, 2015). Training developers should ensure that readability and language choices match the intended audience.

2.3.4 Practicability:

Training programs should present information, ideas, and skills that participants see as directly useful in their working lives (OSHA, 2015). Successful transfer of learning occurs when the participant can see how information presented in a training session can be applied in the workplace (OSHA, 2015).

2.4 Types of Health and Safety Training in Construction

There are several different types of safety training in construction; these include: induction/orientation training, job specific training, supervisory and management training, and specialist training (Phil and Ferret, 2007).

2.4.1 Induction/Orientation training

According to (Phil and Ferret, 2007), induction training should always be provided to new employees, trainees and possibly contractors. While such training covers items such as pay, conditions and quality, it must also include health and safety. It is useful if the employee signs a record to the effect that training has been received. This record may be required as evidence should there be a subsequent legal claim against the organization. According to Phil and Ferret (2007), most induction training programs include the following topics:

i. The health and safety policy of the organization including a summary of the organizational arrangements including employee consultation.
ii. a brief summary of the health and safety management system including the name of the employee's direct supervisor, safety representative and source of health and safety information
iii. the employee responsibility for health and safety including any general health and safety rules (e.g. smoking prohibitions)
iv. the accident reporting procedure of the organization, the location of the accident book and the location of the nearest first aider
v. the fire and other emergency procedures including the location of the assembly point

vi. a summary of any relevant risk assessments and safe systems of work

vii. the location of welfare, canteen facilities and rest rooms.

viii. internal transport routes and pedestrian walkways (e.g. fork lift truck operations)

ix. the correct use of personal protective equipment and maintenance procedures

x. manual handling techniques and procedures

xi. details of any hazardous substances in use and any procedures relating to them (e.g. health surveillance).

Phil and Ferret (2007) further recommended that there should be some form of follow-up with each new employee after 3 months to check that the important messages have been retained. This is sometimes called a refresher course, although it is often better done on a one-to-one basis. It is very important to stress that the content of the induction course should be subject to constant review and updated following an accident investigation, new legislation, changes in the findings of a risk assessment or the introduction of new plant or processes (Phil and Ferret, 2007).

2.4.2 Job-specific training

Job-specific training ensures that employees undertake their jobs in a safe manner (Phil and Ferret, 2007). Such training, therefore, is a form of skill training and is often best done 'on the job', sometimes known as 'toolbox training'. Details of the safe system of work or, in more hazardous jobs, a permit to work system should be covered. In addition to normal safety procedures, emergency procedures and the correct use of personal protective equipment also needs to be included (Phil and Ferret, 2007). The results of risk assessments are very useful in the development of this type of training (Phil and Ferret, 2007). It is important that any common causes of human errors (e.g. discovered as a result of an accident investigation), any standard safety checks or maintenance requirements are addressed. It is common for this type of training to follow an

operational procedure in the form of a checklist which the employee can sign on completion of the training. The new employee will still need close supervision for some time after the training has been completed (Phil and Ferret, 2007).

2.4.3 Supervisory and management training

Supervisory and management health and safety training follows similar topics to those contained in an induction training course (Phil and Ferret, 2007).

There has been considerable research over the years into the failures of managers that have resulted in accidents and other dangerous incidents. According to Phil and Ferret (2007), these failures have included:

i. lack of health and safety awareness, enforcement and promotion (in some cases there has been an encouragement to circumvent health and safety rules)
ii. lack of consistent supervision of and communication with employees
iii. lack of understanding of the extent of the responsibility of the supervisor. It is important that all levels of management, including the board, receive health and safety training. This will not only keep everybody informed of health and safety legal requirements, accident prevention techniques and changes in the law, but also encourage everybody to monitor health and safety standards during visits or tours of the organization.

2.4.4 Specialist training

Specialist health and safety training is normally needed for activities that are not related to a specific job but more to an activity (Phil and Ferret, 2007). Examples include first aid, fire prevention, fork lift truck driving, overhead crane operation, scaffold inspection and statutory

health and safety inspections (Phil and Ferret, 2007). These training courses are often provided by specialist organizations and successful participants are awarded certificates (OSHA, 2014). Details of two of these courses will be given here by way of illustration. Fire prevention training courses include the causes of fire and fire spread, fire and smoke alarm systems, emergency lighting, the selection and use of fire extinguishers and sprinkler systems, evacuation procedures, high risk operations and good housekeeping principles (Phil and Ferret, 2007). A fork lift truck driver's course would include the general use of the controls, loading and unloading procedures, driving up or down an incline, speed limits, pedestrian awareness (particularly in areas where pedestrians and vehicles are not segregated), security of the vehicle when not in use, daily safety checks and defect reporting, refueling and/or battery charging and emergency procedures (Phil and Ferret, 2007).

2.5 Health and Safety Training Methods/Practices

Methods of safety and health training range from passive, information-based techniques (e.g., lectures) to computer-based, programmed instruction and learner centered, performance based techniques (e.g., hands-on demonstrations). Lectures, one of the least engaging methods of safety and health training, are commonly used to present health- and safety-related information. Other common passive techniques include videos and pamphlets or other types of written materials. Methods of training that can be categorized as moderately engaging incorporate knowledge of results, for example feedback interventions in which performance information is provided in small groups, allowing learners to correct their mistakes. Feedback is also a characteristic of programmed instruction, a method of training designed to present information in a standardized manner, such as on a personal computer or in a workbook format. An extensively used moderately engaging method, computer-based instruction, has been created for the entire gamut of workplace

health and safety topics, including occupational safety, industrial safety, systems safety, fire protection, hazardous materials and waste disposal and storage, industrial hygiene, risk management, and safety engineering and design (Huddock,1994). According to Anderson (1985), the most engaging methods of safety and health training focus on the development of knowledge in stages and emphasize principles of behavioral modeling (Bandura, 1986). Behavioral modeling involves observation of a role model, modeling or practice, and feedback designed to modify behavior These methods also include hands-on demonstrations associated with behavioral simulations, which require active participation from the trainee. In the case of behavioral simulations and hands-on training, interactions between trainees and trainers will frequently go beyond 1 -way feedback to engage trainees in dialogue concerning knowledge acquired or actions taken. Such dialogue, in either a virtual or actual context, is important because it is posited to enhance quality of reflection (thinking) with respect to actions taken (Holman, 2000; Hacker, 2003). This action-focused reflection is regarded as the key to knowledge acquisition and transfer of training, in that it forces the trainee to infer causal and conditional relations between events and actions, leading to development of strategies for handling unforeseen events and initiating and promoting self-regulatory motivational processes (e.g., self-monitoring and self-efficacy expectations).

Consistent with these arguments, there is ample evidence in the training literature that active approaches to learning arc superior to less active approaches (Frese, 1994). Therefore, as training moves along the continuum from more passive information-based methods (e.g., lectures) to the most engaging methods (e.g., behavioral modeling and hands-on demonstrations), we hypothesize that greater knowledge acquisition and more transfer of training to the work setting will occur

(thereby improving behavioral safety performance and reducing negative safety and health outcomes).

2.6 Importance of Health and Safety Training

According to Raheja (2015), the importance of health and safety training in construction can be summarised as follows:

i. Help in Addressing Employee Weaknesses**:** Most workers have certain weaknesses in their workplace, which hinder them from giving the best services. Training assists in eliminating these weaknesses, by strengthening workers' skills. A well organised safety training program helps employees gain similar skills and knowledge, thus bringing them all to a higher uniform level. This simply means that the whole workforce is reliable, so the company or organization doesn't have to rely only on specific employees.

ii. Improvement in Workers' Performance: A properly trained employee becomes more informed about procedures for various tasks. The worker confidence is also boosted by training and development. This confidence comes from the fact that the employee is fully aware of his/her roles and responsibilities. It helps the worker carry out the duties in better way and even find new ideas to incorporate in the daily execution of duty.

iii. Consistency in Duty Performance: A well-organised safety training program gives the workers constant knowledge and experience. Consistency is very vital when it comes to an organization's or company's procedures and policies. This mostly includes administrative procedures and ethics during execution of duty.

iv. Ensuring Worker Satisfaction: Safety training makes the employee also feel satisfied with the role they play in the company or organization. This is driven by the great

ability they gain to execute their duties. They feel they belong to the company or the organization that they work for and the only way to reward it is giving the best services they can.

v. Increased Productivity: Through safety training the employee acquires all the knowledge and skills needed in their day to day tasks. Workers can perform at a faster rate and with efficiency thus increasing overall productivity of the company. They also gain new tactics of overcoming challenges when they face them.

vi. Improved Quality of Services and Products: Employees gain standard methods to use in their tasks. They are also able to maintain uniformity in the output they give. This results with a company that gives satisfying services or goods.

vii. Reduced Cost: Safety training results with optimal utilization of resources in a company or organization. There is no wastage of resources, which may cause extra expenses. Accidents are also reduced during working. All the machines and resources are used economically, reducing expenditure.

viii. Reduction in Supervision: The moment they gain the necessary skills and knowledge; employees will become more confident. They will become self-reliant and require only little guidance as they perform their tasks. The supervisor can depend on the employee's decision to give quality output. This relieves supervisors the burden of constantly having to give directives on what should be done.

2.7 Health and Safety Training Evaluation

Safety training evaluation is the systematic collection of descriptive as well as judgmental information necessary to make effective training decisions related to the selection, adoption, value

and modification of various instructional activities involved in training (Goldstein, 1986). This definition mentions not only descriptive but also summative information which are available and also equally present in any given training and development intervention (Neeraj, Gopalkrishna and Sanjay, 2014). Training evaluation includes the systematic collection of necessary information according to a predetermined plan so as to ensure that the information shared is both appropriate and useful (Philips, 1997). Training evaluation is the means generally used to determine the worth or value of the training (Noe, 2002). It is a process of assessing the results or outcomes of training. It determines the significance of the training including to what extent and how well the training met and satisfied the individual as well as organisational needs (Noe, 2002). Training evaluation shows the benefits of training with reference to learning and job performance, and these benefits should be informed to both the top management and the stakeholders of their investments in terms of money, time and effort. At a glance, training evaluation focuses especially on learning outcomes, it gives a micro view of training results. According to Kirkpatrick (2006), every training program must be evaluated because there is no any alternative method of ensuring that investments on training are worthwhile without doing evaluation. Kirkpatrick (2006) further asserts that evaluation is a tedious process to do well but it must be attempted in order to enhance the standard and also the effectiveness of the programs being offered. It must be conducted throughout the training program in order to achieve training goals. The experts of training evaluation believe that the evaluation is not just another element to the training program but must be incorporated within the training process so as to examine the effectiveness of the training program (Philips, 1997; Kirkpatrick, 2006; NIOSH, 2015; OSHA, 2014). According to Kirkpatrick (2006), there is no point of ignoring the training evaluation. OSHA (2014) pointed out that effective evaluation is not only well-planned but also a reliable way to understand the training goals are achieved or not. Hence,

organisations must closely study the data collected from the training evaluation to upgrade the present training programs rather than obtain data just for the purposes of training evaluation, particularly for organizations, who have invested millions of dollars and will continue investing more in training programs (OSHA, 2014). Assessing the effectiveness of training programme is the most important place it is done to observe how well the goals have been achieved and whether it is the best method for accomplishing the goals (Goldstein, 1986).

2.8 Measures for the Evaluation of the Effectiveness of Health and Safety Training

Several training evaluation systems were identified during the literature search phase of research. The most frequently occurring training evaluation systems were the CIPP Model, Kaufman's five levels, the Kirkpatrick model, and Phillips five levels (Phillips, 1997). The CIPP model is an acronym for the four basic types of evaluations in the model. Context, Input, Process, and Product are the four evaluations in the model. The context evaluation in the CIPP model refers to evaluating the appropriateness, social acceptability, and adequacy of the program objectives. The input evaluation refers to evidence and support of the program. In the input evaluation, support could be theoretical or empirical in nature. The CIPP process evaluation step is designed to evaluate the success of the implementation process and how well implementation procedures were followed. The final step in the process, product evaluation, is designed to evaluate the knowledge, skills, abilities, behavior change, and the satisfaction of the participants (Matthews and Hudson, 2001).

Kaufman's five levels is a revision of Kirkpatrick's four levels, which moves beyond the organization and attempts to measure advancement of the society and surrounding environment (Phillips, 1997). The evaluation system used in this study is the Kirkpatrick model. According to The American Society for Training and Development (ASTD) benchmarking forum, 67 percent

of multinational companies that conduct evaluations use the Kirkpatrick model (Santos and Stuart, 2003).

