ASSESSMENT OF THE LEVEL OF COMPLIANCE WITH OCCUPATIONAL SAFETY AND HEALTH ACT 2007 IN PUBLIC TVET INSTITUTIONS IN NAIROBI COUNTY, KENYA

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Assessment of the Level of Compliance with Occupational Safety and Health Act 2007 in Public TVET Institutions in Nairobi County, Kenya

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DECLARATION

This thesis is my original work and has not been submitted for a degree in any other university

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DEDICATION

This work is dedicated to my immediate family; my wife Rahab Wanjiru and son Adrian Ng'ang'a for their continued support.

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LIST OF NOMENCLATURE AND ABREVIATIONS

AS-T/E	Applied Science-Technology/Engineering
AS-T/E-SS	Applied Science-Technology/Engineering Courses/ Social Sciences
DOSHS	Directorate of Occupational Safety and Health Services
ILO	International Labour Organization
JKUAT	Jomo Kenyatta University of Agriculture and Technology
MOEST	Ministry of Education Science and Technology
NIOSH	National Institute of Occupational Safety and Health
OHS	Occupational Health and safety
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act
OSHA2007	Occupational Safety and Health of 2007
OSHA-US	Occupational Safety and Health Act of the United States
SS	Social Sciences Courses
TVET	Technical and Vocational Education and Training
USA	United States of America

ABSTRACT

This study assessed level of compliance with Occupational Safety and Health Act 2007 (OSHA 2007) in Technical and Vocational Education and Training (TVET) institutions in Nairobi County, Kenya. The study assessed level of awareness on OSHA 2007, compliance of risk management and safe systems of work with OSHA 2007. A cross sectional survey was done on a population of fourteen TVET institutions with 1621 employees and questionnaires were used. Stratified random sampling based on courses and management produced seven institutions and 261 employees. Means of ten Key Dimensions (KD1-KD10) were analyzed by SPSS to assess level of compliance with OSHA 2007. All dimensions were transformed into three variables and multiple linear regression analysis done. Mean values (Likert scale1-5) were grouped as least Acceptable (LA) for non-compliance, moderately acceptable (MA), for low compliance and highly acceptable (HA) for compliance. 16.7 % institutions had accidents registers, 50% were unregistered as workplaces and 16.7 % were audited. 54 (26 %) employees were trained in safety while 74 % were not and hence non-compliance. Key dimensions means ranged from 1.97-3.48 in all institutions; with most being compliant and the rest with low compliance. A statistically significant relationship between the independent variables and the dependent variable existed, since $F(3, 204) = 169.050$, $p<.000$. The F-ratio implied the model is within the general population and the results can be generalized in Kenya. Rating of impact of variables indicated risk management practices was highest, (beta=0.381); level of knowledge and awareness was second, (beta =0.356) and safe systems of work (beta=0.192) was third. The level of awareness on OSHA 2007 was low; risk management was low and safe systems of work ineffective and hence low compliance. Robust systems should be implemented to support raising awareness on OSHA, functional risk management and a safe system of work.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Occupational Safety in Technical and Vocational Education and Training (TVET) institutions is an integral and indispensable component of the teaching and learning process. Indeed, no meaningful teaching and learning can take place in an environment that is unsafe and insecure to both learners and staff. It is, therefore, imperative that educational stakeholders foster safe and secure school environments to facilitate increased learner enrolment, retention and completion and hence attainment of quality education. Occupational safety in TVET institutions are the measures undertaken by the institution's management, learners, staff, parents and other stakeholders to either minimize or eliminate risks that may cause accidents, bodily injury and emotional and psychological distress. Accidents can lead to disability or death while emotional and psychological trauma can result in lack of self-esteem and ultimately lead to poor work performance. (Kenya. Ministry of Education, 2008). In Kenya, ensuring occupational safety in schools and colleges is achieved by complying with the relevant legislation which includes Occupational Safety and Health Act 2007 (OSHA 2007) and its subsidiary legislations.

Most countries have formulated and enacted legislation to ensure workers are safe at work. The development of legislation started in England during the industrial revolution. In Kenya, the first legislation was the Factories Act which has been reviewed progressively and has resulted to the current Occupational Safety and Health Act of 2007 (OSHA 2007).The act prescribes its administration, its enforcement and spells out offences, penalties and legal proceedings if there is a breach of the law. It spells out the general and special provisions of safety and health in any workplace, provisions for welfare and special applications. The law gives provisions for the safety specifications

of the workplace, the responsibilities of the employee, the employer and the Kenyan government. Several challenges prevent the compliance with this legislation as was outlined in this study which aimed at establishing the level of compliance with OSHA 2007 among TVET institutions in Nairobi County (Kenya. Ministry of labour, 2007).

Despite immense efforts, occupational accidents and injuries are still too frequent. Millions of workers as well as students become victims every year. The International Labour Organization (ILO) estimates that, globally, about 2.3 million people die every year from occupational injury and diseases. Every 15 seconds, a worker dies from a work-related accident or disease. Every 15 seconds, 153 workers experience occupational accident. More than 160 million people suffer from occupational and work-related diseases, and there are 313 million non-fatal accidents per year. In economic terms, the ILO has estimated that more than 4% of the world's annual GDP is lost as a consequence of occupational accidents and diseases. **(**International Labour Organization**,** 2001). ILO annual total numbers of fatal accidents and diseases in millions for three years were 2.38, 2.31 and 2.34 million in years 2001, 2003 and 2008 respectively (International Labour Organization, 2011). In the years 2010-11, 6223 workers examined in hazardous occupations in Kenya found that 222, workers had occupational disease (ILO, 2013).

Challenges have been identified ensuring occupational safety in Kenya. The status of occupational accidents in Kenya, Egypt and South Africa were as follows: injuries were the fifth leading cause of death in 1987 in Egypt while injuries accounted for 14% of all deaths in South Africa in1992. In a Kenya a rural district, 17% of deaths in the 1980s were due to injuries (Forjuoh *et al,* 1998). In Kenya most accidents were never reported. Reported occupational fatalities and injuries between the year 2000 and 2004 were as follows: 2000-1528, 2001-1923, 2002-1332, and 2003-1599 and 2004-1387 (ILO, 2005). A study done to establish safety in Kenyan schools found that only 20% of sampled schools had OSH Committees (Nthenya, 2011). Electricity was found to be a major source of fires at 90.8% in a study carried out on workplace fire safety

preparedness in Kenya Medical Training College Campuses in Kenya (Mwikali, 2014). A study carried out in Universities in Kenya on compliance with safety legislation found compliance level to be low (Njeru, 2013).There is less research done on occupational accidents and injuries in Kenya and very little in Education-TVET sector.

Apart from lowering economic costs, reducing the toll of occupational accidents and diseases alleviate human suffering. Occupational safety and health should, therefore, be given high priority not only as a moral concern, but also on economic grounds. Healthy workers and students are more likely to have higher work motivation, enjoy greater work satisfaction and contribute to better productivity (ILO, 2001). Occupational safety and health in TVET institutions can only be achieved by complying with OSHA 2007.

1.2 Statement of the problem

The safety of any workplace depends to a large extent on measures taken to organize and manage such safety. In this respect, the Management and other stakeholders have important roles to play in facilitating and enhancing safety at work. This is achieved by ensuring compliance with relevant legislation. In Kenya the OSHA 2007 regulates safety in workplaces. However the level of compliance with OSHA 2007 in Kenya among workplaces has not been well documented. Several studies have been undertaken aiming at investigating the level of compliance and the resulting challenges encountered by employers and employees. A study done to establish safety status in Kenyan secondary schools found that no school evaluated safety programmes as well as hazard /disaster mapping (Nthenya, 2011). It has also been found that weak safety culture result from weak or non-existent safety management systems on safety issues (ACS, 2012). Most of the research done on this topic has been carried out by Directorate of Occupational Health and Safety Services (DOHSS) in the manufacturing sector (Njeru, 2013). However most of the research has targeted the manufacturing sector .Very little research has been carried out in the educational sector and more so in TVET institutions. Very little information is available to the public on the status of compliance with OSHA 2007

and the challenges encountered by TVET institutions in Kenya in complying is available to the public. The roles of School Management Committee/Board of Governors members, the head teacher, teachers, learners, parents and other stakeholders in facilitating and enhancing safety in TVET institutions and the challenges encountered has not been adequately researched and documented. The researcher in the course of his duties as a quality assurance officer has observed shortcomings in complying with OSHA 2007 in most TVET institutions he has inspected. The above arguments lead to undertake this study which aimed at investigating the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County, Kenya. This was achieved by assessing the level of awareness on OSHA 2007, OSH risk management practices and safe systems of in TVET institution.

1.3 Objectives of the Study

1.3.1 Main Objectives of the Study

The main objective of this research was to assess the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County.

1.3.2 Specific Objectives of the Study

In this study, three specific objectives were considered as outlined below:

- To determine the level of knowledge and awareness about Occupational Safety and Health Act 2007 among public TVET Institutions in Nairobi county.
- To investigate the compliance with safety legislation of occupational safety and health risk management practices in public TVET institutions in Nairobi County.
- To investigate the compliance with safety legislation of safe systems of work in public TVET institutions in Nairobi County.

1.4 Research Questions

This study addressed the following research questions:

- What is the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County?
- What is the level of knowledge and awareness about Occupational Safety and Health Act 2007 among public TVET Institutions in Nairobi County?
- What is the level of compliance of occupational safety and health risk management practices with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County?
- What is the level of compliance of safe systems of work in public TVET institutions in Nairobi County with Occupational Safety and Health Act 2007?
- To what extent does awareness about OSHA 2007 and risk management practices influence compliance with the Act?

1.5 Justification of the Study

The data from quality assurance inspection reports from the Ministry of Education Science and Technology has shown that there are shortcomings as regards implementation of OSHA 2007 in TVET institutions in Kenya. It has also been found that little research has been carried out to investigate the level of compliance with safety legislation in public TVET institution in Kenya (Kenya. Ministry of Education, 1999). This study will address gaps in knowledge on the level of TVET institution's compliance with OSHA 2007.The study will also identify the challenges TVET institutions face in complying with OSHA 2007 as well as provide a basis of how to address these challenges and hence improve compliance with OSHA 2007 and consequently contribute in developing safety culture in TVET institutions in Kenya.

1.6 Significance of Study

This study investigated the level of compliance with OSHA 2007 among TVET institutions in Nairobi County. The results will be useful in developing safety culture in TVET institutions in Nairobi and in Kenya as whole as the results can be generalized for other TVET institutions in the whole country. The results will be useful to TVET institutions, policy makers in government agencies as well as other researchers. The results identified the challenges faced by TVET institutions in implementing OSHA 2007 in Kenya as well as how to overcome these challenges. This will result in improved compliance with occupational Safety legislation in Kenya and hence result in safe workplaces for employees and students in TVET institutions in Nairobi County and in Kenya as a whole. This would result in reduced accidents, less cost of treating occupational accidents and diseases, better learning outcomes and increased productivity of employees. The findings justified carrying out the research as the study will improve safety culture in TVET institutions in Kenya as well as lead to increase in the body of knowledge.

1.7 Scope of Study

This was a cross-sectional survey research carried out on the accessible population of fourteen public TVET institutions in Nairobi County. The units of analysis were the public TVET institutions in Nairobi County and their employees while the units of observation were the managers, teachers, technicians and other members of non-teaching staff of individual TVET institutions.

1.8 Theoretical Review/ Framework

Maslow's hierarchy of needs is a theory in psychology proposed by Abraham Maslow in his 1943 paper (Maslow, Lowry & Maslow, 1979).This was a theory on human motivation. Maslow used the terms Physiological, Safety, Belongingness and Love, Esteem, Self-Actualization and Self-Transcendence needs to describe the pattern that

human motivations generally move through. One must satisfy lower level basic needs before progressing on to meet higher level growth needs. Maslow studied what he called exemplary people such as Albert Einstein to arrive at his theory (Maslow, Lowry, & Maslow, 1979). The five stage model was later expanded to include cognitive and aesthetic needs and later transcendence needs (Maslow, 1970a). Changes to the original five-stage model are highlighted and include a seven-stage model and an eight-stage model, both developed during the 1960's and 1970s (McLeod, 2007). As we move up to the second level of Maslow's hierarchy of needs, the requirements start to become a bit more complex. At this level, the needs for security and safety become primary. People want control and order in their lives, so this need for safety and security contributes largely to behaviors at this level (Emmanuel, & Akpan, 2011). Safety constitutes one of the essential human needs, as postulated by Abraham Maslow in his hierarchy of needs theory on human motivation (Maslow & Lowry, 1979). In this work, the researcher addressed occupational, safety and health which builds on and improves Maslow's hierarchy of needs theory. An interpretation of Maslow's hierarchy of needs is represented as a pyramid with the more basic needs at the bottom as shown in the figure 1.1.