Kirkpatrick's training evaluation model delineates four levels of training outcomes: reaction, learning, behavior, and results.

Level one includes assessment of training participants' reaction to the training program. Kirkpatrick (1959) originally discussed reactions in terms of how well participants liked a particular program. In practice, measures at this level have evolved and are most commonly directed at assessing trainees' affective responses to the quality (e.g. satisfaction with the instructor) or the relevance (e.g. work-related utility) of training. Learning measures, level two, are quantifiable indicators of the learning that has taken place during the course of the training. Level three behavior outcomes address either the extent to which knowledge and skills gained in training are applied on the job or result in exceptional job-related performance. Finally, level four outcomes are intended to provide some measure of the impact that training has had on broader organizational goals and objectives. In recent practice, the typical focus of these measures has been on organizational level financial measures.

2.8.1 Reaction as a measure of health and safety training effectiveness

According to Kirkpatrick (1998), emotional reaction refers to the attitudes of participants at the end of training. An employee who has considerably gained skill and knowledge from the training will be willing to apply it on job, thus bring positive reaction (Kirkpatrick, 2006). This could be a barometer for measuring employee's general attitude, expectations and motivation. Although subjective, reaction also provides feedback on training style and content (Kirkpatrick, 2006). Measurement is useful in fostering management supports for the training program (ASTD, 1997). Post training questionnaire can be used to measure emotional reaction. According to

Baird (1995), questionnaire should be directed towards measuring the training attitudes toward content, process (presentation style), definition of course objectives, attainment of course objectives and overall course value. Baird (1995) further stated that the focus of this type of measurement is to investigate the attitudes toward the training material provided during training and obtain feedback from the trainee. The post training questionnaire methods have also received several criticisms in terms of their accuracy and bias, also regarding forms and type of questions included in the questionnaire can largely influence the answer provided in the questionnaire (Tannenbaum and Yukl, 1992; Cannon-Bowers, Salas, Tanenbaum, and Mathieu, 1995; Ford and Kraiger, 1995; Salas and Cannon-Bowers, 2001). Salas and Cannon-Bowers (2001) pointed out that although attempts at improving both pre and post training questionnaires have been made with accuracy and bias issue in mind, the issue of quantification of measuring believes cannot be totally devoid of bias.

At reaction level, employee reactions are understood to show their perceived and subjective evaluation of the relevance and quality of the training program. According to Kirkpatrick (2006), training program should at least first evaluate at this level to help improve to help improved on the conceptualization and design of the training program. Employee reaction at this level measured satisfaction derived from evaluation categories of training such as safety training program objectives, course materials and relevance, facilitator knowledge, facilitator delivery, program evaluation, training facility (Ismaíl, 2017).

2.8.2 Learning as a measure of health and safety training effectiveness

This is the second area of measurement, achieving learning objectives is a type of post training evaluation of knowledge and skill gained through the training intervention and which will

ultimately translate to improving job performance (Philips, 1997). According to Kirkpatrick (2006), a positive emotional reaction and increase practical skill and knowledge of functional concept are indication of successful training and a requirement for meaningful human resource development program. Pre and post-test methods of evaluating training effectiveness produce a result which are compared to a benchmark, the benchmark will help to show whether knowledge and skills have been obtained from the training experience (Kirkpatrick, 2006). This Pre and post-test according to (Kirkpatrick, 2006), may be conducted sometimes in the class room workshop and simulation. Furthermore, (Kirkpatrick, 2006) asserts that adopting this technique class room and simulation will yield direct result and provides less stressful and more positive learning environment. In either case, the result obtained should be compared to the learning objectives.

According to Philips (1997), games simulation and in-class workshop will facilitate the process of measurement in two ways. First, they provide a creative and less stressful environment for entities. Second, if properly designed and applied, they closely aligned employees work environment and resolves several issues related to safety training, by this it provides positive training reinforcement. Learning can be described as the degree to which training has impacted on employee's work related attitude (Kirkpatrick, 2006). It also connotes the level at which employee's skill is broadened and knowledge widened as consequences of training (Philips, 1997).

2.8.2.1 Learning by native English speakers

Some examples of research work that involves "learning" in safety training include the following. Han et al. (2008) state that low skill levels, inadequate technical knowledge, and a steep learning curve are the factors that affect the safety performance of construction workers in a negative manner. Porteous (1997) states that safety knowledge, skills and abilities could be improved by well-generated learning theories. The Occupational Safety and Health Administration specifically

requires that safety proficiency be evaluated and documented by the use of a written assessment and a skill demonstration to evaluate the knowledge and individual skills developed in the course of training (OSHA, 2012). Kirkpatrick (1998) suggests that the effectiveness of learning could be tested by observing the differences between a control group that does not receive training and a trained group. Furnham (2005) argues that individuals learn best when they encounter an obstacle or an intellectual challenge that is of interest to them. According to Furnham (2005), the best way to help people learn is to explain the abstract of the situation and provide varied examples over an effective learning period. Furnham (2005) also states that people learn by modeling others' skills. In addition, Furnham's (2005) study also indicates that safety learning might be achieved by computer-aided tools since it has the benefit of being self-paced. BLR (2007) reports that three basic learning styles exist, including visual learning, auditory learning, and hands-on learning. Workers learn things in different ways and at their own pace. For example, visual learners learn best by seeing, while auditory learners like to listen, and hands-on learners learn best through practical instruction. The BLR (2007) report suggests using more visual aids in safety training sessions. Dudley (2010) defines two teaching styles commonly used by trainers, namely andragogical and pedagogical styles. In the andragogical style, the learner is self-directed and is responsible for his/her own learning. Contrastingly, in the pedagogical style, the trainer takes the full responsibility in how the material is learned and the trainer evaluates learning (Dudley, 2010). Dudley (2010) further asserts that in the andragogical style, learners are internally motivated, display self-esteem, recognition, and confidence, while in the pedagogical style, learners are externally motivated by competition for performance and the negative consequences of failure. It is to be noted that safety training is negatively affected by factors such as economic downturns, limited training budgets, and unpredictable product and technical innovations (Furnham, 2005).

Additionally, the efficiency of safety training programs depends on organizational, feedback, content, process, and worker-related issues. Organizational issues consist of the firm's structure, middle management's commitment to safety, and the effectiveness of safety trainers in improving the quality of training sessions. Bontis et al. (2002), Sicilia and Lytras (2005), and Pham and Swierczek (2006) assert that a supportive firm structure results in knowledge transfer and motivates workers to learn quickly and capture the necessary information in an effective manner in safety training sessions. According to Jaselskis *et al.* (1996), and O'Toole (2002), middle management's commitment to safety training results in experiencing lower injury rates and helps with improving a company's safety culture. Concerning the qualifications of a trainer, OSHA standards mandate that a trainer is considered to be qualified if he/she has previously completed a training program on the subject to be instructed. Furthermore, these trainers are expected to possess relevant academic credentials and teaching experience (OSHA, 2013). Feedback issues play an important role in improved safety performance. Indeed, according to Furnham (2005), safety performance is enhanced by accurate and timely feedback because feedback reinforces safety learning. Also, Loosemore (1998) conducted research about the psychological mechanisms that cause poor safety performance in construction companies and found that feedback should be continuous to achieve actual safety performance that is aligned with planned performance. Therefore, feedback issues deserve special attention in conducting safety training.

Issues related to the content of training sessions consist of goal setting before conducting safety training and developing the safety training content with respect to worker needs and interests. A well-designed content that addresses worker needs and interests results in higher efficiency during training sessions as workers start with different levels of knowledge (Tam and Fung, 2012). Therefore, designing safety training content requires an in-depth analysis of the materials, methods

and processes that are perceived by workers to be of importance to safety. Issues related to the training process may have significant impact on the effectiveness of safety training. The use of visual aids in the training session deserves special attention. Miller *et al.* (2012) emphasize that the use of 4D and 5D visualization tools helps to increase the knowledge gained in training sessions. Also, observing worker practices after training sessions could indicate how much workers learned in the training session. Worker-related issues include encouraging worker awareness about safety issues, promoting pride in work completed without accidents, and motivating workers through frequent and effective training meetings. Workers who are part of an effectively trained team take pride in their firm if projects are completed with a great safety record (Bontis *et al.,* 2002). Han *et al.* (2008) studied critical factors and possible solutions to motivate foreign construction workers and found that one of the measures to be taken to motivate foreign construction workers was training for better communication. Wanberg *et al.'s* (2013) study revealed that the promotion of safety and quality can be achieved through strategies such as assigning resources to preplanning, motivating leadership at workplace, and motivating workers to take pride in their work. The literature appears to support the idea that a good safety record can be achieved if workers are motivated through effective training. There are several methods that can be used to train workers in construction safety. Kraiger (2003) highlighted four methods, namely computer-based training which is flexible, cheap and allows easy-access; team training which aims to practice with other teammates' tasks, roles and responsibilities in order to increase understanding; cross-cultural training which helps with enhancing sensitivity and flexibility towards cultural differences; and corporate training which consists of distance learning and specialized courses. McMahan *et al.* (2010) encourage the use virtual environments as a strategy in worker training because they found that virtual environment applications improve worker

training in pre-inspections of haul trucks and operational procedures of conveyer systems. In another study, Chen *et al.* (2013) proposed a virtual system that consists of a BIM/2D model developed to enhance safety awareness by the careful consideration of hazard types and safety issues along with the testing of users' ability to resolve problems, hence offering a "learning by doing" technique to better recognize site hazards and gain awareness about the severity of accidents.

2.8.2.2 Learning by non-English speakers

Many foreign-born workers are currently employed on construction sites. According to the Bureau of Labor Statistics (2013), there were 25 million foreign-born persons in the U.S. labor force in 2012, comprising 16.1% of the total workforce. Foreign-born workers in occupations related to construction, maintenance, installation, repair, and natural resource extraction constituted 11% of the total foreign-born workers in 2012. While some of these workers understand rudimentary English, others do not speak the language at all, creating a communication problem that may become a grave issue in safety training sessions. Dai and Goodrum (2011) state that the many Hispanic workers employed in the U.S. construction industry have problems in understanding their supervisors' safety instructions because their primary language is Spanish. In addition, Hispanic construction workers experience a larger number of accidents presumably because of their lack of English language skills (Dai and Goodrum, 2011). Indeed, according to the findings of a survey conducted by the Center to Protect Workers' Rights to investigate the effect of language barriers, many Spanish-speaking workers experience language problems and have trouble in understanding safe work procedures (Ruttenberg and Lazo, 2004). Even though training consisted of small-group activities conducted by Spanish-speaking peer trainers who used Spanish-language guides, handouts and power-point slides in the companies surveyed by the Center to Protect Workers'

Rights, one of the most frequent requests made by the trainees was for more videos, graphics, and statistics in Spanish. Canales *et al.* (2009) investigated the training needs of American supervisors and Hispanic workers and found that the ability to communicate improved when American supervisors and Hispanic workers took courses in Spanish and English as a second language, respectively. Han *et al.* (2008) found that the low performance of foreign construction workers was caused by ineffective safety training programs and lack of evaluation in safety training sessions. Evia (2011) proposed the use of computer-based training materials in improving the training of Hispanic workers more than the localization of existing training products in English. Another study conducted by Lin *et al.* (2012) focused on developing 3D safety training materials on fall-related hazards for construction workers who have limited English proficiency or low literacy. The study revealed that 3D simulated virtual job sites are effective in enhancing learning in training sessions by construction workers who have limited English proficiency.

2.8.3 Behavioral changes/training transfer as a measure of health and safety training effectiveness

The third approach to measuring the effectiveness of training focused on the training behavioral changes. The third level of evaluation is about work-related behavioral changes which reflects in performance. This entails studying the changes in employees work related behaviors as a result of training. While emotional reaction and knowledge gain can be easily accomplished immediately after training sessions, measuring behavioral changes requires some time lag for employee to fully implement the newly acquired skill and knowledge. Survey, observations and interviews of performance are some of the tools used in measuring behavioral changes. This is because the changes reflect most and best recognized in performance. The training measure can be linked with

in-house employees' appraisal system and functions. It is very important to understand the concept of behavioral changes resulting from training using employee appraisal system because appraisal method might be too general, however, when using appraisal method, it must be use in the context of behavioral changes as a consequences of training.

Although effective training can improve safety knowledge, it is not sufficient by itself to yield expected benefits. This is because workers often fail to apply learned concepts and skills once they return to work (Blume *et al.,* 2010). In other words, knowledge transfer is not equivalent to training transfer or the application of learned concepts in practice. In fact, in most cases, only 10–15% of training expenditure translates into noticeable improvements in work practices and performance; the rest generally reduces to wasted resources (Baldwin and Ford 1994; Cromwell and Kolb, 2004).

Evidence for the failure of training transfer is abundant within the construction industry. For example, construction managers and safety professionals have expressed frustration over their inability to reduce unsafe behavior and control injury rates- even with adequate training (Choudhry and Fang 2008; Jha, 2011). Not surprisingly, a disproportionate number of apparent safety violations are reported from construction projects on a regular basis (OSHA 2014).

Although past research has established causal links between effective training and safety knowledge gains, there is dearth of research linking training efforts to objective safety outcomes such as reduction in injury rates or improvements in hazard recognition performance (Brahm and Singer, 2013). In fact, some studies have found evidence to the contrary suggesting that a relationship between training efforts and objective safety outcomes does not exist (Li *et al.* 2012). A plausible explanation for this disconnect between safety knowledge gain and objective safety outcomes is the failure of training transfer.

Given that only a small fraction of training expenditure translates into tangible safety benefits (10 15%), even a minor increase in training transfer (e.g., by 30–50%) can dramatically enhance safety performance. Therefore, identifying and implementing training transfer elements that facilitate the transfer of training is particularly important for the construction industry (Mostafa *et al*., 2016).

2.8.3.1 Trainers' role in training transfer

Although some suggestions that trainer's characteristics are a relevant factor (e.g. Burke and Hutchins, 2008; Khamarko *et al.,* 2012), in general, trainers' contributions to transfer are underrepresented in the literature. Efforts to fill this dilemma are important, given that trainers design training programs and influence trainees' engagement and motivation (Towler, 2009). In the case of in-house trainers, their contribution to training transfer is potentially larger since they can be intimately involved in several stages of the training process (before, during and after training) that can influence successful training application, in particularly related to work environment and to the transfer climate, for example: preparing activities for after training to facilitate training transfer (e.g. individualized follow-ups); promoting a ‘‘transfer agreement" among stakeholders (trainee, trainer, and supervisor) for commitment to applying trained knowledge and skills on the job (Salas *et al.,* 2012; Burke and Saks, 2009). Also, to report and to compare safety trainers' transfer practices may stimulate a greater use of research findings by OHS practitioners since the data have been gathered from those who they may closely identify with and value their opinion. Special attention to trainers' good practices and their strategies to increase training effectiveness should be expected but, as Burke and Hutchins (2008) noted, ‘‘Best practices reports in training transfer are limited and often anecdotal" and outdated.

In two related, qualitative studies, Burke and Hutchins (2008) and Hutchins (2009) analyzed, respectively, trainers' suggestions to enhance transfer and their self-reported practices for supporting it. The authors compared the data gathered by open-ended survey questions with established transfer models and the results highlighted the trainers' skills and attributes as an emergent factor. Using a qualitative approach and 16 in-depth interviews, Khamarko *et al.* (2012) also found three main transfer enhancing strategies used by clinical trainers: tailoring training activities to trainees' needs; previous knowledge of trainees' work environment; and post-training support. Thus, research results suggest that the trainer's role in the transfer process is a promising avenue that may lead to a deeper understanding of training transfer.

2.8.3.2 Safety training transfer practices

Safety training transfer practices can be classified as those involving managers, trainers and employees and those implemented before, during and after training (Broad and Newsroom, 1995). According to Broad and Newsroom (1995), the trainers can use six (6) practices to strengthen training transfer in the job environment through management support. These six (6) practices according to Broad and Newsroom (1995), are outlined below.

i. It is also important to orient the supervisor about his/her responsibilities and the expectations of training to clarify the importance of his/her role. Even better, the manager can be asked to attend a training session. This will increase the supervisor's knowledge and demonstrate commitment to the program.

ii. Another effective strategy is to involve supervisors and employees in the training needs assessment. By including these key stakeholders, all involved better understand program content and its application to the workplace. People tend to support what they help build, and programs are no exceptions. If a supervisor is not involved in the needs

assessment, he/she should at least review course content and materials. At this time, the trainer should also explain that coaching an employee after training will also strengthen training transfer.

iii. Assigning pre-course work and ensuring that the supervisor provides time for employees to complete it is another strategy. These exercises allow employees to preview material and gives them an opportunity to identify how and when safety training will be used. By allowing employees the time to complete these assignments, the supervisor sends the message that safety training is important. In addition, the trainer should contact all supervisors and ask that they encourage employees attend safety training. Employees need to hear from management that attendance is mandatory. In addition, employees must understand that they are expected to report back to their manager what was learned. Managers should also be asked to prevent interruptions, action which further demonstrates that safety training is important.

iv. Supervisors can also facilitate the transfer process by shifting trainees' work to other employees. This prevents trainees from facing a backlog of work upon their return and allows them to focus on safety training. When faced with the added work load upon their return, employees may simply revert to old habits rather than attempt to apply new knowledge, skills, and attitudes learned in safety training. It is also important to recognise employee participation during safety meetings. Supervisors can ask trainees to share what was learned and how it applies to the work setting. This further reinforces the importance of safety training. Supervisors should also be asked to facilitate the use of new skills by providing employees adequate time to practice them.

v. Training transfer strategies for trainees are best developed by involving employees in safety training planning and development and providing them with pre-course work. It can also be beneficial to have employees develop a plan to apply the new learned skills once they return to work. This can take the form of a learning contract between trainer, trainee and supervisor; this document should outline safety training expectations and define the responsibilities of all involved. However, this is an involved process and may be difficult to initiate; in such cases, a simple discussion with the trainee can accomplish similar outcomes.

vi. Supervisor and employee training transfer strategies are often complementary. In essence, the purpose of training transfer planning is to develop a system that gets all key stakeholders working together instead of safety training being developed and delivered in a vacuum. Many safety professionals currently employ these strategies to varying degrees. What is typically lacking, however, is an organised systematic approach to their application.

In conclusion, exhaustive literature review of construction safety reveals eleven (11) training transfer practices that impact on safety training. These training transfer elements are summerised in Table 2.1 below.

Table 2.1: The Summary of Health and Safety Training Transfer Elements/Practices

S/N	Training Transfer Practices	Description
1	Upper management commitment	Upper management must explicitly recognise safety training transfer as a strategic effort to improve safety performance.
2	Supervisor/foreman support and expectations	Supervisors/foreman must demonstrate their commitment to the transfer of safety training.

3	Training design and material	Improper training practices can impede effective learning and hinder the transfer of safety knowledge.
4	Peer support and reinforcement	Workers should be supportive of applying newly learned concepts and knowledge in the workplace.
5	Informal and formal feedback	After training efforts, worker's performance with respect to safety training transfer must be evaluated and provided as feedback (both positive and negative).
6	Field reviews evaluating transfer	Field reviews must be held on a regular basis to evaluate the degree of training transfer.
7	Positive reinforcement and incentives	Rewarding desired behaviour through positive reinforcement and verbal incentives can motivate workers to replicate the behaviour.
8	Worker motivation	Workers must be motivated to learn and apply learned concepts in the workplace.
9	Safety culture/climate	Project participants including workers, supervisors, and managers must be dedicated, aliened, and accountable for safety-related issues.
10	Implementation resources and guidance	Workers must be provided with implementation resources and guidance to successfully transfer knowledge gained from training programs.
11	Worker retention and aptitude	Workers must be able retain information disseminated through safety training programs and must be able to adopt learned concepts in new environments.

Source: Mostafa *et al.* (2016)

2.8.4 Result as a measure of safety training effectiveness

The fourth level in Kirkpatrick model revolves around the result/impact of safety training on the organization. The measurement is based on the notion that training and human resources

development must reflect the organizational culture and strategy. A training program is judged successful only if the training outcome aligned closely with the organization's goals. Such organizational goals may include but not limited to: Reduced frequency and/or severity of accidents, fewer staff complaints on health and safety issues, increase in safe behavior(s) by all trainees, reduction in workers' compensation claims, reduction in near misses, injuries and illnesses, increased employee retention, increase in implemented preventive measures and control, improved environmental compliance, etc.

Level 4 is the most important and also the most challenging level to assess (Werner and DeSimone, 2005; Kirkpatrick, 1960; Kirkpatrick, 1998; Phillips, 1996). Typically, at Kirkpatrick's Level 4, organizations search the business results for their training efforts. At this level, organizations attempt to measure actual organizational changes due to training and determine a monetary value on those changes. Programs that target to increase sales, reduce accidents, lower turnover, decrease costs, or increase production can often be evaluated in terms of results (Kirkpatrick, 2006). It should be emphasized that many HRD professionals recognized Phillips' return on investment (ROI) theory and considered it as Phillips' ROI model (Phillips, 1999; 2003). However, in essence, the Phillip's ROI framework is built upon Kirkpatrick's model only by its expansion of the fourth level, and identifies a fifth level that tries to further determine the organizational benefits of training by converting training results to monetary values and comparing them with the cost of training to obtain the true return on the training investment, or ROI. This is evident in Lockwood's (2001) research where she addressed ROI as part of the Kirkpatrick's model.

2.9 Benefits of Health and Safety Training Evaluation

For organisations, there are several arguments for training evaluation. It can justify the financial input made, serve for quality management purposes, provide feedback to human resource departments and trainers for improving training courses, and help to make more accurate decisions about the continuation of training courses (Kaufman *et al*., 1996; Kirkpatrick and Kirkpatrick, 2006; Kraiger, 2002).

Depending on the objectives, contents, participants, and other factors, each training program might have different purposes of evaluation. Therefore, the evaluation design can be adjusted for each training program to meet the specific purposes of the evaluation. Some examples of the reasons for evaluating safety training programs include but not limited to the followings, to;

i. determine whether the objectives of the health and safety training are achieved.
ii. see how the knowledge and skills learned in the safety training are put into practice.
iii. assess the results and impacts of the safety training programs.
iv. assess the effectiveness of the safety training programs.
v. assess whether the safety training programs were properly implemented.
vi. identify the strengths and weaknesses of the safety training programs.
vii. assess whether the safety training programs were suitable in terms of the training contents, timing, participants and other aspects.
viii. find problems of the safety training programs and solutions for improvement.
ix. compare costs and benefits of a safety training program.
x. decide who should participate in future safety training programs.
xi. identify which participants were the most successful with the program
xii. determine whether training program was an appropriate solution for the specific need.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Approach

There are two approaches to research, the quantitative approach and the qualitative approach. This research aimed to evaluate the effectiveness of health and safety training practices of construction firms with a view to improving the effectiveness of health and safety training practices of construction firms and construction safety performance in general.

In order to achieve the research aim and objectives set out in chapter one, a quantitative research approach involving the use of both detailed literature review and self-administered questionnaire survey was adopted for the research. As defined by Hughes (2006), quantitative research is concerned with the collection and analysis of data in numeric form.

For the purpose of this study, detailed literature review was used to achieve the first objective of the research that is; to establish appropriate measures for the evaluation of the effectiveness of health and safety training practices in construction firms. The review essentially provided a good theoretical foundation for this research by articulating relevant issues associated with the phenomenon under study while highlighting the gaps in knowledge and practice. Sources of literature used include libraries, use of electronic sources which include electronic publishing sites and search engines. Types of materials consulted include research papers from peered viewed journals, articles from professional journals and magazines, relevant and related textbooks, encyclopedia, etc.

Similarly, a self-administered questionnaire was used to achieve second, third, fourth, and fifth objectives of this research that is to; evaluate reactions of workmen on key components of health and safety training design and delivery in construction firms; evaluate health and safety training

practices of construction firms in achieving learning of safety knowledge by workers in the health and safety training; evaluate health and safety training practices of construction firms in ensuring training transfer of the learned knowledge by workers in the job environment; and evaluate result of health and safety training practices of construction firms on key organisational objectives of safety training. The self-administered questionnaire survey yielded the required numeric data which was then used to achieve the aim and objectives of the research study.

3.1.1 The quantitative research approach

Quantitative research approaches seek to gather factual data and to study relationships between facts and how such facts and relationships accord with theories and findings of any research executed previously (in literature) (Fellows and Liu, 1999).