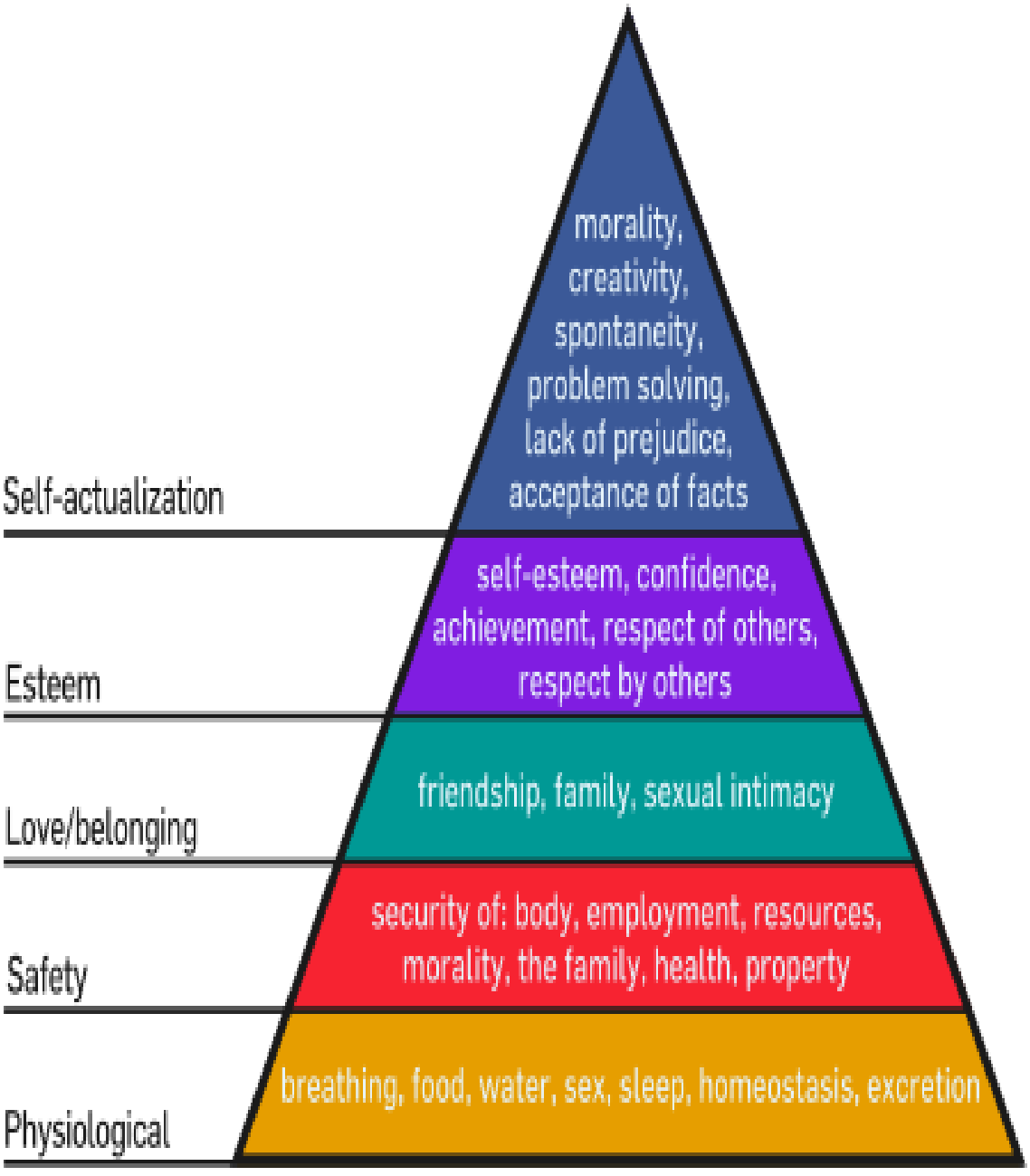

Figure 1.1: Maslow's hierarchy of needs pyramid (Maslow, 1970a)

This study employed the theory of hierarchy of needs by Abraham Maslow on safety and further addresses Occupational Safety and Health. Safety at work ranks as a very important factor in job satisfaction (Kreitner, 2007). In an attempt to satisfy this need certain organizations incorporate into their policy programmes that guarantee workers' safe work execution under a climate that enhance the physical, mental, and emotional conditions. Organizational policy of this nature is often categorized under health and safety. In general terms, health means a state of complete physical, emotional, mental, and social ability of an individual to cope with his environment, and not merely the absence of disease or infirmity (Hippocrates, 1981). Under work environment, employee health is described as the absence of illness or disease due to the interaction of employee and the work environment **(**Hall & Goodale, 1986). Occupational safety can as well be referred to as the absence of injuries due to the interaction of the employee and the work environment. In general, safety means a condition of being safe from undergoing or causing hurt, injuries or loss. Hence, safety policies may encompass activities directed at either reducing or complete removal of hazardous conditions capable of causing bodily injuries and occupational diseases. Organizational safety policy specifies the company's safety goals and designates the responsibilities and authority for their achievement. Organizational health and safety focuses on the development of specific measures and programmes, aimed at protecting employees in the course of performing their duties to maximize productivity and improve the overall organizational performance. **(**International Labour Organization, 2005).

1.8.1 Conceptual Framework

In this study the following independent variables were analyzed:

- Level of knowledge and awareness about Occupational Safety and Health Act 2007 among public TVET Institutions in Nairobi County
- Occupational safety and health risk management practices in public TVET institutions in Nairobi County.

- Safe systems of work in public TVET institutions in Nairobi County

In this study the dependent variable considered was: the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County.

In this study, the relationship between the independent variables and the dependent variable were analyzed as well as the inter-relationships among the independent variables. The figure 1.8.2 shows how the various variables interrelate:

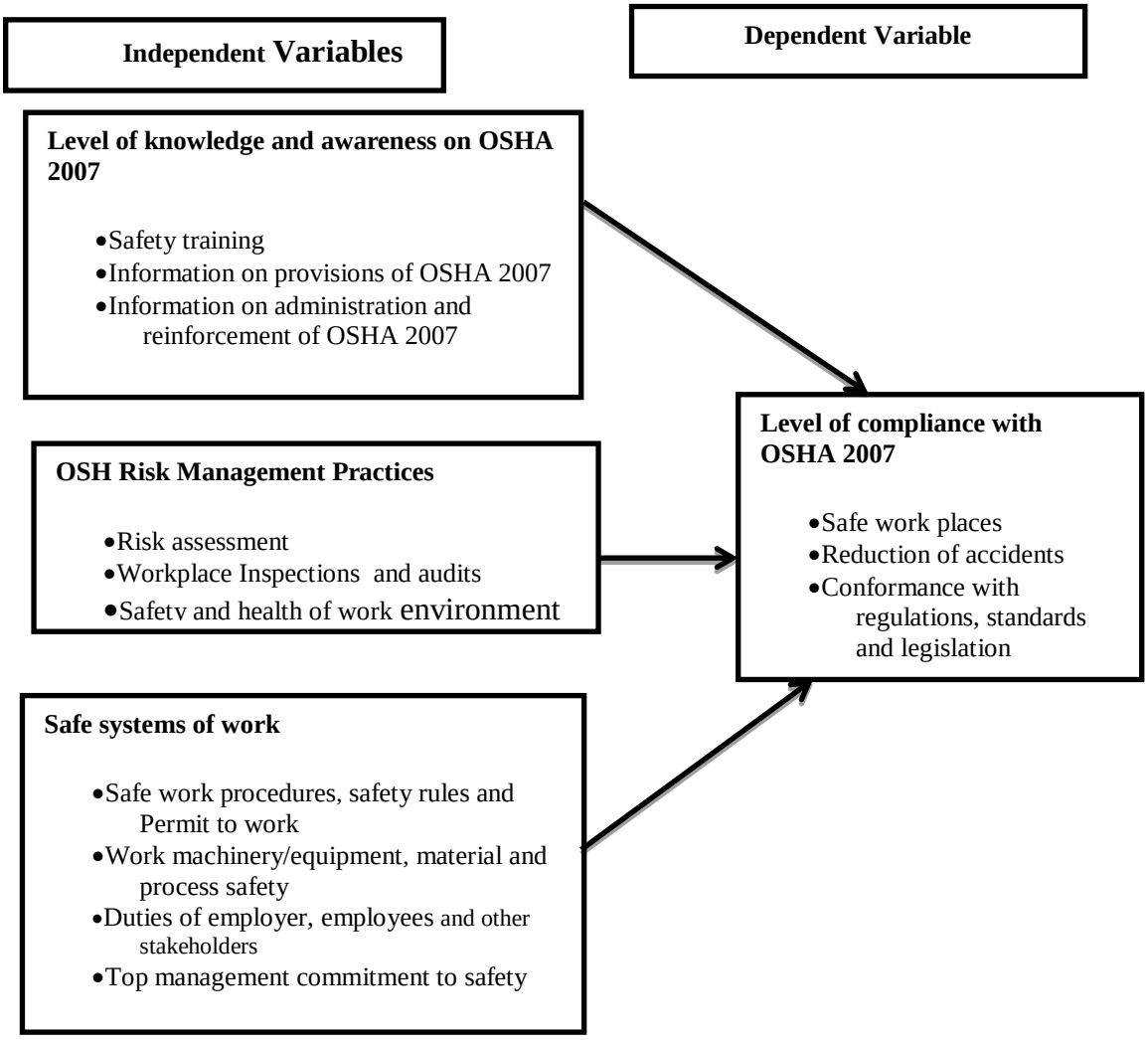

Figure1.2: Conceptual framework: OSHA, 2007

1.9 Independent Variables

In this study three independent variables were to be analyzed. The variables have been operationalized

1.9.1 Level of Knowledge and Awareness on OSHA 2007

The level of knowledge and awareness of OSHA 2007 is determined by the level of training amongst employees and also by information available to workers on the provisions and administration and reinforcement of OSHA 2007. There are two classes of training; induction and in-service training. Training and provision of information on provisions and administration of OSHA 2007 will ensure that public TVET institutions in Nairobi County will increase the level of compliance with OSHA 2007.

1.9.2 OSH Risk Management Practices

TVET institutions need to put in place effective risk management practices to ensure compliance with legislation. This will involve carrying out regular workplace risk assessments, workplace inspections and audits. Risk assessment will identify, evaluate and control risks. A workplace inspection checks whether an organization's management systems are being implemented to the specified standards by checking workplace elements such as the workplace environment, equipment and processes. This will identify and control all hazards. A workplace audit involves checking whether existing management systems comply with the organization's health and safety policies and is achieved by applying the OSHA code of practice for auditing. Implementing effective risk management practices, in public TVET institutions will results to compliance with legislation and a safe work environment. In this work, the level of compliance of OSH risk management practices with OSHA 2007 was investigated by studying the standards of risk assessments , audit and workplace inspections.

1.9.3 Safe Systems of Work

A safe system of work consists of the following: safe work procedures for routine operations; permit to work procedures, for non-routine high risk activities and safety rules, for general behaviour in workplaces. Public TVET institutions are required to formulate and implement safe work procedures, permit to work documents and safety rules as this will result in an increased compliance with legislation. A safe system of work also includes ensuring safety of machinery, materials, the process as well as specifying duties of employer, employees and other stakeholders in a workplace. The top management must also be committed to ensure an effective safety management system is in place so as to improve compliance. Hence compliance with safety legislation will be enhanced. In this study, the level of compliance of safe systems of work with OSHA2007 was investigated by studying safe work procedures and safety rules, safety of work processes and equipment and duties of stakeholders.

1.9.4 Dependent Variable

The dependent variable studied in this work is: the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County. The level of compliance is indicated by having safe workplaces, reduction in occupational accidents /diseases and conformance with regulations, legislation and safety standards among public TVET institutions in Nairobi County. This is achieved if level of knowledge and awareness of OSHA 2007, safe systems of work and OSH risk management practices are improved on.

The above variables were further broken down into key dimensions and elements as per the table 1.1 to ensure operationalization of variables and hence development of questionnaire items.

Table 1.1: Table of operationalization of variables and measurement of concepts

Concepts	Key Dimensions
Level of knowledge and awareness on OSHA 2007	Safety training-KD1
	Communication on information on provisions of OSHA 2007-KD2
	Information on administration and reinforcement of OSHA 2007-KD3
Level of compliance of OSH risk management practices	Risk assessment-KD4
	Workplace inspections and audits-KD5
	Safety and health of work environment-KD6
Level of compliance of Safe systems of work	Safe work procedures Safety rules, and Permit to work-KD7
	Work machinery/equipment, materials and process safety-KD8
	Duties of employer, employee and other stakeholders-KD9
	Top management commitment to safety-KD10

CHAPTER TWO

LITERATURE REVIEW

In this study literature from developed and developing countries was reviewed to examine previous research and identify gaps in knowledge. The literature review approach was from the broad knowledge to the specific.

2.1 Overview of Occupational Accidents Statistics

Workers in all occupations are exposed to various hazards at work. Hazards at work have various forms including physical, biological, psychological and non-application of ergonomic principles. Occupational safety and health address various workplace hazards that include fumes, dust, noise, heat amongst others. Prevention of accidents and occupational diseases should be the primary goal of OSH programmes other than eradicating after occurrence. This is has been addressed in development of legislation. However compliance with legislation has been wanting.

OSH has developed in developed countries in the last two to three decades. In developing countries poor record keeping and reporting mechanisms do not allow the true status to be known. It is estimated that at least 250 million occupational accidents occur every year worldwide, 335,000 of these accidents are fatal (International Labour Organization, 2001). ILO reports that annual total numbers of fatal accidents and diseases in millions for three years were 2.38, 2.31 and 2.34 million in years 2001, 2003 and 2008 respectively (International Labour Organization, 2011).This figures are assumed to be higher as records are unreliable. More fatal occupational accidents occur in developing countries than in developed countries. Statistics from Ghana, Kenya, South Africa and Zimbabwe show that a large proportion of all deaths and morbidities result from accident injuries. Injuries accounted for 14% of all deaths in South Africa

in1992; 73% were violence-related, 13% were transportation- related, and the remaining 14% were due to other unintentional causes . In Zimbabwe, injuries contributed to 15% and over 9% of the total recorded deaths in males and females respectively in 1988 (Forjuoh, *et al.,* 1998).This is the trend across Africa as ascertained by statistics. The proportion of deaths from road traffic crashes compared to those from 16 common infectious conditions increased in 10 years to 39% in Nigeria. Analysis of injury in Egypt established that injuries were the fifth leading cause of death in 1987. In a rural district in Kenya, 17% of all deaths among persons in the age group 15-64 years in the 1980s were due to injuries (Forjuoh, *et al*., 1998). In the years 2010-11, 6223 workers were examined in hazardous occupations in Kenya and it was found that 222, workers had occupational disease (ILO, 2013). A study done to establish safety in Kenyan schools found that only 20% of sampled schools had OSH Committees (Nthenya, D 2011). A study carried out in Universities in Kenya on compliance with safety legislation found compliance level to be low (Njeru, 2013).Much less attention has been given to occupational accidents by researchers compared to other mechanisms of injuries. Data on injury problem in both formal and informal sectors is lacking considering the latter has a higher likelihood of accidents occurring due inappropriate tools, poor training and lack of enforcement. However some data is available from workmen's compensation and social security. In South Africa there was a trend towards deregulation of OSH exposing workers to risks. It was observed that of 248843 patients who attended a trauma facility in 1990 in the Cape Town Metropolitan area, 22716 (9%) presented as a result of occupational injuries, representing an annual rate of 902 per 100 000 persons. Majority were male (83.6%); 60% were unskilled and semi-skilled workers. A total of 91% of all non-fatal injuries and 75% of the fatalities were accidental. Traffic crashes occurring on the job accounted for 5.6% of the non-fatal injuries and 25% of the fatalities**.** About 50% of all occupational injuries reported in this study were treated by private practitioners, highlighting one of the difficulties in obtaining complete data on occupational injuries (Forjuoh *et al.,* 1998). The Ministry of Labour in Kenya, reports that over half of the industrial accidents and injuries in Kenya

are unreported. It further estimates that reported occupational fatalities and injuries for the years 2000-2004 were: 1528, 1923, 1332, 1599 and 1387 respectively **(**International Labour Organization, 2005). Failure to comply with relevant legislation among other factors contributes to these occupational accidents. Like any other work-places, TVET institutions in Kenya face myriad challenges in complying with relevant legislation. This study was aimed at assessing the level of compliance with OSHA 2007 among public TVET institutions in Nairobi County.