It is usually driven by the researcher's concerns and deals with measurable and quantifiable aspects of phenomena under study. It focuses on the questions; to what extent? By how much? What relationship exists between factors? What causes particular processes or situations? It is concerned with phenomena amenable to measurement of quantity and amount (Eboh, 2009). In quantitative research approaches, scientific techniques are used to obtain measurements (quantified data) e.g. social surveys such as; self-administered questionnaires, interview surveys, telephone surveys, computer assisted surveys, as well as web based survey.

As stated earlier, the quantitative research approach was adopted in this study in order to achieve the research objectives and thus realise the overall research aim. A self-administered questionnaire survey was the technique used to obtain measurements (quantified data).

3.2 Population and Sampling

The sampling approach adopted to obtain a representative size from the population for the study is given in this section. The relevant literature guiding the adoption of the approach was also given in order to justify the use of the approach. The approaches used for both pilot study and main fieldwork were also explained in this section.

3.2.1 Research population and study area

The population for the study constituted the number of construction firms registered with Abuja's business addresses with CAC in Abuja. According to the CAC, there are 245 medium and large construction firms registered under Abuja. In view of the kind of information that is requested for in the survey questionnaire, two sets of respondents were targeted. The providers of health and safety training (safety managers) and the receivers of health and safety training (workmen), while Abuja (FCT) of Nigeria was chosen as the study area. Safety managers were considered because according to the American Society of Safety Engineers (2013), these individuals play an important role in health and safety training sessions as they are actively involved in developing and implementing methods to control hazards on construction sites while workmen were considered because they are the receivers of health and safety training and are the most vulnerable to hazards and risks on construction sites. On the other hand, Abuja was chosen as the study area because it is the capital city of Nigeria and one of the most developed states where most indigenous and multinational construction firms have their headquarters situated (Kadiri, Nden, Avre, Oladipo, Edom, Samuel and Ananso, 2014). Distributing questionnaires to the construction firms in this state will therefore approximate to obtaining details of health and safety training practices of construction firms in most parts of Nigeria.

3.2.2 Sample size for the study

The objective of sampling is to provide a practical means of enabling the data collection and processing components of research to be carried out while ensuring that the sample provides a good representation of the population (Fellows and Liu, 1999). Several formulas have been developed for determining the sample size needed to be representative of a given population. Watson (2001) reported that if the population is small (200 people or less), it may be preferable to do a census of everyone in the population, rather than draw a sample. For a marginally higher population than a 134-person sample, the entire population can be surveyed in order gain a 0% sampling error. If the population from which the researcher wants to gather information is, however larger, it makes sense to do a sample. According to Watson (2001) there is no set percentage that is accurate for every population but what matters is the actual number or size of the sample.

Also, based on Salkind (1997)'s recommendation that when mailing out surveys or questionnaires, count on increasing the sample by 40%-50% to account for lost mail and uncooperative subjects". Taking cognisance of this, Watson (2001) reported that after a researcher has come up with an estimate of the percentage expected to respond, then the base sample size can be divided by the percentage of response. Based on this, Watson (2001) gave the formula below for determining the sample size of a research and this was adopted in this study.

$$n = [\, P(1-P) / \{A^2/Z^2\} + \{P(1-P)/N\}] \div R \quad \text{---------- (1)}$$

Where n = sample size required, N = number of samples in the population,

P = estimated variance in population, as a decimal: (i.e. 0.5 for this study),

A = Precision desired, expressed as a decimal (i.e. 0.05 for 5% used in this study),

Z = Based on confidence level: 1.96 for 95% confidence was used for this study

R = Estimated Response rate, as a decimal (75% i.e. 0.75)

$n = [0.5(1-0.5) /\{0.05^2/1.96^2\} + \{0.5(1-0.5)/245\}] \div 0.75$

$n = 150$

The sample size for this research based on equation (1) above is therefore 150 construction firms.

3.2.3 Sampling technique

Sampling techniques the process of obtaining information about an entire population by examining only a part of it (Morenikeji, 2006; Nagaya, 2010; Haque, 2013). In most of the research work and surveys the usual approach happens to be making generalisation or drawing inferences based on samples about the parameters of population from which the samples are taken. A sample can now be defined as any number of persons, units or objects selected to represent the population according to some rule or plan. Sampling is therefore the method of selecting a fraction of the population in such a way that it represents the whole population.

The sampling approach adopted for this study involved two methods of sampling. The first method involved the use of purposive sampling technique for the selection of ten construction firms that participated in the pilot study whose sites were visited. The purposive sampling was undertaken to the validity and reliability of the health and safety training practices covered by the questionnaire based on(training design and delivery, learning of safety knowledge, training transfer in the workplace; and results of safety training on key organisational objectives).The second method involved the use of random sampling technique for selecting members (respondents) from the list of registered construction firms in Abuja obtained from The Corporate Affairs Commission (CAC) and administering survey questionnaires to them. The random sampling was undertaken to

evaluate the health and safety training practices of construction firms in terms of training design and delivery, learning of safety knowledge, training transfer in the workplace; and results of safety training on key organizational objectives. The random sampling technique was used in order to have an unbiased selection and give the elements in the population equal chances of being chosen. Secondly, it was used in order to get a representative number from the population size as the sample size to be used for the main study.

3.3 Method of Data Collection

3.3.1 The self-administered questionnaire survey

A self-administered questionnaire survey is a survey research method which utilizes a standardized set or list of questions given to individuals or groups, the results of which can be consistently compared and contrasted. It offers researchers the opportunity to reach a large number of potential respondents in a variety of locations, especially by using mail-response or online questionnaires (Russell, 2006). According to Morenikeji (2006), a questionnaire is a device for searching for answers to questions by using a form which the respondent fills himself. Among the types of information that can be collected by means of a questionnaire are facts, activities, level of knowledge, opinions, expectations and aspirations, membership of various groups, and attitudes and perceptions (Siniscalco and Auriat, 1998).

In designing questionnaires, the objectives of the study must be put into consideration by the researcher. Nagaya (2010) classified questionnaire into two types – the structured questionnaire and unstructured questionnaire. The structured questionnaire is the type in which items for responses have already been written. It contains closed-ended questions. The structured questionnaire however does not allow respondents any opportunity to expand or clarify their

responses. The unstructured questionnaire contains direct questions for which sufficient space is provided for the respondents to write their answers. It contains open-ended questions. The unstructured questionnaire tend to yield more depth information than structured questionnaire items. They require less skill to write but demand much time to fill. On the basis of this, the study employed the use of two sets of structured questionnaires administered to two sets of respondents. The first set of questionnaire was self-administered to workmen employed by medium and large construction firms to accomplish the second and third objectives of the study, that is, to evaluate reactions of workmen on key components of health and safety training design and delivery in construction firms; to evaluate health and safety training practices of construction firms in achieving learning of safety knowledge by workers in health and safety training. The second set of questionnaire was self-administered to safety engineers employed by medium and large construction firms to accomplish the fourth and fifth objectives of the study, that is, to evaluate health and safety training practices of construction firms in ensuring training transfer of the learned safety knowledge by workers in the job environment; to evaluate result of health and health and safety training practices of construction firms on key organizational objectives of safety training. Each questionnaire consisted of two sections (A and B). Section A of the first set of questionnaire administered to workmen consisted of questions on the profiles of respondents (e.g workmen's years of experience, type of construction work involved in, availability of safety training,frequency of safety training involvement). The information in this section gives a detailed account of the background of respondents which was used to ascertain the pedigree of the respondents in providing the kind of information that is required to achieve the aim of this study.

Section B of the questionnaire covered questions on the health and safety training practices of construction firms based on the first and second levels of Kirkpatrick's model. Kirkpatrick model

was used because according to the literature, it is the most widely accepted approach to the evaluation of health and safety training practices in construction firms. Specifically, the first two levels of the Kirkpatrick's model are: reaction of workmen; learning of safety knowledge.

LEVEL 1=Reaction, this level asks questions on how participants react to the health and safety training practices of construction firms. In order to evaluate the reactions of participants on the health and safety training practices construction firms, six (6) evaluation criteria and sixteen (16) key components of health and safety training design and delivery elements were generated from the literature. Workmen were then requested to indicate their level of agreement with each of the 16 key components as they relate to the health and safety training design and delivery in construction firms using a scale rating of 1-5.

Where,

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.

LEVEL 2=Learning/Knowledge, this level asked questions on the practices that are used by construction firms to achieve learning of safety knowledge by workers in health and safety training. In order to evaluate health and safety training practices of construction in ensuring learning of safety knowledge by workers, 15 health and safety training practices that facilitate worker learning of safety knowledge in safety training were identified from the literature. Respondents (workmen) were requested to rate the health and safety training practices in construction firms using a scale rating of 1-5.

Where,

1 = never, 2 = seldom, 3 = sometimes, 4 =often, 5 = always.

Similarly, two sections (A & B) were created in the second set of questionnaire self-administered to safety managers. The first part (section A) of the questionnaire comprised closed questions

requesting for the characteristics of construction firms (e.g. age, size, type of construction undertaken, annual turnover, health and safety training practice, health and safety training types) These questions were meant to give an insight into how reliable the information supplied in the returned questionnaires were, as it was expected that safety managers of any given firm will have a more comprehensive knowledge about the health and safety training practices of construction firms. The second part (section B) of the questionnaire comprised of questions on the health and safety training practices of construction firms based on the third and fourth levels of Kirkpatrick's model. Specifically, the last two levels of the Kirkpatrick's model are: training transfer; results of safety training on key organisational objectives.

LEVEL 3=Training Transfer (Change in Behavior), this level asked questions on health and safety training practices that facilitate training transfer in the job environment. In order to evaluate training transfer, 11 health and safety training practices that facilitate efficient training transfer in the job environment were identified from the literature. Safety managers were asked to rate the health and safety training practices of construction firms in ensuring training transfer of safety knowledge by workers in the job environment using a scale of 1-5.

Where,

1 = never, 2 = seldom, 3 = sometimes, 4 =often, 5 = always.

LEVEL 4=Results, this level asked questions on what occurred as the final result/impact of the health and safety training practice on key organisational objectives/goals. In order to evaluate the results of health and safety training practices of construction firms, 8 key organisational performance indicators of effective health and safety training were generated from the literature. Safety managers were then asked to rate the results of the health and safety training practices of

construction firms on each key organisational objective of health and safety training using a scale rating of 1-5.

Where,

1 = not effective, 2 = least effective, 3 = somewhat effective, 4 = effective, 5 = very effective.

The questions in the questionnaire were all crucial to the achievement of the aim and objectives of the study.

3.4 Data Analysis

The study employed the use of both descriptive and inferential methods of analysis to analyse the collected data in order to achieve the objectives of the study as discussed below:

3.4.1 Descriptive statistics

Data presentation was done using frequency tables, mean and standard deviation. In order to achieve the second, third, fourth and fifth objectives of the study, key components of health and safety training design and delivery in construction firms; health and safety training practices of construction firms in achieving learning of safety knowledge by workers in safety training; health and safety training practices of construction firms in ensuring training transfer of the learned safety knowledge by workers in the job environment; results of health and safety training practices of construction firms on key orgainisational objectives of safety training were identified from extensive review of literature. Frequency tables were used to rank the reaction of workmen on the health and safety training design and delivery in construction firms on a 5-point rating scale: *1- Strongly Disagree; 2- Disagree; 3- Neither Disagree nor Agree; 4- Agree; 5- Strongly* Agree (see Appendix A). Relative Mean Score (RMS) and Standard Deviation were used to rank the health and safety training practices by the construction firms in order of implementation on a 5 – point

scale: *1 – Never; 2 – Seldom; 3 – Sometimes; 4 – Often; 5 – Always* (see Appendix A). The identified health and safety training practices regulations guiding the activities of construction firms were thereafter also ranked in order of compliance with the use of RMS and Standard Deviation on a 5–point scale. These helped to fully achieve the third and fourth objectives respectively. RMS was used to evaluate the results of health and safety training practices by the construction firms on key organisational objectives of safety training using a 5 – point scale: *1 – Not Effective; 2 – Least Effective; 3 – Somewhat Effective; 4- Effective; 5- Very Effective* (see Appendix B). These helped to fully achieve the fifth objective respectively.

The use of RMS was employed because it was necessary to evaluate the health and safety training practices adopted by the construction firms. Equation 2 gives the formula for computing the Mean Score used to evaluate the health and safety training practices on a five-point Likert's Scale with the aid of Statistical Package for Social Sciences (SPSS) for Windows version 23.

$$\text{Mean Score} = \frac{\sum f(x)}{\sum f} \qquad \text{---------- } (2)$$

Where;

f = Number of respondents for the attribute rated scale (1, 2, 3, 4 or 5)

x = Observed Value or rated scale (1, 2, 3, 4 or 5)

f(x) = Product of number of respondents for attribute rated scale and observed value

$\sum f(x)$ = Number of respondents for the attribute rated 3 on scale used

$\sum f$ = Total number of Respondents

Tables 3.1 and 3.2 give the decision rule adopted to determine the level of importance of the health and safety practices.

Table 3.1: Decision Rule for Ranking Health and Safety Training Practices

SCALE	MEAN SCORE	Decision/Remark
1	4.50 to 5.00	Always
2	3.50 to 4.49	Often
3	2.50 to 3.49	Sometimes
4	1.50 to 2.49	Seldom
5	0.00 to 1.49	Never

Source: Field Survey (2017)

Table 3.2: Decision Rule for Ranking Health and Safety Training Practices

SCALE	MEAN SCORE	Decision/Remark
1	4.50 to 5.00	Very Effective
2	3.50 to 4.49	Effective
3	2.50 to 3.49	Somewhat Effective
4	1.50 to 2.49	Least Effective
5	0.00 to 1.49	Not Effective

Source: Field Survey (2017)

The choice of 3.50 – 5.00 as the cut-off point for the health and safety training practices was as a result of the fact that health and safety training, being a crucial issue in health and safety, requires best practices in order to bring about improved safety performance in construction. Based on the scale used (1 - 5), best health and safety training practices should be far above average. In addition, in the study of Agumba and Haupt (2014) the mean score of the identified health and safety practices ranged between 3.80 and 4.60. This justifies the choice of 3.50 – 5.00 as the cut-off point for the important health and safety training practices in the study.

3.4.2 Inferential statistics

Inferential statistics are mathematical methods that employ probability theory for deducing (inferring) the properties of a population from the analysis of the properties of a data sample drawn from it. It is concerned also with the precision and reliability of the inferences it helps to draw (Business Directory Online, 2014). The type of inferential statistics used in the study was Independent Samples t-test to test for the significance of the difference between respondents' assessments in the two categories of construction firms (medium and large) used. In this study, SPSS 23 was used to perform the Independent Samples T test in order to see if the differences between the groups are statistically significant at $\alpha = 0.05$. The Independent Samples T test was preferred to a non-parametric test such as a Mann Whitney U test because non-parametric tests assume that the observations in the samples do not follow a normal distribution. Since the sample of 130 construction firms considered in this study is split into two groups (i.e., medium vs. large firms) for comparison purposes, it is safer to assume that the fewer observations in the two samples are normally distributed. The Independent Samples T test that was used in this study is a parametric test that is used when samples are normally distributed.

CHAPTER FOUR

4.0 DATA PRESENTATION AND ANALYSIS

4.1 Respondents' Demographic Information

The population for the survey of the study were medium and large-sized construction firms in Abuja, Nigeria. The study targeted two (2) sets of respondents; the providers of health and safety training (construction firms) and the receivers of health and safety training (workmen). The profile of these respondents are discussed in this section. The response rate of the respondents to the questionnaires administered is first presented before presenting a profile of the respondents in this section.

4.1.1 Response rate

Table 4.1: Response Rate for the Study

	No. Distributed	No. Received	Response Rate (%)
Pilot Survey	10	10	100.00
Main Survey	150	130	86.70
TOTAL	160	140	87.50

Source: Field Survey (2017)

Table 4.2: Percentage of Questionnaires Received in Each Type of Construction Firm

Size	No. Received	Percentage (%)
Medium	79	61
Large	51	39
TOTAL	130	100

Source: Field Survey (2017)

As shown in Table 4.1, a total of 150 questionnaires were distributed in the survey, out of which only 130 (86.7%) were completed and returned while the remaining 20 (13.3%) were not returned. Also, as shown in Table 4.2, out of the 130 completed and returned questionnaires, 79 respondents (61%) corresponded to medium sized construction firms, while the remaining 51 respondents (39%) were large sized construction firms.

4.1.2 Respondents' profile

The profiles of the respondents are defined by their organisational characteristics which define the internal environment within which they operate and also their health and safety training practices.

Table 4.3: Age of Construction Firm

Years of Experience	Frequency (No.)	Percentage (%)
1-5 years	39	30.0
6-10 years	28	22.0
11-15 years	40	31.0
> 20 years	23	17.0
Total	130	100

Source: Field Survey (2017)

Table 4.3 shows the range of years of experience of the construction firms surveyed. It was discovered that most of the firms (67%) have had between 1 and 10 years of experience, while the remaining (33%) have being in existence for more than 10 years. This implies that the firms were suitable and experienced enough to provide accurate response to the questionnaire.

Table 4.4: Type of Construction Firm

Type of Firm	Frequency (No.)	Percentage (%)
Building Construction	70	54.0
Civil Engineering	60	46.0
Total	130	100

Source: Field Survey (2017)

Table 4.4 reveals that the about (54%) of the construction firms undertake building construction works and the remaining (46%) undertake civil engineering works. This indicates that, on the average, the construction firms predominantly undertake building construction works.

Table 4.5: Size of Construction Firm

Size of Firm	Frequency (No.)	Percentage (%)
Medium	79	61.0
Large	51	39.0
Total	130	100

Source: Field Survey (2017)

Table 4.5 reveals that the about (61%) of the construction firms were medium sized and the remaining (39%) were large sized construction firms. Taking into account, the scope of the study which is to study medium and large construction firms, the 130 construction firms that took part in the study were thus, considered to be suitable to provide accurate answers to the questions in the research questionnaire.

Table 4.6: Annual Turnover

Annual Turnover	Frequency (No.)	Percentage (%)
N51-100 million	43	34.0
N101-150 million	29	22.0
N151-200 million	25	19.0
> N200 million	33	25.0
Total	130	100

Source: Field Survey (2017)

Table 4.6 shows the annual turnover of the construction firms surveyed. It was revealed that (34%) had between N51-100M, (22%) had N101-150M, (19%) had N151-200M, and (25%) with over N200M. This shows that the construction firms surveyed have a very high annual turnover and thus, can afford to channel some of their resources to providing health and safety training for their workers. This means that the construction firms surveyed are therefore suitable for the study.

Table 4.7: Health & Safety Training practice in Construction Firms

H & S Training Practice	Frequency (No.)	Percentage (100%)
Yes	114	88.0
No	16	12.0
Total	130	100.0

Source: Field Survey (2017)

In table 4.7, an attempt was made to find out whether health and safety training for workers is being practiced by construction firms. Results reveal that majority (88%) of respondents indicated yes while the remaining (12%) indicated no. This shows that the overwhelming majority of the sample surveyed practice health and safety training and thus, justifying the choice of the population for the study.

In addition, the respondents were also requested to state the frequency at which health and safety training is provided to workers in their construction firms. Result on table 4.8 shows that 12% said not at all, 18% said daily, 40% weekly and 42% monthly.

Table 4.8: Frequency of H & S Training Practice

Frequency of Safety Training	Frequency (No.)	Percentage (%)
Not at all	16	12.0
Daily	20	18.0
Weekly	46	40.0
Monthly	48	42.0
Total	130	100.0

Source: Field Survey (2017)

Table 4.9: Availability Health & Safety Training Strategy in Construction Firms

H & S Training Practice	Frequency (No.)	Percentage (%)
Yes	51	39.0
No	79	69.3
Total	130	100

Source: Field Survey (2017)

Table 4.10: Type of H & S Training Practice in construction Firms

Type of H & S Training Practice	Frequency (No.)	Percentage (%)
None	16	12.0
induction training	32	28.1
job-specific training	18	15.8
supervisory and management training	10	8.8
specialist training	6	5.3
Others	10	8.8
induction and job-specific	38	33.3
Total	130	100.0

Source: Field Survey (2017)

In addition, construction firms were also asked if they have a specific health and safety training strategy they adopt in training workers. Results on table 4.9 show that (31%) indicated yes, while the remaining (61%) said no. This shows that most of the construction firms surveyed lack a formal strategy for delivering health and safety training to workers just as the literature suggests.

Effort was also made to investigate the type of health and safety training practices/interventions that are adopted by construction firms on sites to improve workers' safety. Table 4.10 shows that (12%) provide none, (28.1%) provide induction training to workers, while (15.8%) provide job specific training to workers, (5.3%) practice specialist training only, (8.8%) practice a combination of supervisory and management training, (33.3%) practice a combination of induction and job specific training, and (8.8%) practice other forms of training not covered by the questionnaire. This shows that majority of construction firms surveyed practice a combination of induction and job-specific training as a strategy for reducing/minimising accidents on site.

4.3 EVALUATION OF THE EFFECTIVENESS OF HEALTH AND SAFETY TRAINING PRACTICES OF CONSTRUCTION FIRMS

4.3.1 Reactions of trainees (workmen) on the health and safety training practices of construction firms

From the review of literature in this study, 16 key components of health and safety training design and delivery in construction were identified and rated by workmen in order of agreement based on health and safety training practices of construction firms using a five-point scale (see Appendix A). These components of health and safety training design and delivery were categorised into six evaluation categories which are: Training Objectives, Course Materials and Relevance, Facilitator Knowledge, Facilitator Delivery, Program Evaluation and Training Facility. Tables 4.11 and 4.12 show the respondent's assessments in medium sized and large sized construction firms.

Table 4.11: Reactions of Workmen on Key Components of H & S Training Design & Delivery in Medium Construction Firms

S/N	Components of health & safety training design & delivery	Respondents' choices							STD. DEV.	Rank
		1	2	3	4	5	∑fx	MEAN		
i	I was appropriately challenged by the material	0	0	0	41	22	63	4.35	0.481	1
ii	I experienced minimal distractions during the training session	0	0	43	18	2	63	3.35	0.544	2
iii	My learning was enhanced by the experiences shared by the facilitator	0	0	45	16	2	63	3.32	0.534	3
iv	My learning was enhanced by the knowledge of the facilitator	0	2	40	21	0	63	3.30	0.528	4
v	I felt that the course materials will be essential for my success	0	12	30	21	0	63	3.14	0.715	5
vi	I will be able to immediately apply what I learned	0	29	34	0	0	63	2.54	0.502	6
vii	I was pleased with the room set-up	10	23	26	4	0	63	2.38	0.831	7
viii	I understood the learning objectives	0	39	24	0	0	63	2.38	0.49	8

ix	I was able to relate each of the learning objectives to the learning I achieved	0	40	23	0	0	63	2.37	0.485	9
x	I found the course materials easy to navigate	0	46	17	0	0	63	2.27	0.447	10
xi	I was well engaged during the session	7	40	12	4	0	63	2.21	0.722	11
xii	I was given ample opportunity to demonstrate my skills	0	51	12	0	0	63	2.19	0.396	12
xiii	It was easy for me to get actively involved during the session	7	41	14	1	0	63	2.14	0.618	13
xiv	I was given ample opportunity to demonstrate my knowledge	7	43	12	1	0	63	2.11	0.599	14
xv	I was given ample opportunity to get answers to my questions	14	36	11	2	0	63	2.02	0.729	15
xvi	I was given ample opportunity to practice the skills I am asked to learn	16	38	9	0	0	63	1.89	0.625	16

1= Strongly Disagree, 2= Disagree, 3= Neither Disagree nor Agree, 4= Agree, 5= Strongly Agree

It was shown in Table 4.11 that 16 key components can be found under health and safety training design and delivery in construction firms. *One (1)* component of health and safety training design and delivery was identified here with mean score (4.35). This component is "I was appropriately challenged by the material". Majority of the respondents in medium construction firms that is, *10%-51% 'strongly disagree or disagree'* to reacting to 15 of the 16 components of training design and delivery. These components range from "I will be able to immediately apply what I learned (2.54)" to "I was given ample opportunity to practice the skills I am asked to learn (1.89)". Results in Table 4.11 also show that quite a number of the respondents that is, *30%-45% 'for half of the time disagree and half the time agree'* to reacting to four (4) of the 16 components. For instance, "I experienced minimal distractions during the training session (3.35); My learning was enhanced by the experiences shared by the facilitator (3.32); My learning was enhanced by the knowledge of the facilitator (3.30) and I felt that the course materials will be essential for my success (3.14)."