2.2 Level of Knowledge and Awareness on Legislation in Training Institutions

Awareness of OSHA is improved by training employees on safety as well as the provisions of OSHA 2007 on its administration and reinforcement.

2.2.1 Influence of Safety Training on Compliance with Provisions of Safety Legislation in Training Institutions

Training of workers and students in training institutions influence the level of compliance with legislation. Occupational and Health Act of 1970 in the United State of America (OSHA-USA) contains requirements for training of worker to reduce accidents (United States Bureau of Statistics, 1998). The OSHA-US has developed voluntary training guidelines that provide employers with a model for designing, conducting, evaluating, and revising training programs (United States Bureau of Statistics, 1998). Other standards limit certain jobs to workers considered competent by virtue of special training (Gregory *et al*., 1999).

Documented outcomes of OSH training vary and are inconclusive. Incidence of occupational accidents are useful in identifying populations at higher level of occupational risks, and hence the need for training (United States Bureau of Statistics, 1998). Training programmes should be evaluated to ensure they meet their goals. Surveys indicate that 80% of teens in the US have worked by the time they finish high school. Every year, approximately 53,000 youth get serious injuries on the job that

demand seeking emergency room treatment Young people need to be trained and job placement should give the youth opportunity to practice skills for safety at work. Department of Education Office of Vocational and Adult Education (OVAE) includes these skills as part of the educational experience **(**Labor Occupational Health Program University of California & Berkeley, 2010).

Over the last decade it has been noted that work-related stress affect teachers' health in addition to other occupational illnesses. The school should be save for learning and teaching. Safety training for all persons in school is the responsibility of the school management. The school management should engage a safety specialist to train employees on safety and hence ensure compliance with safety legislation (Fiji. Ministry of education, 2007). Hence TVET institutions have a responsibility of training staff and students on safety in Kenya.

2.2.2 Level of Knowledge and Awareness of Administration and reinforcement of Safety Legislation and Policy among Training Institutions

The OSH manager or specialist should possess specific knowledge and skills to be effective. He should have skills for planning, directing, evaluating safety programmes as well as implementing them. The specialist should be aware of procedures rules, policies and principles on occupational safety. He should be knowledgeable in order to instruct supervisors, workers on safe work procedures and handling of hazardous materials. Many positions in this occupation require a practical knowledge and skill in the application of the methods, techniques, and procedures used by industrial hygienists, safety engineers, fire prevention engineers, or other health and safety personnel though the exact skills may vary from organization to organization (United States of America, 1981). In Malta health and safety teachers are appointed and deployed to every high school to work with head teachers, on promotion of OSH (European Agency for Health and Safety at work, 2013). The safety specialist in training institutions should have knowledge in general management to enable him understand organizational objectives,

principles, standards and work processes in order for him to collect safety data and prepare reports. This also enables him to collect data on accidents trends. To address these needs, NIOSH in conjunction with Environmental Occupational Health Sciences Institute of New Jersey developed occupational and environmental safety checklists that cover occupational and environmental hazards found in vocational schools (Palassis & Sweeney, 2002). This has increased the level of awareness on safety legislation in the US. Similarly. The level of awareness on occupational safety and health legislation can be an indicator level of compliance with OSHA 2007 in Kenya. ILO requires that education and training in OSH is mandatory as per the SEOUL Declaration (International Labour Organization, 2012).

The level of awareness can be demonstrated by ensuring availability and displaying legislation. In Fiji, the school management is required to ensure that a copy of the Health and Safety at Work Act of 1996 and copies of supplementary regulations are available and prominently displayed in the schools **(**Fiji. Ministry of Education, 2007). In Kenya every workplace including training schools is required to prominently display the abstract of OSHA 2007 in all workplaces (Kenya. Ministry of Labour, 2007).In Kenya the level of Knowledge and awareness on OSHA 2007 is low (Ministry of Labour, Kenya, 2012).

2.3 Occupational safety and health risk management practices in training institutions

2.3.1 Risk Management Practices in Workplaces

OSH like other facets of business require proper management. An organization should have an OSH system that effectively controls risks, prevent occupational injuries and diseases and complies with regulations and legislation. Any institution is prone to risks that affect its operations. Hence the need to implement an acceptable safety management system. The emphasis is on management functions, guidelines, industry standards,

quality principles, to establish the safety management system (Losifmoraru, 2012). An effective OHS risk management comprises of six Principles as outlined below:

•Top management leadership and commitment

• Involvement of all workers

•Effective communication

•Provision of information, education and training

• Identification of hazards, risk assessment risk control at operational level

•OHS management information system implementation (Commonwealth of Australia, 2005).

TVET institutions in Nairobi should implement an OSH management that employ the six principles.

2.3.1.1 Senior Management Leadership and Commitment

The above model works well when top management is committed to drive OSH risk management strategy. This is because senior management is mandated to make critical decisions of organizations. Integrating risk management in initial planning of a business makes it more effective. In Australia emphasis is placed high levels of professional leadership and expertize and performance management, through legislation (Commonwealth of Australia, 2005). TVET institutions like other organization must br led senior management that is committed to safety at work. This is not necessarily the case in Kenya. In a study done to establish safety standards in Borabu District in Kenya it was found that 36% of head teachers indicated that Board of Governors were uncooperative in improving safety standards. (Migiro, 2012).

2.3.1.2 Involvement of all workers

The success of any OSH system and development of a 'safety culture' at work results when workers are involved. OSH activities are supported by open communication between workers and management. Employees provide information on OSH as they are in the immediate work surroundings and hence identify hazards. This information is useful as workers provide advice about possible solutions (Commonwealth of Australia, 2005). In Kenya the OSH Policy and legislation require workers to participate in OSH Committees (Ministry of Labour, Kenya, 2012).

2.3.1.3 Effective Communication through Consultation

OSH Act I Australia targets fostering consultative relationship between the senior managers and junior managers. This consultation requires all parties to contribute to a pool of knowledge useful in making strategic decisions on safety at work. Involving all workers ensure ownership of risk identification and risk treatment. The OSH Act in Australia, requires that consultations on safety should happen under specific circumstances (Commonwealth of Australia, 2005). This is also true of the Kenyan OSHA 2007 where workers from all levels participate in OSH activities through OSH Committees(Ministry of Labour, Kenya, 2007).The Directorate of Occupational safety and Health Services (DOSHS) in Kenya established and OSH information Centre to disseminate information on OSH (International Labour Organization, 2013). Reception of information has been a challenge in the TVET sector. In a study done to establish safety status in Kenyan secondary schools it was found that knowledge of schools OSH Policy was low and administrators were not trained in safety (Nthenya, 2011).

2.3.1.4 Provision of Appropriate Information, Education and Training

Employers have a duty of protecting workers from hazards at work. This duty includes ensuring workers are adequately trained in safe systems of work that include; safe use of equipment or materials, use health and safety control, measures, use of Personal

Protective equipment accident reporting amongst others. Employers are expected to provide to trainees in appropriate languages; the information instruction, training and supervisory necessary for them to perform their duties. Information and training are provided after training needs analyses is done so that gaps in competency between actual competency and required competency. In-service training is done to as to raise company of workers. Identification of training needs the following factors; task, work experience, language and literacy of the workers, the plant and substances used, and identification of and risk assessments conducted (Commonwealth of Australia, 2005). Kenya there is a general shortage of skills in OSH due to failure to integrate OSH in the school curriculum (Ministry of Labour, Kenya, 2012). This should be addressed.

2.3.1.5 Hazard Identification, Assessment and Risk Control at operational level

Risk identification, assessment and control consists of the three components of risk management. Risk management targets reducing the likelihood and consequence of an incidence at work, causing an injury. It is a systematic process involving examining all aspects of the work place to control workplace safety and health hazards. OSH risk management is effective when it is integrated in the organization's processes and practices and a safety culture evolves. Risk management is the core of occupational health and safety programmes (Commonwealth of Australia, 2005). ILO requires that risk education be part of the curriculum (International Labour Organization, 2012).This is not the case in Kenya. In a similar study done to establish safety status in Kenyan secondary schools it was found that no school had established a monitoring and evaluation system of safety programmes and none had done hazard /disaster mapping (Nthenya, 2011).

.3.1.6 Development and Implementation of Appropriate OHS Management Information Systems

Risk management involve continuous improvement. Monitoring OSH issues indicates injury trends or recurrent hazards within the organization. This information form the basis of prevention programmes that target areas of concern (Commonwealth of Australia, 2005). Kenya has through DOSHS established am OSH information system to manage flow of information (Ministry of Labour, Kenya, 2012).

2.3.2 Managing Occupational Safety and Health Risk in Training Institutions

OSH legislation requires all likely hazards are identified and resulting risks are eliminated or reduced. Legislation demands that organizations should have risk management systems in place. The four stages of risk a risk assessment were; hazard identification; assessment of risks of those hazards and implementation of control measures. This will reduce risk of injury from the hazards identified earlier. Control measures implemented are reviewed regularly reviewed to confirm if it is fixing the problem (Losifmoraru, 2012). In Kenya, OSHA 2007 requires all workplaces to undertake risk audits annually (Ministry of Labour, Kenya, 2007).

Workplace inspections, register of injuries, incident reporting, consultation and feedback from employees are useful in identifying hazards. Risks increase due to purchase of new plant, cleaning agents, work activities, engaging contractors and interaction with customers. Risk assessment establishes the likelihood of exposure to a hazard and the seriousness of the effect of hazard. Serious hazards are identified and addressed. OSH risk managements are carried out before a business is established or acquired before manufacturing plant and before new or altered system of work are established (Manju, 2009).Assessing risks involves checking type of hazard, severity of hazard, likelihood of consequence, frequency and duration of exposure, age of workers and the work environment(Losifmoraru, 2012). ILO emphasize on preventive OSH culture across all

sectors by implementing international standards and ILO Guidelines on OSH management systems and ILO Global strategy on OSH to manage risks (International Labour Organization, 2011). In Kenya demands workplaces to undertake workplace inspections and maintain a register of occupational accidents (Ministry of Labour, Kenya, 2007).

Controlling risks involves eliminating risks at work, whereby the bets control strategy is to remove the problem by use of an alternative process. If eliminating the problem proves to be hard, hierarchy of control of risks is used to select the most effective methods to reduce the risks. This is a six level process for minimizing risks at workplaces. The first level is at the design level when new plants or materials or equipment are being set up. The hazard is also removed or enclosed and can also be minimized through engineering controls, administrative controls as well as use of personal protective equipment. If none of the controls is adequate, a combination of the controls is used to reduce risks to the lowest level possible. Periodic reviews are then done to determine the effectiveness of the controls (Losifmoraru, 2012).This reviews is achievable through periodic inspections, safety audits, consultation with employees and a review of incident investigations as per OSHA 2007(Ministry of Labour, Kenya, 2007). Management of risks is built into all activities at work that may result in safety issues(Losifmoraru, 2012).For instance, in Greece a system for recording accidents was effective in management of risks(European Agency for Health and Safety at work, 2013). Similarly, OSHA 2007 requires Workplaces to undertake risk identification and control (Ministry of Labour, Kenya, 2007).

2.3.2.1 Legal responsibilities on OSH in schools

The Health and Safety Act, 1974 In UK places the overall responsibility for health and safety at work on employers. The employer has the regal responsibility of safety of students, staff and visitors. The functions of health and safety can be delegated to other members of staff without delegating responsibility. During off site school visits teachers

in charge accept responsibility for safety of pupils on behalf of the school management. The act also specifies their responsibilities as employees (Health and Safety Executive, 2011). The construction of classrooms, workshops laboratories are done as per provided guidelines based on British Standard, BS 4163:2007.Also codes of practice guides those who construct technology workshops in schools. The recommendations cover the use of equipment, machines, materials, and chemicals amongst others, in learning institutions (Health and Safety Executive, 2011). Also in UK safety checklist have been developed for use by teachers to ensure learners are safe in schools. The checklist provides teachers and support staff the issues they must consider in a classroom situation to ensure safety of learners. The checklist does not include music and drama, which are addressed by risk assessment. The checklists takes about twenty minutes to complete. (Health and Safety Executive, 2011). The Ministry of Education Science and Technology in Kenya has developed a safety guideline for schools in Kenya. Health and safety programmes in a school involve ensuring that learners, staff and visitors are in safe environment (Kenya. Ministry of Education Science and Technology, 2008).

In Kenya workplaces including training institutions are required to comply with Occupational Safety and Health Act 2007 (OSHA 2007). The acts has provisions on how to make workplaces safe that include how to undertake risk assessment, workplace inspections and audits in workplaces. The cat specifies standards for lighting, ventilation work station ergonomics, sanitary conveniences, fire protection and safe storage. The welfare of workers is also addressed in the act to ensure provision of safe drinking water, sitting facilities, first aid, medical surveillance and supervision of inexperienced workers (Kenya. Ministry of Labour, 2007).

2.4 Safe Systems of Work in Training Institutions

Safe systems of work consist of safe work procedures for routine operations; permit to work procedures for non-routine high risk activities and safety rules for general behaviour at the workplace. In addition machinery and process safety must be in place as

well as a safety management system driven by senior management. The Occupational Safety and Health Act 2007 (OSHA 2007) in Kenya specify how a safe system of work should be implemented to address the above areas (Kenya. Ministry of labour, 2007).

2.4.1 Top Management Commitment to Safety Management in Training Institutions on Compliance with Legislation

The systems approach on OSH is premised on the idea that the management has the power and resources to implement OSH Policy in organizations. The systems approach aims at preventing occupational accidents through identification of hazards, planning, monitoring of prevention measures and integration of safety and health in routine work and decision making at every level of the organization's management systems lower incidences of accidents and occupational illnesses. The relationship between safety and health indicators and OSH management systems in Australia found that effective systems are realized by involving senior managers and workers in safety programmes (Hermanus, 1999).