Table 4.12: Reactions of Workmen on Key Components of H & S Training Design & Delivery in Large construction Firms

S/N	Components of health & safety training design & delivery	Respondents' choices							Standard Deviation	
		1	2	3	4	5	∑fx	Mean		Rank
i	I was well engaged during the session	0	0	0	37	14	51	4.27	0.451	1
ii	I was given ample opportunity to practice the skills I am asked to learn	0	0	0	38	13	51	4.25	0.440	2
iii	I was able to relate each of the learning objectives to the learning I achieved	0	0	4	35	12	51	4.16	0.543	3
iv	My learning was enhanced by the experiences shared by the facilitator	0	0	6	32	13	51	4.14	0.601	4
v	It was easy for me to get actively involved during the session	0	0	3	39	9	51	4.12	0.475	5
vi	I was pleased with the room set-up	0	0	4	38	9	51	4.10	0.500	6
vii	I found the course materials easy to navigate	0	0	6	34	11	51	4.10	0.575	7
viii	My learning was enhanced by the knowledge of the facilitator	0	2	5	34	10	51	4.02	0.678	8
ix	I was given ample opportunity to demonstrate my knowledge	0	2	7	33	9	51	3.96	0.692	9
x	I experienced minimal distractions during the training session	0	0	10	34	7	51	3.94	0.580	10
xi	I was given ample opportunity to get answers to my questions	0	0	8	39	4	51	3.92	0.483	11
xii	I understood the learning objectives	0	6	3	31	11	51	3.92	0.868	12
xiii	I felt that the course materials will be essential for my success	0	1	10	33	7	51	3.90	0.64	13
xiv	I will be able to immediately apply what I learned	0	7	1	35	8	51	3.86	0.849	14
xv	I was given ample opportunity to demonstrate my skills	0	5	9	27	10	51	3.82	0.865	15
xvi	I was appropriately challenged by the material	14	37	0	0	0	51	1.73	0.451	16

1= Strongly Disagree, 2= Disagree, 3= Neither Disagree nor Agree, 4= Agree, 5= Strongly Agree

It was shown in Table 4.12 that 16 key components can be found under health and safety training design and delivery in construction firms. *15 components* of health and safety training design and delivery were identified here with mean scores ranging between 4.27 and 3.82. These components are: "I was well engaged during the session (4.27); I was given ample opportunity to practice the skills I am asked to learn (4.25); I was able to relate each of the learning objectives to the learning I achieved (4.16); My learning was enhanced by the experiences shared by the facilitator (4.14); It was easy for me to get actively involved during the session (4.12); It was easy for me to get actively involved during the session (4.10); My learning was enhanced by the knowledge of the facilitator (4.02); I was given ample opportunity to demonstrate my knowledge (3.96); I experienced minimal distractions during the training session (3.94); I was given ample opportunity to get answers to my questions (3.92); I felt that the course materials will be essential for my success (3.90); I will be able to immediately apply what I learned (3.86); and I was given ample opportunity to demonstrate my skills (3.82)." This shows that majority of the respondents that is, *27%-39% 'agree or strongly agree'* to reacting to *15 of the 16* components of training design and delivery while *14%-37%* of the respondents *'strongly disagree or disagree'* to reacting to only *one (1)* of the 16 components of training design and delivery. For instance, "I was appropriately challenged by the material".

Additionally, Independent Samples T test was carried out to compare the mean scores of the respondent's assessments on the key components of health and safety training design and delivery between medium construction and large construction firms in order to ascertain if significant differences exist. Results in Table 4.13 show that $(p<0.001)$ which is less than $p\text{-value}= 0.05$ and thus it can be concluded that there was a statistically significant difference in the health and safety training design and delivery between medium construction and large construction firms.

Table 4.13: Results of Independent Samples Test of components of H & S Training Design & Delivery Between Medium & Large firms

		Levene's Test for		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Lower	Upper
Reaction	Equal variances assumed	.670	.415	-4.912	112	.000	-.56764	.11557	-.79662	-.33865
	Equal variances not assumed			-4.956	110.157	.000	-.56764	.11454	-.79463	-.34064

4.3.2 Health and Safety Training Practices for Achieving Learning of Safety Knowledge by Workers in Construction Firms

From the review of literature in this study, 15 health and safety training practices that aid learning of safety knowledge by workers in construction were identified and rated by workmen in order of implementation using a five-point scale (see Appendix A). These health and safety training practices in achieving learning were categorised into five evaluation categories which are: Organisational Issues, Feedback Issues, Content Issues, Process Issues, and Worker Issues. Tables 4.14 and 4.15 show the respondent's assessments in medium sized and large sized construction firms respectively.

Table 4.14: Workmen's Assessments of H & S Training Practices of Medium Construction Firms in Achieving Learning of Safety Knowledge by Workers

S/N	HEALTH AND SAFETY TRAINING PRACTICES	MEAN	STD. DEV.	RANK
I	The safety-related behaviours of workers are observed	4.27	0.545	1
ii	Experienced workers share their safety knowledge with inexperienced workers	4.08	0.630	2
iii	Safety goals are set before safety training	3.05	1.023	3
iv	Workers are motivated to follow safety rules	2.98	1.114	4
V	Content of safety training is designed to satisfy worker needs/interests	2.84	1.334	5
vi	Questions and answers are encouraged in safety training	2.84	1.194	6
vii	Workers are aware of the critical safety issues	2.78	1.099	7
viii	Qualified safety trainers are employed	2.56	0.590	8
ix	Feedback on health and safety issue provided to workers	2.54	0.534	9
X	Middle management participates in health and safety training	2.51	0.504	10
xi	Organizational structure encourages safety training	2.46	0.534	11
xii	Visual aids are used in safety training sessions	2.43	1.103	12
xiii	Management encourage pride in work completed without accidents	2.16	1.461	13
xiv	Workers who have completed safety training are rewarded	1.76	1.254	14
xv	Exams are administered to workers during or after safety training	1.44	1.074	15

1= Never, 2= Seldom, 3= Sometimes, 4= Often, 5= Always

It was shown in Table 4.14 that 15 health and safety training practices can be found under learning of safety knowledge by workers in construction firms. *Two (2)* implemented health and safety training practices were identified here with mean score ranging between 4.27 and 4.08. These implemented practices range from “the safety related behaviours of workers are observed” with a mean score of (4.27) to “experienced workers share their safety knowledge with inexperienced workers” with a mean score (4.08). This was obvious as observed the field survey that medium sized construction firms perform health and safety training in an environment where experience sharing does occur.

Table 4.15: Workmen's Assessments of H & S Training Practices of Large Construction Firms in Achieving Learning of Safety Knowledge by Workers

S/N	HEALTH AND SAFETY TRAINING PRACTICES	MEAN	STD. DEV.	RANK
i	Organizational structure encourages safety training	4.33	0.476	1
ii	Content of safety training is designed to satisfy worker needs/interests	4.29	0.460	2
iii	Qualified safety trainers are employed	4.27	0.493	3
iv	Questions and answers are encouraged in safety training	4.25	0.659	4
v	The safety-related behaviours of workers are observed	4.10	0.458	5
vi	Safety goals are set before safety training	4.04	0.692	6
vii	Middle management participates in health and safety training	4.00	0.447	7
viii	Experienced workers share their safety knowledge with inexperienced workers	3.92	0.523	8
ix	Workers are motivated to follow safety rules	3.65	1.293	9
x	Workers are aware of the critical safety issues	3.59	1.186	10
xi	Management encourage pride in work completed without accidents	3.41	1.486	11
xii	Feedback on health and safety issue provided to workers	3.00	1.058	12
xiii	Visual aids are used in safety training sessions	2.90	1.345	13
xiv	Workers who have completed safety training are rewarded	2.45	1.301	14
xv	Exams are administered to workers during or after safety training	2.35	1.339	15

1= Never, 2= Seldom, 3= Sometimes, 4= Often, 5= Always

It was shown in Table 4.15 that 15 health and safety training practices can be found under learning of safety knowledge by workers in construction firms. *Ten (10)* implemented health and safety training practices were identified here with mean score ranging between 4.33 and 3.59. These implemented practices are: organisational structure encourages safety training (4.33), content of safety training is designed to satisfy workers' needs/interests (4.29), qualified safety trainers are employed (4.27), questions and answers are encouraged in safety training (4.25), the safety related behaviours of workers are observed (4.10), safety goals are set before safety training (4.04), middle management participates in health and safety training (4.00), experienced workers share their

safety knowledge with inexperienced workers (3.95), workers are motivated to follow safety rules (3.65), and workers are aware of the critical safety issues (3.59).

Furthermore, Independent Samples T test was carried out to compare the mean scores of the respondent's assessments on the health and safety training practices between medium and large construction firms in order to see if significant differences exist. Results in Table 4.16 show that *(p<0.001)* which is to less than *p-value= 0.05* and thus it can be concluded that there was a statistically significant difference in mean scores of the health and safety training practices in achieving learning of safety knowledge between medium and large construction firms.

Table 4.16: Results of Independent Samples Test of H & S Training Practices in Achieving Learning between Medium & Large firms

		Levene's Test for		t-test for Equality of Means						
									95% Confidence Interval of the	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Learning	Equal variances assumed	.335	.564	-4.481	112	.000	-.69381	.15483	-1.00058	-.38703
	Equal variances not assumed			-4.492	108.032	.000	-.69381	.15447	-.99999	-.38762

4.3.3 Health and Safety Training Practices for Achieving training transfer of Safety Knowledge by Workers in the job environment in Construction Firms

From the review of literature in this study, 11 health and safety training practices that facilitate health and safety training transfer of learned safety knowledge in the job environment were identified and rated by safety managers employed by construction firms in order of implementation using a five-point scale (see Appendix B). Tables 4.17 and 4.18 show the respondent's assessments in medium and large construction firms respectively.

Table 4.17: Safety Managers' Assessments of H & S Training Practices of Medium Construction Firms in Achieving Training Transfer of Safety Knowledge by Workers in the Job Environment

S/N	HEALTH AND SAFETY TRAINING PRACTICES	MEAN	STD. DEV.	RANK
i	Organizational structure encourages health and safety training transfer	4.24	0.429	1
ii	Middle management provide adequate opportunity to workers for applying learned concepts in practice	4.00	0.539	2
iii	Workers are provided with implementation resources and guidance to successfully transfer knowledge gained from health and safety training	3.10	0.856	3
iv	Project participants including workers, supervisors and managers are dedicated, aligned and accounted for safety related issues in the job environment	3.02	0.992	4
v	Content of health and safety training is designed to satisfy worker needs/interest	2.97	0.782	5
vi	Experienced workers are encouraged to transfer their safety knowledge to the inexperienced workers	2.92	1.021	6
vii	Workers are motivated to learn and apply learned concepts in the work place	2.75	0.879	7
viii	Management evaluate and provide feedback on workers' performance with respect to health and safety training transfer	2.65	0.986	8
ix	Workers hold each other accountable for transferring newly learned concepts and knowledge in the work place	2.33	1.295	9
x	Field reviews are held on a regular basis to evaluate the degree of health and safety training transfer	2.21	0.722	10
xi	Rewarding desired behaviour with positive reinforcement and verbal incentive	2.10	0.756	11

1= Never, 2= Seldom, 3= Sometimes, 4= Often, 5= Always

It was shown in Table 4.17 that 11 health and safety training practices can be found under training transfer of safety knowledge by workers in in the job environment. *Two (2)* implemented health and safety training practices were identified here with mean score ranging between 4.24 and 4.00. These implemented practices range from Organizational structure encourages health and safety training transfer with a mean score (4.24) to Middle management provide adequate opportunity to workers for applying learned concepts in practice with a mean score (4.00).