Safety culture in an organization determines how safety is treated while the leadership determines the strength of safety culture. In universities and colleges in the US lines of authority should flow clearly from the chancellor, vice-chancellor, to deans of colleges, to departmental chairs and finally to faculty and students. The management is expected to build strong safety culture at every level. Institutions such as University of California, San Diego and Princeton have high-level management organizations to guide health and safety (American Chemical Society, 2012). In Kenya, some TVET institutions have developed good safety management systems while others are yet to establish them. The Ministry of Education Science and Technology (MOEST): State Department of Science and Technology has developed a policy for OSH and has established an Occupational Safety and Health Committee for engagement at the headquarters and the regional offices. Each TVET institution is required to develop an OSH policy as per the

Occupational Safety and Health Act 2007 (OSHA2007) (Kenya. Ministry of Higher Education Science and Technology, 2010).

2.4.2 Safety Culture among Training Institutions

Safety culture consists of actions, attitudes and behaviours of all persons in an organizations. At the organizational level safety culture is defined by five properties; shared values on safety, concern for processes and procedures, the organization's desire to raise safety, contribution of members at all levels and how stable safety is in the organization (Njeru, 2013).In training institutions members of organization includes faculty, managers , students and non-teaching staff. A good safety culture indicates values shared within the organization. An effective safety culture is indicated by leadership involvement at all levels. In training institutions, the leadership ensures that faculty and all students are protected and trained in safety as well as development of safety policy (American Chemical Society, 2012).

Institutions with low injury rates have leadership that demonstrate commitment to safety and the converse is true **(**ACS, 2012).Institutions with strong safety culture have clear definitions of responsibilities at all levels of the organizational structure. In addition it must have a positive attitude to safety and as well as implement a system for investigating accidents or incidences. There should also be collaboration within members of academic community on safety (Hill, 2012). Weak safety culture in organizations is due to poor leadership and non-involvement of all members.

2.4.3 Influence of Financial Cost on Compliance with Safety Legislation among Training Institutions

Occupational and Safety and Health Act (OSHA-US), of 1979 in USA provided for mandatory OSH standards in all industries. The acts requires employers to provide employees with safe working environment free from occupational accidents, diseases and deaths. Analysis of OSHA programmes indicates that there is a cost component

involved i9n complying with the act (Harvey, 1998).In the UK, 30 institutions reported that majority of the cost was due to preventive measures on safety while the minority cost was due to reactive response after accidents had already occurred. Cost for compliance with safety legislation per employee ranged from £21 to £550 for the small organizations, while for large organizations it ranged from £20 to £300 per employee. The overall annual cost for small organization ranged from while £500 to £5,500 while for large organizations it ranged from £10,000 to £1.1 million. Majority of organizations reported that the benefits of safety programmes outweighed the costs (Lancaster *et al.*, 2003). Measures to improve safety reduces occupational accidents, injuries and deaths resulting to saving on costs incurred due to these safety issues. In addition, improving workplace safety increased productivity (LaTourette, T., & John Mendeloff, 2008).In Latin America, although 2-4 % of GDP of the region is lost due to occupational fatalities alone, there is no evidence of private sector investment in safety. In TVET institutions in Kenya, the cost of implementing safety programs may have hindered compliance with OSHA 2007. (Contreras & Dummer, 1997).

2.4.4 Safe Work Procedures, Safety Rules, and Permit to Work

Safe work procedures guide routine operations at work to ensure workers are safe while Permit to work is a formal written system for controlling potentially hazardous non-routine work (International Association of Gas and Oil Producers, 2001).These non-routine work includes working in confined places, high voltage electrical live working and excavations among others. Occupational Safety and Health Act, 2007 in Kenya provides elaborate details of work procedures, safety rules and permits to work for various work operations (Kenya. Ministry of Labour, 2007).

2.4.5 Work Machinery/Equipment, Materials and Process Safety

Material and process safety ensures conditions that can cause harm in operations are improved in organizations. They include all activities of everyone with access to workplace facilities. The safety components considered includes equipment, machinery, tools and general housekeeping, energies and materials used at work. Other safety issues such as ergonomics of workstations, long working hours material handling and welfare facilities are considered. OSHA 2007 in Kenya has details on how to address materials, process and equipment safety (Kenya. Ministry of Labour, 2007). Hazard and risk assessment is done to improve machinery and process safety (Chilworth global, 2013).

2.4.6 Duties and Responsibilities of employer, employee and other stakeholders

The OSHA 2007 specify the duties of employers, employees and other stakeholders in implementing a safe system of work at workplaces. It also prescribes behaviours of employees at work to ensure their own safety and that of others at work. The act requires employers to ensure workplaces are safe and specifies the duties of employees (Kenya. Ministry of labour, 2007).

2.5 Critique of Existing Literature

The U.S. Department of Labour states that the Occupational Safety and Health Act 1970, of USA (OSHA-US) provide for standards on worker training. OSHA-US has developed voluntary training guidelines that provide employers with a model for designing, conducting, evaluating, and revising training programs. Safety training increases the level of knowledge and awareness of legislation. According to the Ministry of Education of Fiji, a school should be a safe and healthy place for teaching and learning and the school management is responsible for the conduct of health and safety training for all persons working in the school. Training will also ensure that the youth learn and practice general health and safety skills that they will carry with them from job to job. In Kenya the Occupational Safety and Health Act, 2007 provides for the training

on safety of employees at all levels. In most workplaces which includes training institutions safety specialists require to have knowledge of general management functions, practices, and procedures to enable them to understand organizational objectives, safety and occupational health principles, regulations, standards, and work processes. This will ensure that, workers are trained on safety and this raises the level of awareness and subsequently the level of compliance with legislation. Research and data on the level of knowledge and awareness on OSHA 2007 has been found to be non-existent.

Most workplaces in the developed world have implemented effective risk management practices as opposed to the developing world. According to Commonwealth of Australia, an effective OHS risk management system comprises of six principles. These principles are: senior management commitment; involvement of all workers; effective communication; provision of information and training and risk assessment of workplaces. These principles apply to all workplaces including training institutions. This will improve the level of compliance with legislation. Loland Iosifu Moraru has identified and expounded on the four steps of risk management process which are; hazard identification, risk assessment, risk control and review. The risk is controlled through the hierarchy of risk control method. The application of the six principles of risk management systems in the risk control process has been adequate to improve compliance with legislation in developed countries such as the US where NIOSH has developed checklists on occupational and environmental hazards found in vocational schools. OSHA 2007 provides guidelines for machinery/equipment, materials and process safety. However research on implementation has not targeted learning institutions. This kind of data on occupational hazards is not available in developing countries where research is inadequate or mostly non-existent. However in Kenya the Ministry of Education Science and Technology has developed an Occupational Safety and Health Policy and safety guideline for schools in Kenya but its implementation and effectiveness has not been evaluated.

The systems approach to Occupational Health and Safety (OSH) is effective since the management has the influence, power and resources to take the initiative in implementing OSH policy. Occupational, health and safety management systems can reduce the incidence of injury and disease. A study of relationship between health and safety performance and Occupational Health and Safety (OHS) management systems in most industries in Australia, found that effective systems involve senior managers and workers in safety programmes. Effective safety culture in training institutions starts with the leadership. Organizations with lowest injury rates have strong leadership involvement in implementing safe systems of work. In the US it has been found that a strong, positive safety culture in the academic institution includes the highest level of leadership showing an active commitment to safety by developing a safety policy. This has assisted in developing a safety culture in workplaces. In Kenya, the Occupational Safety and Health Act 2007 sets standards to ensure safety at work. However gaps exist as there is inadequate data on compliance in most workplaces. There has been little research on compliance in learning institutions in Kenya.

CHAPTER THREE

MATERIALS AND METHODS

In this work the research design, the population, sampling techniques used have been discussed. The data collection and analysis methods and results presentation have also been expounded on.

3.1 Study Design

In this work a cross-sectional survey research design was carried out aimed at investigating the level of compliance with Occupational Safety and Health Act 2007 (OSHA 2007) in public TVET institutions in Nairobi County. The research was descriptive and both qualitative and quantitative data was collected. In this work, the researcher generalized the results to all the public TVET institutions in Kenya as the target population or the universe. The accessible population was all public TVET institutions in Nairobi County. The definition of the target and accessible population was derived from the professional experience of the researcher as an Accreditation and Quality Assurance Officer. This definition ensured that the accessible population was in itself representative of the target population and thus ensuring the population validity (Mugenda & Mugenda, 1999).

3.2 Study Area and Population

The researcher carried out a cross-sectional survey research on the available population of public TVET institutions in Nairobi County which are fourteen in number. In this study the units of analysis were the public TVET institutions in Nairobi County and their employees while the units of observation were the managers, teachers, technicians and other non-teaching staff of individual TVET institutions. The researcher obtained a sample of TVET institutions and a sample of employees from the sampled TVET institutions.

3.3 Sampling Method

The researcher studied an accessible population of fourteen TVET institutions in Nairobi County and their employees which formed the sampling units and unit of analysis. The researcher sampled the data using proportionate stratified random sampling based on nature of courses taught and the type of management in institutions. This is because the nature of courses offered determines the equipment/machines in use and the risks. The size of the sample was optimum to ensure efficiency, representativeness, reliability, and flexibility as well as reduce systemic bias and sampling error (Kothari, 2004).At the respondent level the accessible population of all employees in public TVET institutions Nairobi County was 1621**.**

A two level sampling procedure was used; at the institution category and at the respondents level. In sampling, the researcher limited systemic bias by use of proportionate stratified random sampling to ensure representativeness, while a large sample and homogeneous elements in strata reduced sampling errors. Among the fourteen public TVET institutions in Nairobi County, four are managed and funded by the Ministry of Education Science and Technology (MOEST) while ten are under other Government ministries. All TVET Institutions under the MOEST offer the category of courses; Applied Sciences, Engineering/Technology and Social Sciences (AS-E/T-SS) .Seven TVET Institutions under other government ministries offer Applied Sciences, Engineering/Technology and Social Sciences while three offer Social Sciences (SS) only. It is expected that workers' exposure to risks depend on working environment which include laboratories, engineering workshops, theory classrooms and offices. There were two levels of stratification. The first level of strata of institutions was classified by the nature of management and funding of public TVET institutions. This yielded two strata: TVET institutions under the management and funding of the MOEST and those managed and funded by other government ministries. The second level of stratification occurred in the stratum of TVET institutions under the management of other government ministries .In this stratum the institutions were classified as those

offering AS-E/T-SS courses and Social Sciences courses only. Table 3.1 shows the list of TVET institutions and the number of employees to be sampled.

Table 3.1: TVET Institutions in Nairobi County to be sampled

Category of Institutions	TVET Institution	Number of Employees
MOEST	Kenya Technical Teachers College	178
	Nairobi Technical Training Institute	151
Other Government Ministries	Kenya Water Institute	85
	Kenya Institute of Highways and Building Technology-Nairobi	118
	NYS Institute of Business Studies	55
	Kenya Institute of Surveying and Mapping	67
	Kenya School of Monetary Studies	55
Total		709

Ministry of Education Science and Technology Registry Data bank: 2012

3.4 Sample Size Determination

The research design, methods of data analysis and size of accessible population determined the size of the sample. Descriptive studies can be carried out by selecting a sample size of at least ten percent of the accessible population (Mugenda & Mugenda, 1999).There were two classes of samples; institutions and employees. The researcher used a sample size of fifty percent (7 institutions) in each stratum of 14 TVET institutions and applied the table method of determining sample of employees (Krejcie, & Morgan, 1970). The stratification was based on the type of management and type of courses taught. Four of the fourteen institutions were managed by MOEST and offered

AS-E/T-SS courses; seven institutions were managed by other government ministries and offered AS-E/T-SS courses while three institutions offered SS courses only. Table 3.2 shows the institutions sampled.

Table 3.2: TVET Institutions' Category and the Number Sampled

Category of Institutions	**Courses**	**Total number of institutions**	**Fifty percent of Each stratum of institutions**
MOEST	AS-T/E-SS	4	2
Other Government Ministries	AS-T/E-SS SS	7 3	3 2
Total	-	14	**7**

KEY

MOEST: Ministry of Education Science and Technology

AS-T/E-SS**:** Applied Science-Technology/Engineering Courses

SS: Social Sciences Courses

Applying the table method formula generated a sample size of 310 from a population of 1621 employees, as outlined below.

The sample sizes for different sizes of population at a 95 per cent level of certainty (assuming data are collected from all cases in the sample) are shown in tables 1 Appendix 4 Tables 2 and 3 shows the population of workers in various classifications. The study population was 1621 which lay between 1500 and 2000 which generates sample sizes of 306 and 322 respectively as in the table 1 in appendix 4.

Therefore the sample size was calculated by interpolation as follows:

2000-1500= 500; 322-306= 16; 1621-1500= 121,

Therefore sample size = 306+16/500×121= 310

Therefore, the minimum sample size from the table was 310 employees.

Where the population is less than 10,000, a smaller sample size called the adjusted minimum sample size can be used without affecting the accuracy as it is economical on time and finances (Lewis, P., Thornhill, A. & Saunders, M., 2003).

$$n' = n/[1 + (n/N)] \text{.....equation 3.4.1}$$

Where n' is the adjusted minimum sample size; n is the minimum sample size (from table 1 in Appendix 4) and N is the total population. The adjusted minimum sample size for a population of 1621 and a minimum sample size of 310 (from table 1 in Appendix 4) is:

$$n' = 310/[1 + (310/1621)] = 260.5 \sim 261$$

Stratified random sampling was used to obtain the adjusted minimum sample size proportional to the total population of employees in sampled public TVET institutions in Nairobi County. The portions of the sample from each stratum and that of each class of workers at the institutional level were proportional to the total population of workers in each stratum and that of each class of workers at the institutional level. These portions of samples calculated were as shown in tables 3.4.1and 3.4.2.

Table 3.3: Respondents sampled from TVET Institutions funded and managed by MOEST

Institutions offering AS-T/E-SS courses	Employees	Population	Teachers	Technicians	Non-Teaching Staff	CEOs	Sample Size
Nairobi Technical Training institute	Total number	151	120	11	20	-	-
	Number of employees sampled	-	37	4	6	1	**48**
Kenya Technical Teachers College	Total number	178	140	8	30	-	-
	Number of employees sampled	-	43	3	9	1	**56**
Total		**329**				**2**	**104**

KEY

MOEST: Ministry of Education Science and Technology

AS-T/E-SS: Applied Science-Technology/Engineering-Social Sciences Courses

SS: Social Sciences courses only

The following formula was used to obtain the portion of the sample under each management:

$$\mathbf{P_m = n'/N \times n_m}\ldots\ldots\ldots\ldots\text{equation 3.4.3}$$

Where*;* n' is the adjusted minimum sample size; N is the total population; n_m is the number of respondents in institution under MOEST and P_m is the portion of sample of institutions under each management

For institutions under MOEST, the portion of respondents in the sample is $P_m = 261/1621 \times 646 = 104.01$ respondents; for institutions under other ministries, the portion

of respondents in the sample is P_m = 261/1621 ×975=*156.9* respondents as per the figures obtained in table3.4.1 and table 2 in appendix 4.

Number of respondents in the sample from each institution is obtained by using the formula:

$$\mathbf{n_r = n_s/n_t \times p_s}\text{……}\text{equation 3.4.4}$$

Where n_r is the number of respondents from institution; n_s is number of workers in the sample form each institution; n_t total number of workers in the stratum and p_s portion of the respondents for the stratum from the total population.

eg for Nairobi Technical Training Institute was =151/329×104=47.7

The number of respondents per class of workers per institution was obtained using the formula:

$$\mathbf{T_c = (N_c/n_w) \times [(n_r)-1]}\ \text{……}\text{equation 3.4.5}$$

Where T_c is the number of respondents per class of workers per institution; N_c is the number of employees in each class of workers; n_w is the total number of workers in each institution and n_r is the number of respondents from institution.

For Nairobi Technical Training Institute the number of teacher respondents was =120/151× (48-1) =37. Other classes of workers in each institution was calculated as shown above and displayed in tables 3.3 and 3.4.

Table 3.4: Respondents sampled from TVET Institutions funded and managed by other government ministries

	Name of institutions	Employees	Population	Teachers	Technicians	Non-Teaching Staff	CEOs	Sample size
Institutions offering AS-T/E courses	KEWI	Total number	85	34	8	43	-	-
		Sampled employees	-	14	3	18	1	**36**
	KNSM	Total number	67	43	1	23	-	-
		Sampled employees	-	17	1	9	1	**28**
	KIHBTN	Total number	118	80	20	18	-	-
		Sampled employees	-	33	8	7	1	**49**
Institutions offering SS courses only	NYSB	Total number	51	28	4	19	-	-
		Sampled employees	-	11	2	7	1	**21**
	KSMS	Total number	55	27	3	25	-	-
		Sampled employees	-	11	1	10	1	**23**
Total			**376**					**157**

KEY
MOEST: Ministry of Education Science and Technology
AS-T/E-SS: Applied Science-Technology/Engineering-Social Sciences courses
SS: Social Sciences courses only
KEWI: Kenya water institute
KNSM: Kenya institute of surveying and mapping
KIHBTN: Kenya institute of highways and building technology-Nairobi
NYSB: NYS Institute of business studies
KSMS: Kenya School of monetary studies

3.5 Research Instruments

In this, study questionnaires were used as the data collection instrument. The researcher administered questionnaires based on the classes of employees in each institution. In all the institutions sampled, the researcher identified five major classes of employees. These classes were; chief executive officers (CEOs)/Principals/managers, teachers, workshop/laboratory technicians, other non-teaching managerial staff and other non-teaching support staff. The researcher administered two questionnaires: one to employees who were chief executive officers (Principals/Mangers/Managing Directors) and another one to the teachers, technicians and other non-teaching staff. The questionnaires that were employed featured both open-ended and close-ended items with Likert scales.

3.6 Data Processing and Analysis

The researcher collected data from seven TVET institutions as his sample size at the institutional level and from a sample size of 261 employees at the respondent level. The TVET institutions and their employees were the units of analysis while the units of observation were employees. The researcher administered questionnaires among the five classes of employees in all sampled institutions. The five classes of employees were; CEOs, teachers, workshop/laboratory technicians, other non-teaching managerial staff and other non-teaching support staff. One questionnaire was administered to the CEO/Senior management in each sampled institution. The second questionnaire was administered to the remaining part of the sample, whereby it was distributed proportionally to the institutions' total population of employees in four different categories namely; teachers, workshop/laboratory technicians, other non-teaching managerial staff and other non-teaching support staff. The researcher developed the scaling measures to be employed in measurement. However, where other scaling measures have been developed and tested by other researchers, the researcher adopted these measures (Sekaran & Bougie, 2010) .The researcher adopted scaling measures

developed earlier in a research that evaluated safety culture maturity model and compliance with OSHA 2007 among public universities in Kenya, to measure 'top management commitment to safety'(Njeru, 2013).

In this study the collected data was cleaned, coded and analyzed using Statistical Package for Social Studies (SPSS version 21.0) statistical computer software. The type of data generated determined the type of analysis to be carried out. In this study qualitative and quantitative data was generated. For qualitative data, the researcher employed coding of data as 1and 2 and used SPSS computer software to do the analysis. Information collected from the Likert scales was also used to generate quantitative data after coding. For quantitative data, the researcher employed SPSS computer Statistical Software that comprised descriptive and inferential statistics, where the output were frequency tables, pie charts, frequency polygons and percentages. Data was analyzed using SPSS for windows version 21.0 and analyzed at 5% level of significance. Correlation analysis is used to determine the degree of relationship between two variables (Mugenda & Mugenda, 2003). Multiple regression analysis is used to determine whether a group of variables together predict a given dependent variable (Mugenda & Mugenda, 2003). In this study, standard multiple regression analysis was done as the researcher was not sure of the impact of each independent variable on the dependent variable. Standard multiple regression analysis determined whether the three independent variables predicted the dependent variable and the impact of each independent variable on dependent variable. The multiple linear regression equation used in this model was of the form:

$$\boldsymbol{Y = B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + e}\text{----equation 3.7}$$

Where: Y= the dependent variable; the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County.

X_1= Independent variable 1; level of knowledge and awareness about Occupational Safety and Health Act 2007 among public TVET Institutions in Nairobi

X_2= Independent variable 2; occupational safety and health risk management practices in public TVET institutions in Nairobi County

X_3= Independent variable 3; safe systems of work in public TVET institutions in Nairobi County

B_0=Constant

B_{1-3} = the regression coefficients or change induced in Y by each X

e =Error.

The above equation generated the best model for standard multiple linear regression analysis (Mugenda & Mugenda, 2003).

3.7 Data Validation

In data validation the researcher establishes if using the data will result in the measurement of what he intended to measure. In a broader concept validity pertains to the extent that a method investigates what it is intended to investigate **.**Data validation (data vetting, data cleaning) is the process of checking that data conforms to specification. Quantitative research use sampling or statistical manipulation to control for validity threats (Kvale, 1989). Valid research findings require random or representative sample of sufficient size; a statement of the experimental treatment and the anticipated effect of the treatment and criteria representative of the ultimate objective of reduced incidence rates. It also requires simple, easily understood statistical techniques with replication as the best test of significance, and an interpretation that summarizes the findings and their practical significance for various situations. The following are among the kinds of validity checks that may be carried out: number and

type of characters in a data item; range of values of a data item; correctness of characters; consistency between one data item and others in the same record and correctness of check data totals for individual records (Shannon, 1975).

Validation included checking the range, the mean, correctness of characters; consistency between one data item and others, outliers and the median in the data for consistency. Stratified random sampling method was used to arrive at a representative sample. In the study a representative sample size of 7 (50% of a total of 14 institutions) institutions was used. Further, a representative sample size of 261 (16 % of a total population of 1621) respondents was determined. Sampling at the institutional level and at the respondent level was within a minimum of 10 % (Mugenda & Mugenda, 1999). The researcher employed the table method of determining sample size for research activities to determine the sample size of respondents (Krejcie & Morgan, 1970). A sample size of 261 was optimum to ensure efficiency, representativeness, reliability, and flexibility so to as reduce systemic bias and sampling error (Kothari, 2004). In sampling, the researcher limited systemic bias by use of correct sampling procedures that ensure representativeness, while sampling errors was reduced by selecting a relatively large sample and ensuring elements in each stratum is highly homogeneous.

In this study the collected data was cleaned by checking incomplete questionnaires and inconsistencies in answering questionnaire items .The data was then coded and keyed into the computer. The range, the mean, correctness of characters; consistency between one data item and others and the median in the data for consistency were all checked during trial analysis using SPSS software. The analysis methods used employed both descriptive and inferential statistics. Multiple regression analysis is used to determine whether a group of variables predict a given dependent variable (Mugenda & Mugenda, 2003). Analysis and comparing of means was used to indicate the level of compliance in ten key dimensions of the research.

Multiple linear regression analysis was done where an F-test was done to test if the model and estimated coefficients (R^2, R and Adjusted R) can be found in the general population the sample is drawn from. The aim was to confirm the coefficients in the ANOVA tests of F-tests of the multiple linear regression tests whether the $R^2=0$ (Gupta, 2000).It is also possible to test for the statistical significance of each of the independent variables. If $p < .05$, the conclusion was that the coefficients are statistically significantly different to zero. In this study these F-test and the coefficients were generated and were used to establish if the results could be generalized to total population. A linear regression model generated was used to determine if the three independent variables predicted the dependent variable.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Biodata Analysis

The characteristics of the respondents were analyzed in terms of gender, type of courses and class of workers as illustrated below.

4.1.1 Response rate

Data collected from seven TVET Institutions were cleaned by checking incomplete questionnaires and inconsistencies in answering questionnaire items. The data were classified into strata, coded, keyed into the computer and analyzed. 0.02 % (5) of returned questionnaires of all those administered to general employees was incomplete. The total response rate was 81.2 % (212) which comprised 81.6% (208) and 85.7 % (6) administered to general employees and managers respectively.

4.1.2 Distribution of Respondents by classes of workers and in Strata

The respondents were classified into two categories; CEOs and general workers. 2.7 % (7) of the sample consisted of CEOs while 97.3 % (254) consisted of other workers. The general workers were classified into strata based on the type of management and type of courses offered in the seven institutions sampled. Institutions were classified as per courses they offered and comprised those offering Applied Sciences, Technology/Engineering and Social Sciences (AS-T/E-SS), those offering Applied Sciences, Technology/Engineering courses (AS-T/E) and those offering Social Sciences (SS). Workers from institutions offering AS-T/E-SS, AS-T/E and SS comprised 39.8 % (104), 43.3 % (113) and 16.8 % (44) respectively. The workers were also classified as per the category of workers as in figure 4.1. Teachers comprised 55.8 %,

laboratory/workshop technicians 7.7 %, non-teaching managerial staff 18.3% and non-teaching support staff 18.3% as shown in figure 4.1 of the pie chart below.

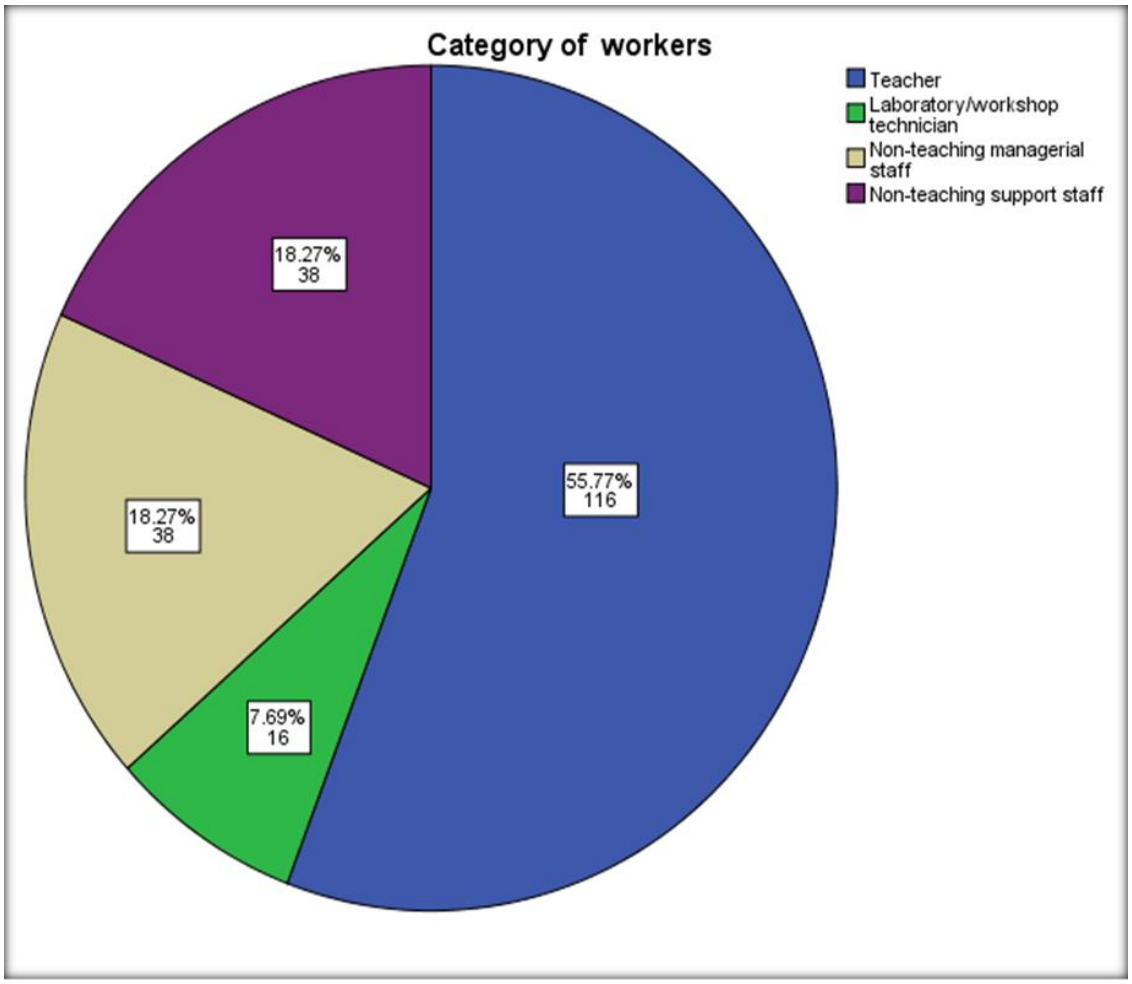

Figure: 4.1: Categories of employees

4.1.3 Gender versus Type of Courses Offered

In terms of gender there were more males than females among general workers in this study as shown in table 4.1 below. Males comprised 137 (65.9 %) and females 70 (33.7 %) while one employee did not indicate the gender. There was 82(39.4%), 92(44.2 %) and 34(16.3 %) workers in in institutions offering AS-T/E-SS, AS-T/E and SS courses respectively.