Table 4.18: Safety Managers' Assessments of H & S Training Practices of Large Construction Firms in Achieving Training Transfer of Safety Knowledge by Workers in the Job Environment

S/N	HEALTH AND SAFETY TRAINING PRACTICES	MEAN	STD. DEV.	RANK
i	Organizational structure encourages health and safety training transfer	4.39	0.777	1
ii	Middle management provide adequate opportunity to workers for applying learned concepts in practice	4.37	0.894	2
iii	Content of health and safety training is designed to aid training transfer	4.20	0.917	3
iv	Experienced workers are encouraged to transfer their safety knowledge to the inexperienced workers	4.14	0.825	4
v	Workers are motivated to learn and apply learned concepts in the work place	4.12	0.840	5
vi	Workers hold each other accountable for transferring newly learned concepts and knowledge in the work place	3.98	1.010	6
vii	Management evaluate and provide feedback on workers' performance with respect to health and safety training transfer	3.88	0.431	7
viii	Workers are provided with implementation resources and guidance to successfully transfer knowledge gained from health and safety training	3.71	0.672	8

ix	Project participants including workers, supervisors and managers are dedicated, aligned and accounted for safety related issues in the job environment	3.27	0.493	9
x	Rewarding desired behaviour with positive reinforcement and verbal incentive	3.24	0.651	10
xi	Field reviews are held on a regular basis to evaluate the degree of health and safety training transfer	2.69	0.707	11

1= Never, 2= Seldom, 3= Sometimes, 4= Often, 5= Always

It was shown in Table 4.18 that 11 health and safety training practices can be found under training transfer of safety knowledge by workers in in the job environment. *Eight (8)* implemented health and safety training practices were identified here with mean score ranging between 4.39 and 3.71. These implemented practices are: Organisational structure encourages health and safety training transfer (4.39), middle management provide adequate opportunity to workers for applying learned concepts in practice (4.37), content of health and safety training is designed to aid safety training transfer in the job environment (4.20), experienced workers are encouraged to transfer their safety training transfer skills to the inexperienced workers (4.14), workers are motivated to learn and apply learned concepts in the work place (4.12), management evaluate and provide feedback on workers' performance with respect to health and safety training transfer (3.98) and workers are provided with implementation resources and guidance to successfully transfer knowledge gained from health and safety training (3.71).

Furthermore, Independent Samples Test was carried out to compare the mean scores of the respondent's assessments on the health and safety training practices between medium and large construction firms in order to see if significant differences exist. Results in Table 4.19 show that *($p<0.001$)* which is to less than *p-value=0.05* and thus it can be concluded that there was a

statistically significant difference in mean scores of the health and safety training practices in achieving training transfer of safety knowledge in the job environment between medium and large construction firms.

Table 4.19: Results of Independent Samples Test of H & S Training Practices in Achieving Training Transfer between Medium & Large firms

		Levene's Test for		t-test for Equality of Means						
									95% Confidence Interval of the	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Training Transfer	Equal variances assumed	6.055	.015	-11.292	112	.000	-1.20802	.10698	-1.41997	-.99606
	Equal variances not assumed			-11.204	91.362	.000	-1.20802	.10782	-1.42217	-.99386

4.3.4 Results of health and safety training practices of construction firms on key organisational objectives of health and safety training

From the review of literature in this study, 8 key organisational objectives/goals of effective health and safety training were identified and rated by safety managers based on health and safety training practices of construction firms in order of effect using a five-point scale (see Appendix B). Tables 4.20 and 4.21 show respondent's assessments in medium and large construction firms respectively.

Table 4.20: Safety Managers' Assessments of Results of H & S Training Practices of Medium Construction Firms on Key Organisational Objectives of Safety Training

S/N	KEY ORGANISATIONAL OBJECTIVES OF SAFETY TRAINING	MEAN	STD. DEV.	RANK
I	Reduction in near misses, injuries and illnesses	3.69	0.735	1
Ii	Reduced frequency and/or severity of accidents	3.67	0.816	2
Iii	Increase in safe behaviour(s) by all trainees	2.95	0.888	3
Iv	Increased employee retention	2.54	0.502	4
V	Reduction in workers' compensation claims	2.38	0.728	5
Vi	Improved environmental compliance	2.35	0.786	6
Vii	Fewer staff complaints on health and safety issues	2.30	0.463	7
viii	Increase in implemented preventive measures and control	2.16	0.368	8

1= Not Effective, 2= Least Effective, 3= Somewhat Effective, 4= Effective, 5= Very Effective

It was shown in Table 4.20 that eight (8) performance indicators of effective safety training can be found under key organisational objectives of health and safety training in construction. *Two (2)* results on key organisational objectives of health and safety training were identified here with mean score ranging between 3.69 and 3.67. These results range from reduction in near misses, injuries and illnesses (3.69) to reduced frequency and/or severity of accidents (3.67).

Table 4.21: Safety Managers' Assessments of Results of H & S Training Practices of Large Construction Firms on Key Organisational Objectives of Safety Training

S/N	KEY ORGANISATIONAL OBJECTIVES OF SAFETY TRAINING	MEAN	STD. DEV.	RANK
I	Reduced frequency and/or severity of accidents	3.86	0.693	1
Ii	Increase in safe behaviour(s) by all trainees	3.78	0.577	2
iii	Increased employee retention	3.78	0.832	3
iv	Reduction in near misses, injuries and illnesses	3.76	0.907	4
V	Improved environmental compliance	3.75	0.771	5
vi	Increase in implemented preventive measures and control	3.71	0.610	6
vii	Fewer staff complaints on health and safety issues	3.69	0.735	7
viii	Reduction in workers' compensation claims	3.67	0.816	8

1= Not Effective, 2= Least Effective, 3= Somewhat Effective, 4= Effective, 5= Very Effective

It was shown in Table 4.20 that eight (8) performance indicators of effective safety training can be found under key organisational objectives of health and safety training in construction. *Eight (8)* results on key organisational objectives of health and safety training were identified here with mean score ranging between 3.86 and 3.67. These results are: reduced frequency and/or severity of accidents (3.86), Increase in safe behavior(s) by all trainees (3.78), Increased employee retention (3.78), reduction in near misses, injuries and illnesses (3.76), Improved environmental compliance (3.75), Increase in implemented preventive measures and control (3.71), Fewer staff complaints on health and safety issues (3.69) and Reduction in workers' compensation claims (3.67).

Additionally, Independent Samples T test was carried out to compare the mean scores of the safety managers' assessments of results of health and safety training practices between medium and large construction firms on key organisational objectives/goals of safety training so as to see if

significant differences exist. Results in Table 4.22 show that *(p<0.001)* which is to less than the *p-value=0.05* and thus it can be concluded that there was a statistically significant difference in mean scores between results of health and safety training on key organisational objectives/goals in medium and large construction firms.

Table 4.22: Results of Independent Samples Test of Result of H & S Training on key organisational objectives between Medium & Large firms

		Levene's Test for		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Lower	Upper
Result	Equal variances assumed	1.437	.233	-8.276	112	.000	-.84329	.10189	-1.04517	-.64140
	Equal variances not assumed			-8.235	101.654	.000	-.84329	.10241	-1.04642	-.64016

4.4 DISCUSSION OF RESULTS

4.4.1 Reaction of workmen on key components of health and safety training design and delivery

The descriptive results in section 4.3.1 revealed that workmen in large construction firms 'agree or strongly agree' to reacting positive to key components of health and safety training design and delivery than their counterparts in medium construction firms whom mostly 'strongly disagree or disagree' to reacting negative on the components. The result of the study carried out by Wilkins (2011) is evident to the findings discussed above because it revealed that construction workers in The US showed 'strong disagreement or disagreement' with the ways in which health and safety training is designed and delivered in construction. Wilkins (2011) highlighted the needs for safety

training to cover content relevant to the lives of the trainees, for presentation by a trainer knowledgeable about the subject, and for supplementing training with tangible materials that are understandable.

4.4.2 Strategies employed by construction firms to ensure/achieve worker learning in safety training

The descriptive results in section 4.3.2 revealed that medium construction firms achieve worker learning in safety training through 2 health and safety training practices which are: the safety related behaviours of workers are observed and experienced workers are encouraged to share their safety knowledge with inexperienced workers. It was observed that from the data collected from the field survey, majority of these medium construction firms carry out building construction works while the large construction firms majorly carry out civil engineering works. The findings of this study are supported by the findings of David and Sevilay (2015) that revealed that companies that perform building works monitor workers' safety related behaviours more closely than companies that are involved in civil engineering works, because building works involve a large number of activities with a multitude of trades compared to civil works that are generally composed of fewer trades. Also, Rowlinson (2004) mentions that building works are more labor intensive and repetitive than civil works, hence providing the opportunity to observe safety related behaviours of workers more consistently.

The findings of this study also revealed that large construction firms employ 10 health and safety training practices to achieve learning of safety knowledge by worker which are: organisational structure encourages safety training, qualified safety trainers are employed, safety goals are set before safety training, content of safety training is designed to satisfy workers' needs/interests,

experienced workers are encouraged to share their safety knowledge with the inexperienced workers, questions and answers are encouraged in safety training, workers are motivated to follow safety rules, and the safety related behaviours of workers are observed. The results therefore imply that workers in large construction firms are more likely than their counterparts in medium construction firms to learn/acquire safety knowledge, skills and attitudes in safety training. The findings of this study are supported by David and Sevilays' (2015) study that states that companies that perform mostly civil works are mostly large in nature as such tailor the content of training sessions more in line with workers' needs and interests, because civil works may include many diverse types of construction such as highways, bridges, railroads, dams, etc., each requiring a tailor made training program.

4.4.3 Strategies employed by construction firms to facilitate training transfer in the job environment

The descriptive results in section 4.3.3 revealed that medium construction firms employ two (2) health and safety training practices to ensure training transfer of the learned safety knowledge by workers in the job environment. These strategies are: *organisational structure is set up to pay special attention to safety training transfer* and *middle management provide adequate opportunity to workers for applying learned concepts in practices*. Indeed, research indicates that a supportive organizational structure encourages workers to capture and transfer the necessary safety information quickly (Bontis et al., 2002; Pham and Swierczek, 2006; Sicilia and Lytras, 2005). Also, Jaselski *et al.* (1996) and Choudhry et al. (2007) found that middle management's commitment to safety training transfer is very effective in enhancing workers' safety culture. The results of the study also found that large construction firms employ eight (8) health and safety

training practices to facilitate efficient training transfer of learned safety knowledge in the job environment which are: organisational structure encourages health and safety training transfer, content of health and safety training is designed to aid safety training transfer in the job environment, middle management provide adequate opportunity to workers for applying learned concepts in practice, workers are provided with implementation resources and guidance to successfully transfer knowledge gained from health and safety training, experienced workers are encouraged to transfer their safety training transfer skills to the inexperienced workers, and workers are motivated to learn and apply learned concepts in the work place. The findings of this study are supported by the findings of Mostafa *et al.* (2016) study that states that for safety training to yield any meaningful impacts, organisational structure must explicitly recognise safety training transfer as a strategic effort to improve safety performance. Support to training transfer must be demonstrated by allocating sufficient resources and founding toward efforts that can enhance training transfer. Mostafa also highlighted that middle management must also demonstrate their commitment and support to the transfer of safety training. Commitment and support may be demonstrated by modelling trained behavior, by participating in training programs, by providing resources for effective training transfer and by providing adequate opportunity for applying learned concepts in practice.

4.4.4 Results/impacts of health and safety training practices on key organizational objectives/goals of safety training

The descriptive results in section 4.3.4 revealed that the health and safety training practices of medium construction firms have result on 2 key organisational objectives while those of large construction firms have result on 8 key organisational objectives of safety training. The results

therefore imply that the health and safety training practices of large construction firms are 4 times more likely to yield results on key organisational objectives of safety training than those of medium construction firms. The finding of this study is supported by Shittu's (2016) study which states that construction firms that majorly carry out civil engineering works which mostly large in nature are more likely than their counterparts in that carry out building construction works which are mostly medium in nature to adopt health and safety measures to control safety risks and hazards on construction sites which will invariably yield significant results on the overall safety performance.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

The findings of the study following the presentation, analysis and discussion of results carried out in chapter four, were as follows:

i. Majority of respondents (10%-51%) in medium construction firms 'strongly disagree or disagree' to reacting to eleven (11) of the sixteen (16) components of health and safety training design and delivery while almost an equal number of respondents (27%-39%) in large firms 'agree or strongly agree' to reacting to fifteen (15) of the sixteen (16) components.

ii. Two (2) health and safety training practices that aid learning of safety knowledge by workers are implemented in medium firms while ten (10) health and safety training practices are implemented in large construction firms.

iii. Two (2) health and safety training practices that facilitate training transfer of learned safety knowledge by workers in the job environment are implemented in medium construction firms while eight (8) health and safety training practices are implemented in large construction firms.

iv. The health and safety training practices of medium firms have results on two (2) key organisational objectives. These results between reduced frequency and/or severity of accidents and reduction in near misses, injuries and illnesses. On the other hand, the health and safety training practices of large construction firms have result on all the eight (8) key organisational objectives identified. These eight (8) results range from "Reduced frequency and/or severity of accidents (3.86)" which is the highest ranked

result to “Reduction in workers’ compensation claims (3.67)” which is the least ranked result.