Table 4.1: Type of Courses offered in TVET institutions and gender of employees

			Type of courses offered			Total
			AS-T/E-SS	**AS-T/E**	**SS**	
Gender	Male	Number of employees	55	64	18	137
		%	67.1%	69.6%	52.9%	65.9%
		% Total	26.4%	30.8%	8.7%	65.9%
	Female	Number of employees	27	27	16	70
		%	32.9%	29.3%	47.1%	33.7%
		% of Total	13.0%	13.0%	7.7%	33.7%
	No response	%	0.0%	1.1%	0.0%	0.5%
Total		Number of employees	82	92	34	208
		% of Total	39.4%	44.2%	16.3%	100.0%

Key: AS-T/E-SS**:** Applied Sciences-Technology/Engineering-Social Sciences

AS-T/E**:** Applied Sciences-Technology/Engineering

SS: Social Sciences

4.1.4 Gender versus Job Title and Department

To establish relationship between risk exposure as per type of courses offered and level of compliance, sampled employees were distributed as per job titles and type of courses offered as shown in the bar chart in figure 4.2. Teachers teaching in institutions offering AS-T/E, SS and AS-T/E-SS courses comprised 24.6%, 6.8% and 24.6% respectively. Laboratory technicians working in institutions offering AS-T/E and AS courses comprised 6.3% and 1.9% respectively, while non-teaching staff in management were 18.8% and non-teaching support staff were 16.9%.

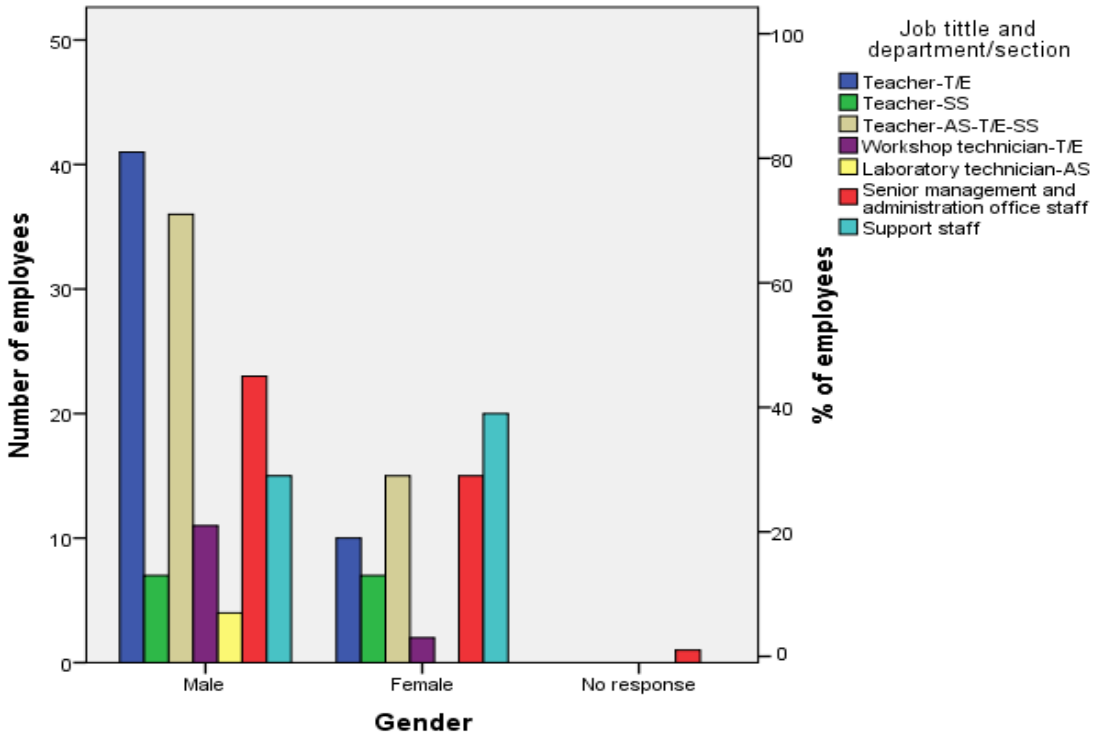

Figure 4.2: Gender versus job title and department

4.1.5 Gender and Job Category

To establish the relationship between gender and category of work, and level of compliance, sampled employees were distributed as per gender and category of work as shown in figure 4.3. Teachers, workshop or laboratory technicians, non-teaching managerial staff and non-teaching support staff were 116 (55.8%), 16(7.7 %), 38 (18.3 %) and 38(18.3%) respectively. Male workers comprised 65.9 % while female workers were 33.7%. 0.5 % did not indicate their gender.

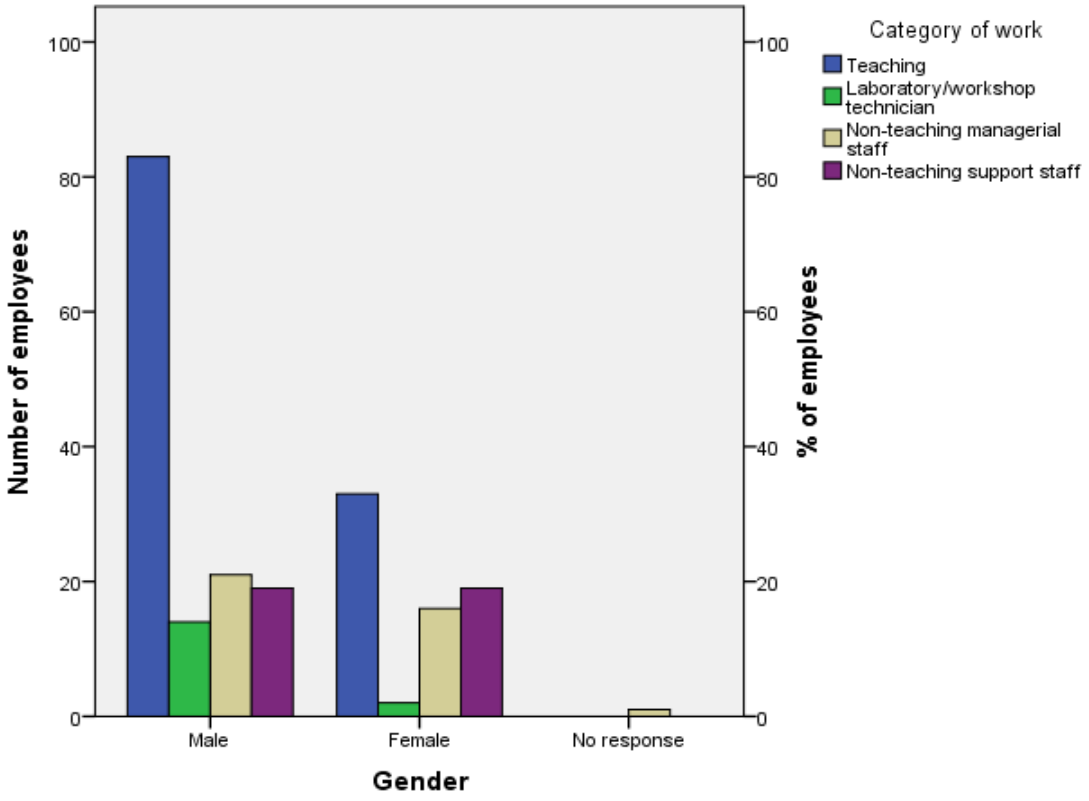

Figure 4.3: Job and category of workers

4.1.6 Gender and Terms of Employment

Majority of workers among the respondents were permanent employees who numbered 191 (91.8%), while workers on contract numbered 13 (6.3 %) and those on temporary employment were 2 (1 %). There were more male workers who numbered 137 (65.9%) than female workers who numbered 70 (33.7%) as shown in table 4.2.

Table 4.2: Gender and terms of employment

			Terms of employment				Total
			Permanent	Contract	Temporary	No response	
Gender	Male	Number of employees	129	7	1	0	137
		% within gender	94.2%	5.1%	0.7%	0.0%	100.0%
		% Terms of employment	67.5%	53.8%	50.0%	0.0%	65.9%
		% of Total	62.0%	3.4%	0.5%	0.0%	65.9%
	Female	Number of employees	61	6	1	2	70
		% within gender	87.1%	8.6%	1.4%	2.9%	100.0%
		% Terms of employment	31.9%	46.2%	50.0%	100.0%	33.7%
		% of Total	29.3%	2.9%	0.5%	1.0%	33.7%
	No response	Number of employees	1	0	0	0	1
		% within gender	100.0%	0.0%	0.0%	0.0%	100.0%
		% Terms of employment	0.5%	0.0%	0.0%	0.0%	0.5%
		% of Total	0.5%	0.0%	0.0%	0.0%	0.5%
Total		Number of employees	191	13	2	2	208
		% within gender	91.8%	6.3%	1.0%	1.0%	100.0%
		%Terms of employment	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	91.8%	6.3%	1.0%	1.0%	100.0%

1.7 Employees Gender and Age

Majority of the workers, 86 (41.3%) were in the age bracket of 41-50 years while the least number of workers 26 (12.5%) were in the age bracket of 18-30 years as shown in the table 4.3.The age of workers can be an indicator of experience as well as the level of how careful a worker is at work.

Table 4.3: Gender and age of workers

			Age					Total
			18-30	31-40	41-50	51-60	No response	
Gender	Male	Number of workers	14	24	53	45	1	137
		% within gender	10.2	17.5	38.7	32.8	0.7	100.0
		% within age	53.8	63.2	61.6	78.9	100.0	65.9
		% of Total	6.7	11.5	25.5	21.6	0.5	65.9
	Female	Number of employees	12	14	32	12	0	70
		% within gender	17.1	20.0	45.7	17.1	0.0	100.0
		% within age	46.2	36.8	37.2	21.1	0.0	33.7
		% of Total	5.8	6.7	15.4	5.8	0.0	33.7
	No response	Number of employees	0	0	1	0	0	1
		% within gender	0.0	0.0	100.0	0.0	0.0	100.0
		% within age	0.0	0.0	1.2	0.0	0.0	0.5
		% of Total	0.0	0.0	0.5	0.0	0.0	0.5
Total		Number of employees	26	38	86	57	1	208
		% within gender	12.5	18.3	41.3	27.4	0.5	100.0
		% within age	100.0	100.0	100.0	100.0	100.0	100.0
		% of Total	12.5	18.3	41.3	27.4	0.5	100.0

4.1.8 Employees Gender and Number of Years Worked in Institution

Majority of workers numbering 122 (58.7%) had worked for less than 15 years in the institution while 16 (7.7. %) employees had worked for a period between 31 to40 years in the institution as shown in the bar chart in figure 4.4. 36.1% and 22.65% of male and female workers respectively had worked for less than 15 years in the institution.

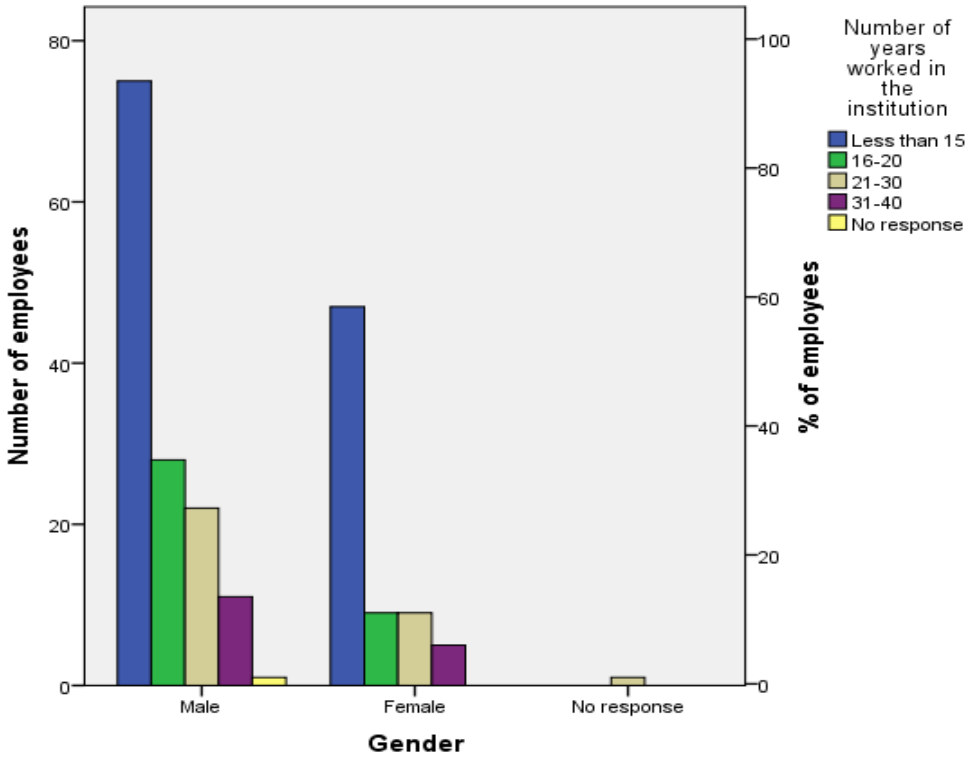

Figure 4.4: Gender and number of years worked in the institution

4.1.9 Gender and Level of Education of employees

Majority of workers numbering 63 (30.3 %) had post graduate degrees while 2 (1 %) employees had primary level education as shown in figure 4.5. There was 18.8% of the

male and 11.5% of the female employees with postgraduate education. The researcher noted that male workers were more than female workers across each of the level of education attained.

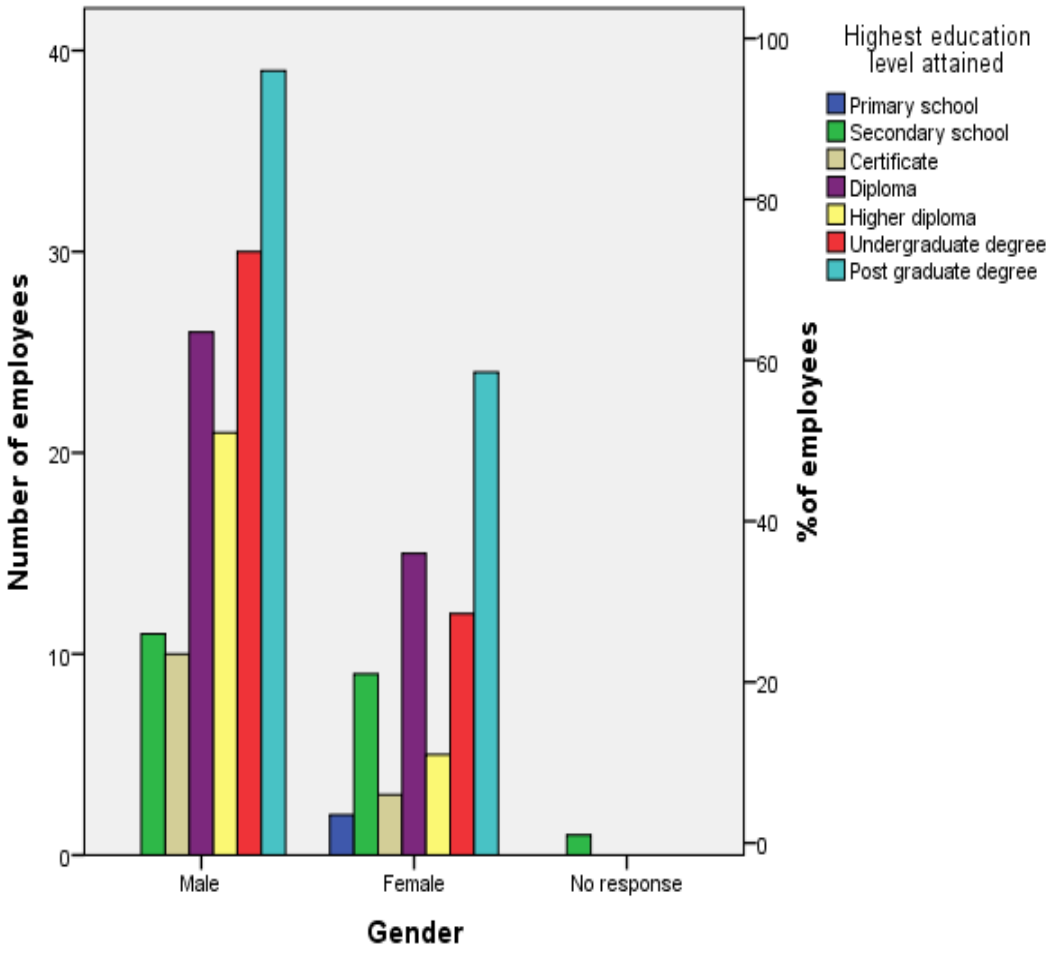

Figure 4.5: Gender and education level of employees

4.2 Analysis of General Compliance with OSHA 2007

4.2.1 Accidents at the Workplace

4.2.1.1Occupational Accidents Experienced in TVET Institutions

Accidents experienced in workplaces can be indicator of an institution's level of safety preparedness and hence compliance level with legislation. In the institutions sampled, 29 (13.9%) of employees reported having experienced accidents while 179 (86.1%) had not experienced accidents. Among the institutions whose employees experienced accidents institution tvt04 had the highest number of workers at 13 (44.8%) while institutions tvt02 and tvt05 had the lowest number of workers both at 1 (3.4%) that experienced accidents as shown in figure 4.6.

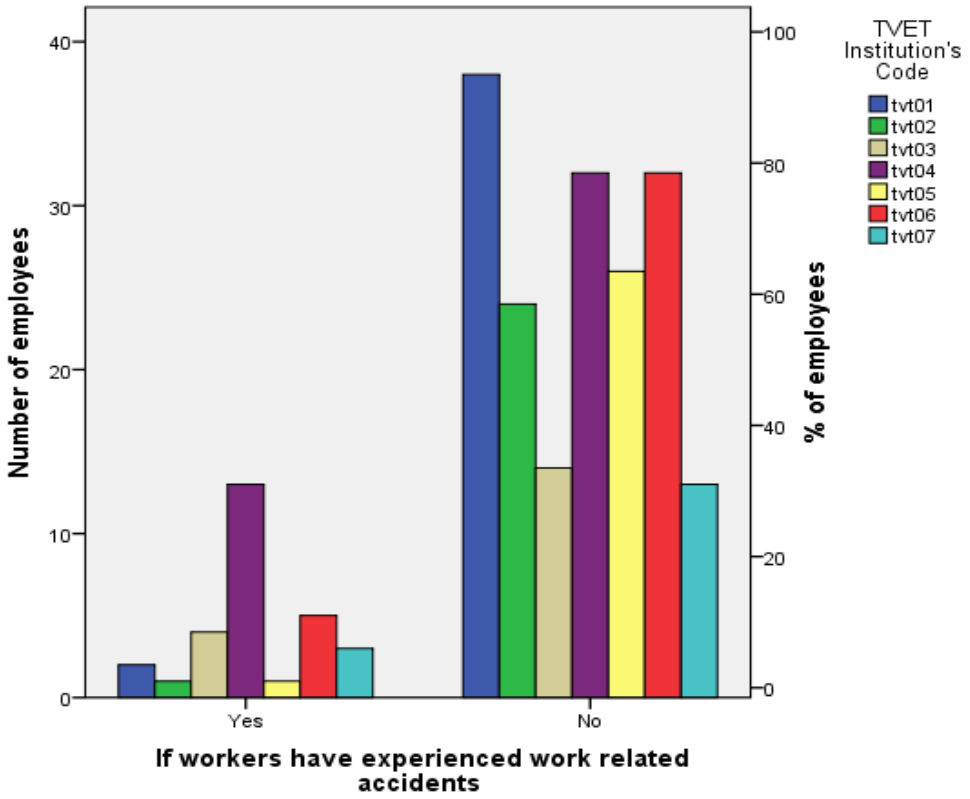

Figure 4.6: Number of employees who experienced work related accidents in various TVET institutions

4.2.1.2 Accidents and the Type of Courses Offered in TVET Institutions

The researcher wanted to assess the level of accidents experienced by employees in TVET institutions as per the type of courses offered. Among sampled institutions, those offering AS-T/E-SS, AS-T/E and SS courses had 82 (39.4%), 94 (44.2%) and 34 (16.3 %) workers respectively as shown in table 4.4. 29 (13.9%) employees experienced accidents. Among TVET institutions whose employees experienced accidents, those offering AS-T/E-SS courses had the highest number of employees at 18(62.1%),followed by institutions offering SS courses at 7 (24.1 %) and the least number of employees was 4 (13.8 %) for institutions offering AS-T/E courses. It can be deduced that institutions offering AS-T/E-SS had the largest proportion of employees

who experienced accidents at work. This can be interpreted that institutions offering AS-T/E-SS had the lowest level of compliance with OSHA 2007 compared to those offering other courses. It was also possible that institutions offering AS-T/E-SS courses had a higher level of hazards that were not mitigated and hence indicating that the compliance level was low.

Table4.4: Percentages of employees who have experienced accidents in institutions offering various courses

			Type of courses offered			Total
			AS-T/E-SS	AS-T/E	SS	
Experienced work accidents	Yes	Number of employees	18	4	7	29
		% experienced accidents	62.1%	13.8%	24.1%	100.0%
		% Type of courses offered	22.0%	4.3%	20.6%	13.9%
		% of Total	8.7%	1.9%	3.4%	13.9%
	No	Number of employees	64	88	27	179
		% experienced accidents	35.8%	49.2%	15.1%	100.0%
		% Type of courses offered	78.0%	95.7%	79.4%	86.1%
		% of Total	30.8%	42.3%	13.0%	86.1%
Total		Number of employees	82	92	34	208
		% experienced accidents	39.4%	44.2%	16.3%	100.0%
		% Type of courses offered	100.0%	100.0%	100.0%	100.0%
		% of Total	39.4%	44.2%	16.3%	100.0%

Key: AS-T/E-SS: Applied Sciences-Technology/Engineering-Social Sciences

AS-T/E: Applied Sciences-Technology/Engineering SS: Social Sciences

4.2.1.3 Accidents and Age of Employees

The proportion of workers who had experienced accidents across different age brackets was assessed. Among sampled TVET institutions had 26(12.5%), 39 (18.8%),86 (41.3%) and 57 (27.4 %) employees in 18-30, 31-40, 41-50 and 51-60 age brackets in years respectively.29 (13.9%) employees experienced accidents. Among employees who experienced accidents, 16(55.2 %) employees were the majority and were in the age brackets 41-50 years while the lowest number of employees was 2 (6.9 %) who were in the age bracket of 31-40 years as shown in figure4.7.

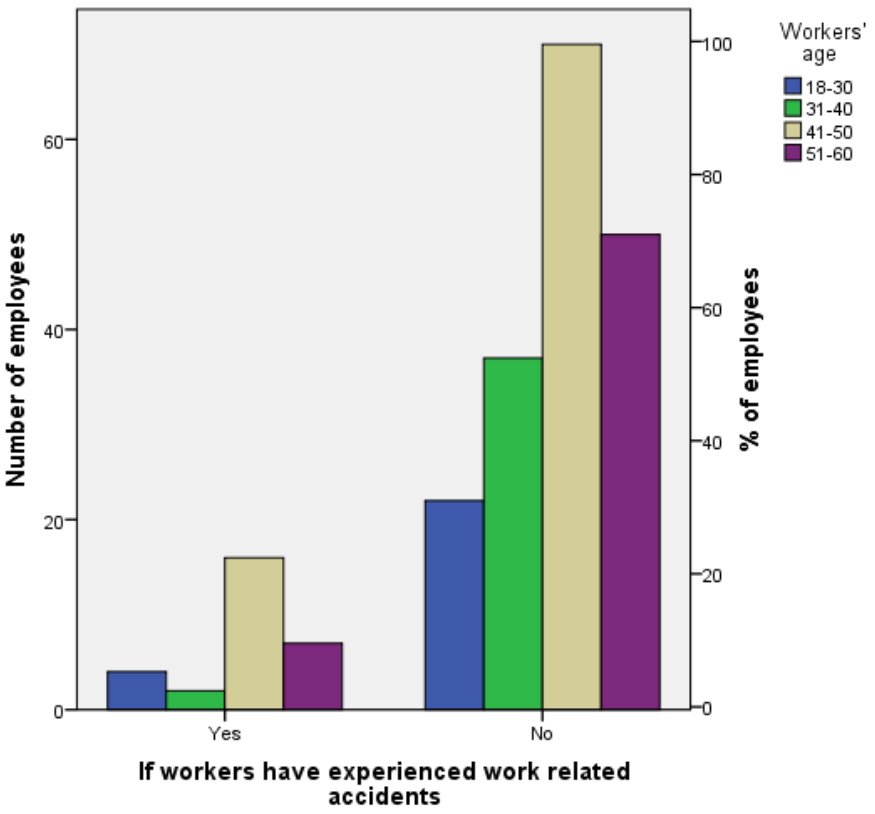

Figure 4.7: Age and number of employees who experienced accidents

4.2.1.4 Occupational Accidents and years worked in Institutions

The impact of the number of years worked in an institution on the proportion of workers who have experienced occupational accidents was assessed.123 (59.1 %), 37 (17.8 %), 32 (15.4 %) and 16 (7.7 %) of the employees had worked for a period of less than 15 years, 16-20 years, 21-30 years and 31-40 years respectively as per figure 4.8. 29 (13.9%) employees experienced accidents. Among those that experienced accidents 15 (51.7 %) employees had worked for less than 15 years, 7 (24.1 %) employees had worked for 16-20 years, 6 (20.7 %) employees had worked for 21-30 years and 1 (3.4%) employee had worked for 31-40 years. It can be deduced that the proportion of employees who experienced accidents varied inversely with the number of years worked in the institution. Hence higher number of years worked indicated more experienced workers and hence less number of accidents experienced. Hence it can be deduced that TVET Institutions with more experienced workers were more compliant with OSHA 2007.

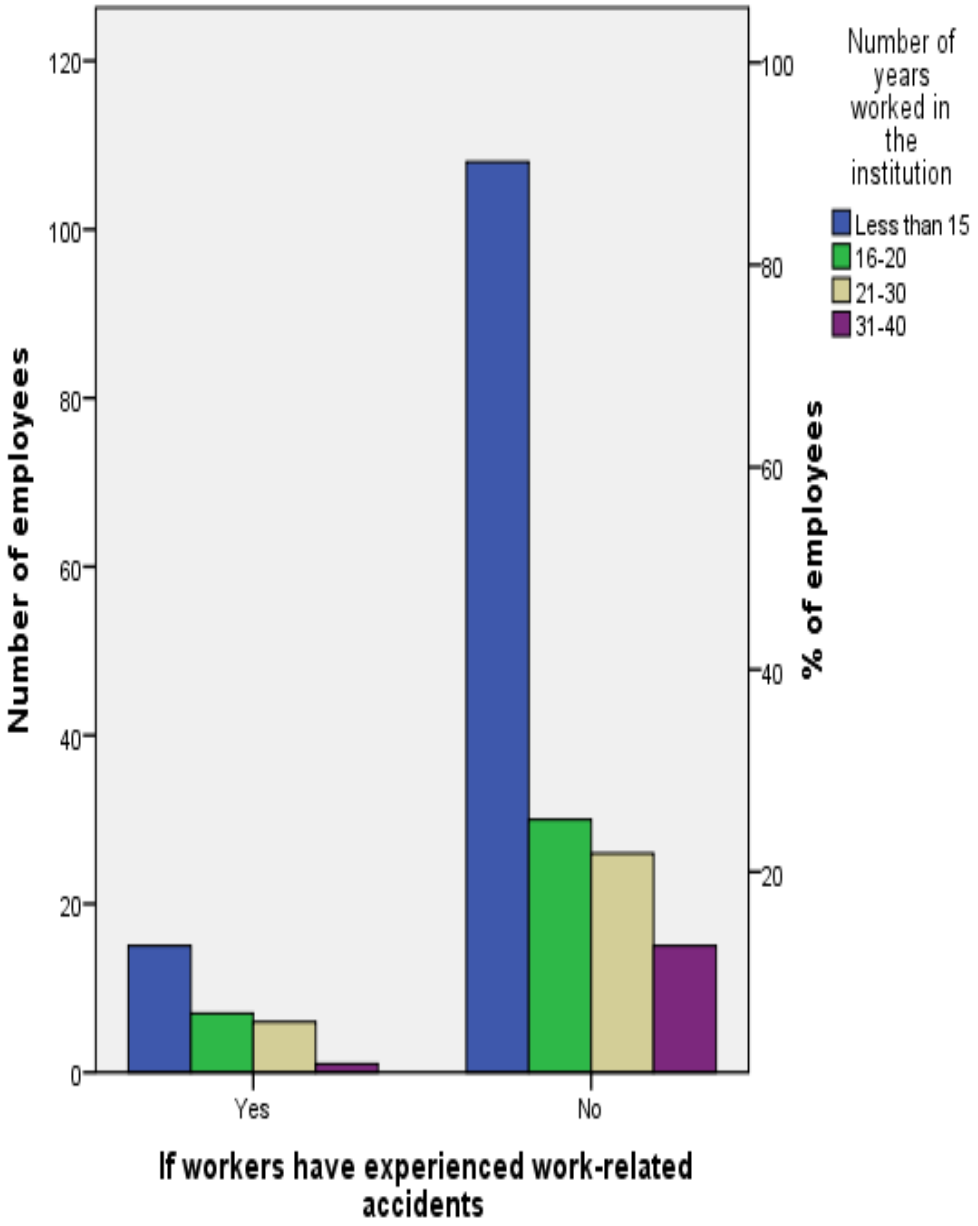

Figure 4.8: Number of workers who experienced accidents and period worked in the institution