5.2 Conclusion

Based on the findings of the study, the study thus, concludes that the health and safety training practices of large construction firms are more effective than those of medium construction firms in terms of components safety training design and delivery; learning aids of safety knowledge by workers; efficient training transfer of the learned knowledge by workers in the job environment; and result on key organisational objectives of health and safety training. This therefore, means that the health and safety training practices of large construction firms are more likely to yield better safety outcomes more than building construction firms.

5.3 Recommendations

i. The study recommends that construction firms supplement health and safety training with manuals that are easy to navigate and not too challenging to workers.

ii. The study also recommends that construction firms should employ qualified safety managers to ensure learning of safety knowledge by workers during safety training.

iii. It is also recommended that construction firms should ensure training transfer of safety knowledge by workers in the job environment by setting up an organisational structure that supports training transfer and encourage middle management provide adequate opportunity to workers for applying learned concepts in practice.

iv. It is also recommended that the health and safety training practices of construction firms should yield meaningful results on the leading and lagging indicators to safety training such as reduced frequency and/or severity of accidents and reduction in near misses, injuries and illness.

v. Finally, it should be noted that this study explored the effectiveness of health and safety training practices of medium and large construction firms based on four (4) measures of evaluation namely: reactions of workmen on health and safety training design and delivery and worker learning in safety training. Further studies can be conducted by identifying additional objective outcomes of health and safety training such as hazard recognition, return on investment and safety risk perception. It would also be interesting to directly measure in future research how much safety knowledge workers actually learn and implement in training sessions.

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APPENDIX A

SAMPLE OF QUESTIONNAIRE FOR WORKMEN

Department of Quantity Surveying,
Faculty of Environmental Design,
A.B.U. Zaria.
February, 2017.

Dear Sir/Ma,

REQUEST FOR RESPONSE TO RESEARCH QUESTIONNAIRE

I humbly write to request your response to this questionnaire which forms part of a research aimed at evaluating the effectiveness of health and safety training practices of construction firms in Nigeria. The questionnaire is designed to source information from construction firms on two measures of evaluation of the effectiveness of health and safety training practices, namely; reactions of participants on key components of health and safety training design and delivery and health & safety training practices for achieving learning of safety knowledge by workers in safety training. Data on key components of health and safety training design and delivery will help us measure trainees' satisfaction with health and safety training practices of construction firms while worker learning strategies assists in evaluating whether or not these strategies are effective in ensuring learning in safety training.

Kindly lend your contribution to the success of this research by completing this questionnaire. All information supplied by you in this questionnaire shall be treated with utmost confidentiality and the final outcome of the research shall be mailed to you through the address which you will be required to provide in the questionnaire.
It will take you approximately 10-12 minutes to complete this questionnaire.

I will be most grateful if you can spare sometime from your tight schedule to fill this questionnaire as soon as you receive it.

Thank you for your anticipated co-operation.
Yours faithfully,

Ismail Umar Shehu
Ismailumarshehu8@gmail.com

SECTION A: DEMOGRAPHY OF RESPONDENTS

Instruction: Indicate your answer/response with a tick in the box that corresponds to your choice or where required, give a short written reply in the space provided.

1. Please indicate your level of experience in practice from the following:
   a. 1 – 5years [ ] b. 6 – 10years [ ] c. 11 – 15years [ ] d. 16 – 20years [ ]
   e. More than 20years [ ]
2. What type of construction works are you involved in, in your firm? You may choose more than one.
   a. Building construction [ ] b. Civil Engineering work [ ]
   c. Heavy engineering [ ]
3. Does your firm provide health and safety training for workers?
   a. Yes [ ] b. No [ ]
4. If yes in 3 above, how often does your organization provide you with health and safety training?
   a. Daily [ ] b. Weekly [ ] c. Monthly [ ] d. annually [ ]

SECTION B: EVALUATION OF THE EFFECTIVENESS OF HEALTH AND SAFETY TRAINING PRACTICES OF CONSTRUCTING FIRMS

5. The table below consists of a list of key components of health and safety training design and delivery. Using a scale of 1 – 5, please indicate your level of agreement on each component based on the health and safety training practices of your firm.

Where,

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

EVALUATION CATEGORY	REACTION OF PARTICIPANTS		SCALE				
			1	2	3	4	5
Training objectives	i.	I understood the learning objectives.					
	ii.	I was able to relate each of the learning objectives to the learning I achieved.					
	iii.	I was appropriately challenged by the material.					
Course materials and relevance	iv.	I found the course materials easy to navigate.					
	v.	I felt that the course materials will be essential for my success.					
	vi.	I will be able to immediately apply what I learned.					
Facilitator knowledge	vii.	My learning was enhanced by the knowledge of the facilitator.					

	viii.	My learning was enhanced by the experiences shared by the facilitator.					
Facilitator delivery	ix.	I was well engaged during the session.					
	x.	It was easy for me to get actively involved during the session.					
	xi.	I was given ample opportunity to get answers to my questions.					
	xii.	I was given ample opportunity to practice the skills I am asked to learn.					
Program evaluation	xiii.	I was given ample opportunity to demonstrate my knowledge.					
	xiv.	I was given ample opportunity to demonstrate my skills.					
Training facility	xv.	I was pleased with the room set-up.					
	xvi.	I experienced minimal distractions during the training session.					

6. The table below consists of safety training elements that facilitate worker learning in health and safety training. Using a scale of 1 – 5, please indicate the extent to which they are used by your firm to achieve learning in health and safety training.
   Where,
   1 = never, 2 = seldom, 3 = sometimes, 4 =often, 5 = always

EVALUATION CATEGORY	**WORKER LEARNING IN HEALTH AND SAFETY TRAINING**		**SCALE**				
			1	**2**	**3**	**4**	**5**
Organisational issues	i.	Qualified safety trainers are employed					
	ii.	Organizational structure encourages safety training					
	iii.	Middle management participates in health and safety training					
Feedback issues	i.	Feedback on health and safety issue provided to workers					
	ii.	The safety-related behaviors of workers are observed					
	iii.	Experienced workers share their safety knowledge with inexperienced workers					

Content issues	i.	Safety goals are set before safety training					
	ii.	Questions and answers are encouraged in safety training					
	iii.	Content of safety training is designed to satisfy worker needs/interests					
Process issues	i.	Visual aids are used in safety training sessions					
	ii.	Exams are administered to workers during or after safety training					
	iii.	Workers who have completed safety training are rewarded					
Worker related issues	i.	Workers are aware of the critical safety issues					
	ii.	Management encourage pride in work completed without accidents					
	iii.	Workers are motivated to follow safety rules					

SECTION C: CONTACT INFORMATION

1. If you wish to receive a summary of the findings of this research work, please provide your email address below_____

APPENDIX B

SAMPLE OF QUESTIONNAIRE FOR SAFETY MANAGERS

Department of Quantity Surveying,
Faculty of Environmental Design,
A.B.U. Zaria.
February, 2017.

Dear Sir/Ma,

REQUEST FOR RESPONSE TO RESEARCH QUESTIONNAIRE

I humbly write to request your response to this questionnaire which forms part of a research aimed at evaluating the effectiveness of health and safety training practices of construction firms in Nigeria. The questionnaire is designed to source information from safety managers on two measures of evaluation of the effectiveness of health and safety training practices, namely; health and safety training practices for achieving training transfer and results of health and safety training practices on key organizational objectives. Data on Training transfer will give a clear picture of the extent to which the learned health and safety knowledge, skills, and attitudes in safety training are effectively transferred on the job environment, while data on results will be used to measure the extent to which your firm's health and safety training practices translate to tangible benefits.

Kindly lend your contribution to the success of this research by completing this questionnaire. All information supplied by you in this questionnaire shall be treated with utmost confidentiality and the final outcome of the research shall be mailed to you through the address which you will be required to provide in the questionnaire.
It will take you approximately 10-12 minutes to complete this questionnaire.

I will be most grateful if you can spare sometime from your tight schedule to fill this questionnaire as soon as you receive it.

Thank you for your anticipated co-operation.
Yours faithfully,

Ismail Umar Shehu
Ismailumarshehu8@gmail.com

SECTION A: DEMOGRAPHY OF RESPONDENT

Instruction: Indicate your answer/response with a tick in the box that corresponds to your choice or where required, give a short written reply in the space provided.

1. Which of the following corresponds to your company's years of experience?
   a. 1 – 5years [ ] b. 6 – 10years [ ] c. 11 – 15years[ ] d. 16 – 20years [ ] e. More than 20years [ ]
2. What is the size of your construction firm?
   a. Medium [ ] b. Large [ ] c. Not applicable [ ]
3. What type of construction work is undertaken by your company? You may choose more than one.
   a. Building construction [ ] b. Civil engineering work [ ] c. Heavy engineering [ ]
4. Which of the following corresponds to your company's annual turnover?
   a. Below N50million [ ] b. N51 - N100million [ ] c. N101 – N150million [ ]
   b. N151 – N200million [ ] e. over N200million [ ]
5. Do you practice health and safety training in your firm?
   a. Yes [ ] b. No [ ]
6. Do you have a health and safety training strategy?
   a. Yes [ ] b. No [ ]
7. Which of the following types of health and safety training interventions do you practice in your firms? You may choose more than one.
   a. Induction training [ ] b. Job-specific training [ ] c. Supervisory and management training [ ] d. Specialist training [ ] e. Others specify: _____

SECTION B: EVALUATION OF THE EFFECTIVENESS OF HEALTH AND SAFETY TRAINING PRACTICES OF CONSTRUCTION FIRMS

8. The table below contains key elements that facilitate efficient transfer of training in the job environment. Using a scale of 1 – 5, please rate the level to which each element is used to achieve training transfer in your firm
   1 = never, 2 = seldom, 3 = sometimes, 4 = often, 5 = always

S/NO	HEALTH AND SAFETY TRAINING TRANSFER ELEMENTS	SCALE				
		1	2	3	4	5
i.	Organizational structure encourages health and safety training transfer					
ii.	Content of health and safety training is designed to satisfy worker needs/interest					
iii.	Experienced workers are encouraged to transfer their safety knowledge to the inexperienced workers					
iv.	Middle management provide adequate opportunity to workers for applying learned concepts in practice					
v.	Workers hold each other accountable for transferring newly learned concepts and knowledge in the work place					
vi.	Management evaluate and provide feedback on workers' performance with respect to health and safety training transfer					
vii.	Field reviews are held on a regular basis to evaluate the degree of health and safety training transfer					
viii.	Rewarding desired behavior with positive reinforcement and verbal incentive					
ix.	Workers are motivated to learn and apply learned concepts in the work place					
x.	Project participants including workers, supervisors and managers are dedicated, aligned and accounted for safety related issues in the job environment					
xi.	Workers are provided with implementation resources and guidance to successfully transfer knowledge gained from health and safety training					

9. The table below represents key organizational objectives/goals of effective health and safety training practices. Using a scale of 1 – 5, how would you rate the health and safety training practices of your firm on each key performance indicator?

Where,

1 = Not effective, 2 = least effective, 3 = Somewhat effective, 4 = Effective, 5 = Very effective

S/NO	KEY ORGANIZATIONAL OBJECTIVES/GOALS OF HEALTH AND SAFETY TRAINING	SCALE				
		1	2	3	4	5
i.	Reduced frequency and/or severity of accidents					
ii.	Fewer staff complaints on health and safety issues					
iii.	Increase in safe behavior(s) by all trainees					
iv.	Reduction in workers' compensation claims					
v.	Reduction in near misses, injuries and illnesses					
vi.	Increased employee retention					
vii.	Increase in implemented preventive measures and control					
viii.	Improved environmental compliance					

10. Please list and rate on a scale of 1-5, any additional methods that you use to evaluate the effectiveness of health and safety training program that have not been covered by the questionnaire_____
_____
_____

SECTION C: CONTACT INFORMATION

11. If you wish to receive a summary of the findings of this research work, please provide your email address below_____