4.2.1.5 Accidents and the Category of Work

The aim was to assess the relationship between the category of work and the number of employees who experience occupational accidents. The distribution of workers among sampled institutions was 116 (55.8 %) teachers, 16 (7.7%) technicians, 38 (18.3 %) non-teaching managerial staff and 38 (18.3 %) non-teaching support staff as per table 4.5. In total 29 (13.9%) employees experienced accidents. In total, the largest proportions of category of workers who experienced accidents were non-teaching managerial staff at 23.7 %, while the lowest proportion was non-teaching support staff at 7.9 %. Among those that experienced accidents there were 15 (51.7 %) teachers, 2 (6.9 %) technicians, 9 (31 %) non-teaching managerial staff and 3 (10.3 %) non-teaching support staff. It was observed that among employees who experienced accidents, teachers were the majority, and hence it can be deduced that teachers were less compliant with OSHA 2007 or were more exposed to occupational hazards compared to other category of workers.

Table 4.5: Number of workers who experienced occupational accidents and their category of work

			Category of your work				Total
			Teaching	Laboratory/workshop technician	Non-teaching managerial staff	Non-teaching support staff	
Experienced work accidents	Yes	Number of employees	15	2	9	3	29
		% experienced work accidents	51.7%	6.9%	31.0%	10.3%	100.0%
		% category of work	12.9%	12.5%	23.7%	7.9%	13.9%
		% of Total	7.2%	1.0%	4.3%	1.4%	13.9%
	No	Number of employees	101	14	29	35	179
		% experienced work accidents	56.4%	7.8%	16.2%	19.6%	100.0%
		% category of work	87.1%	87.5%	76.3%	92.1%	86.1%
		% of Total	48.6%	6.7%	13.9%	16.8%	86.1%
Total		Number of employees	116	16	38	38	208
		% experienced work accidents	55.8%	7.7%	18.3%	18.3%	100.0%
		% category of work	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	55.8%	7.7%	18.3%	18.3%	100.0%

4.2.1.6 Accidents and Reading of OSHA 2007 Act

The research aimed at assessing the relationship between reading OSHA Act and level of occurrence of occupational accidents among employees in TVET institutions.31 (14.9 %) employees had read OSHA Act while 177 (85.1 %) had not as shown in table 4.6 . 29 (13.9 %) employees had experienced accidents while 179 (86.1 %) had not. Among those who experienced work-related accidents, 14 (48.3 %) employees had read OSHA Act while 15 (51.7 %) had not. Among employees who had read the OSHA Act, 45.2 % had experienced work-related accidents while 54.8 % had not. The types of accidents reported includes: falls, severed limbs, fingers and toes, cuts by sharp edges, electrical shocks, falling from heights and being hit by falling objects. Employees also reported suffering from asthma/ allergy due to chalk dust, back pain due to improper chairs and headaches and eye strain due to glare from computer screens. The findings indicated that reading the act resulted to lower level of occupational accidents. It can be deduced that reading OSHA 2007 resulted in increased awareness leading to better OSH risk management practices and hence better compliance. The converse was also found to be true as most TVET institutions had few workers who had read the act, resulting to lower compliance with the legislation.

Table 4.6: Reading of OSHA 2007 and occupational accidents

			Have read OSHA 2007 Act		Total
			Yes	No	
Experienced work related accidents	Yes	Number of employees	14	15	29
		% experienced work accidents	48.3%	51.7%	100.0%
		% have read OSHA 2007 Act	45.2%	8.5%	13.9%
		% of Total	6.7%	7.2%	13.9%
	No	Number of employees	17	162	179
		% experienced work accidents	9.5%	90.5%	100.0%
		% have read OSHA 2007 Act	54.8%	91.5%	86.1%
		% of Total	8.2%	77.9%	86.1%
Total		Number of employees	31	177	208
		% experienced work accidents	14.9%	85.1%	100.0%
		% have read OSHA 2007 Act	100.0%	100.0%	100.0%
		% of Total	14.9%	85.1%	100.0%

4.2.1.7 Accidents and Safety Training

The aim was to assess the relationship between occurrence of occupational accidents and level of safety training among employees in sampled institutions. 54 (26 %) employees in the sample had received safety training while 154 (74 %) had not as shown in table 4.7. In total, 29 (13.9 %) employees had experienced accidents while 179 (86.1 %) had not. Among employees who had received safety training 72.2 % had not experienced accidents while 27.8% experienced accidents.

Table 4.7: Reading OSHA 2007 and occupational accidents

			Experienced Work Accidents		Total
			Yes	No	
Received Safety Training	Yes	Number	15	39	54
		% received safety training	27.8%	72.2%	100.0%
		% experienced work accidents	51.7%	21.8%	26.0%
		% of Total	7.2%	18.8%	26.0%
	No	Number of workers	14	140	154
		% received safety training	9.1%	90.9%	100.0%
		% experienced work accidents	48.3%	78.2%	74.0%
		% of Total	6.7%	67.3%	74.0%
Total		Number of workers	29	179	208
		% received safety training	13.9%	86.1%	100.0%
		% experienced work accidents	100.0%	100.0%	100.0%
		% of Total	13.9%	86.1%	100.0%

Table 4.8: chi-square tests table on safety training and accidents

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	11.636a	1	.001		
Continuity Correction b	10.131	1	.001		
Likelihood Ratio	10.390	1	.001		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	11.580	1	.001		
N of Valid Cases	208				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.53.

b. Computed only for a 2x2 table

An X^2 test was done to explore the relationship between safety training among workers and occupational accidents. The null hypothesis is that; there is no relationship between safety training and experiencing occupational accidents. From table 4.8 it is seen that $\chi(1) = 11.636, p = .001$. This implies that there is statistically significant association between safety training and work accidents. It can be deduced that, safety training among workers resulted in fewer accidents. This occurred because safety training improved safety knowledge and better risk management practices leading to better compliance with OSHA 2007.

4.2.1.8 General Accidents Registers

OSHA Act 2007 requires employers to maintain a general accident register for recording accidents (Kenya. Ministry of Labour, 2007). This is an indicator of compliance with the act.

Table 4.9: general accidents' registers

General accidents' registers		Number of TVET institutions	Percent
Presence of general accidents' registers	Yes	1	16.7
	No	5	83.3
	Total	6	100.0

The research findings as per table 4.9 indicated that 16.7 % of the institutions sampled had general registers to record occurrence of accidents while 83.3 % had no general registers as per the requirement of OSHA 2007. This was indicated very low compliance with legislation.

4.2.1.9 Registration as a Workplace

ALL employers are required to register workplaces as per OSHA 2007(Kenya. Ministry of Labour, 2007). Failure to register a workplace indicates non-compliance.

Table 4.10: Registration as a workplace

Registration of workplace	Response	Number of TVET institutions	Percent
Institution Registered as a workplace by Kenyan Government	Yes	3	50.0
	No	3	50.0
	Total	6	100.0

The research findings as per table 4.10 indicated that 50% of the institutions sampled had not registered as a workplace by the Kenyan government. This was against a requirement that all workplaces should be registered as workplaces as per OSHA 2007. Hence compliance level was low.

4.2.1.10 Annual Safety Audits

OSHA 2007 requires all workplaces be audited annually by a competent person and a report submitted to the Director, DOSHS (Kenya. Ministry of Labour, 2007). Undertaking safety audits is an indicator of compliance.

Table 4.11: Annual safety audits

Annual safety audit	Response	Number of TVET institutions	Percent
TVET Institution regularly audited by licensed auditors	Yes	1	16.7
	No	5	83.3
	Total	6	100.0

The research findings as per table 4.11 indicated that 16.7 % of the institutions sampled were regularly (annual) audited as per the requirements of OSHA 2007. 83.3 % were never regularly audited. Hence the level of compliance was very low.

4.2.2 Reading of OSHA 2007 Act

4.2.2.1 Reading of OSHA 2007 among TVET Institutions

The research aimed at assessing the level of reading of OSHA Act among employees in sampled TVET institutions.31 (14.9 %) employees had read OSHA Act 2007 while 177 (85.1 %) had not as shown in the figure 4.9 TVET institution tvt04 had the highest

proportion of workers who had read the act at 24.4 % while tvt05 had the lowest proportion at 3.7 %. It was observed that the level of awareness about this act was low among workers in sampled institutions which was interpreted to mean low levels of compliance with legislation.

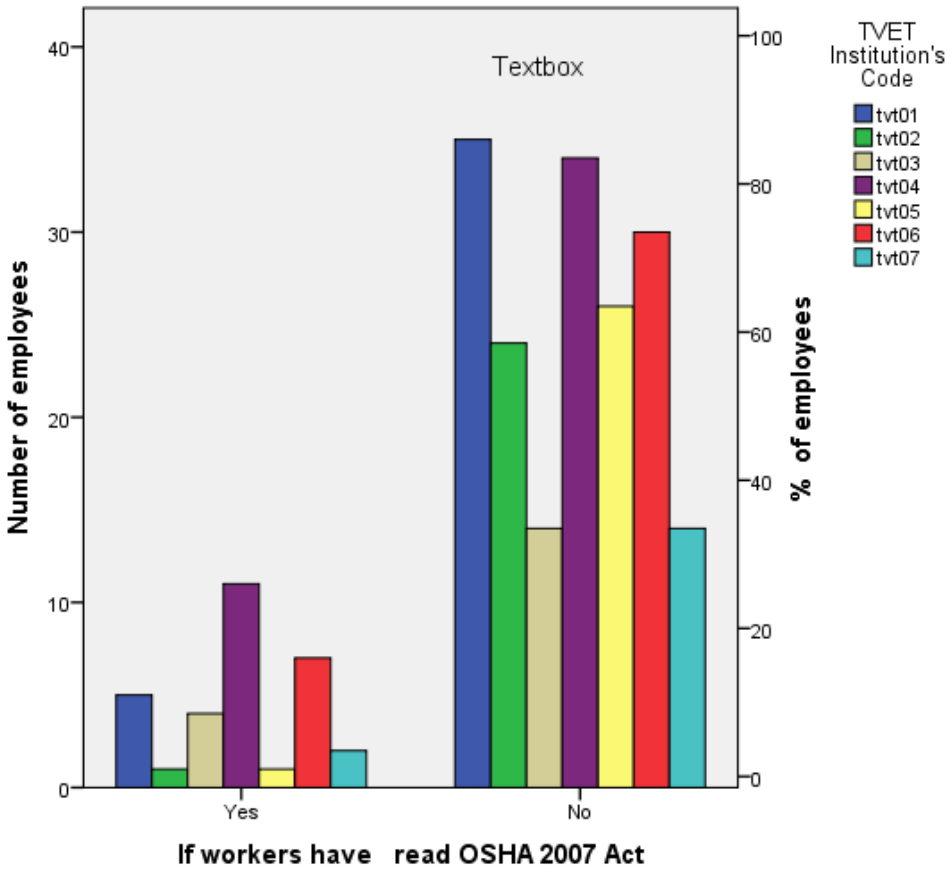

Figure 4.9: Reading of OSHA 2007 among employees in TVET Institutions

4.2.2.2 Reading of OSHA and Courses Offered

The aim was to assess the level of knowledge and awareness about OSHA 2007 among workers in TVET institutions classified as per the type of courses offered. There were 82 (39.4 %), 92 (44.2 %) and 34 (16.3 %) employees sampled from institutions offering AS-T/E-SS, AS-T/E and SS courses respectively as per table 4.12 .31 (14.9 %) employees had read OSHA 2007 while 177 (85.1 %) had not. Institutions offering AS-T/E-SS courses had the highest proportion of their workers who had read the act at 22 % while institutions offering AS-T/E courses had the lowest proportion at 7.6 %.It can be deduced that institutions offering AS-T/E courses had workers with the lowest level of knowledge and awareness about OSHA and hence low compliance levels. Among workers who had read the act, majority were from institutions offering AS-T/E-SS courses at 58.1% while the lowest were from institutions offering SS courses at 6 (19.4 %). It can be deduced that institutions offering AS-T/E-SS had workers who had knowledge on OSHA 2007 leading to better OSH risk management systems and hence better compliance with legislation.

Table 4.12: Reading of OSHA and courses offered

			Type of courses offered			Total
			AS-T/E-SS	AS-T/E	(SS)	
Have read OSHA 2007 Act	Yes	Number of employees	18	7	6	31
		% have read OSHA 2007 Act	58.1%	22.6%	19.4%	100.0%
		% Type of courses offered	22.0%	7.6%	17.6%	14.9%
		% of Total	8.7%	3.4%	2.9%	14.9%
	No	Number of employees	64	85	28	177
		% have read OSHA 2007 Act	36.2%	48.0%	15.8%	100.0%
		% Type of courses offered	78.0%	92.4%	82.4%	85.1%
		% of Total	30.8%	40.9%	13.5%	85.1%
Total		Number of employees	82	92	34	208
		% have read OSHA 2007 Act	39.4%	44.2%	16.3%	100.0%
		% Type of courses offered	100.0%	100.0%	100.0%	100.0%
		% of Total	39.4%	44.2%	16.3%	100.0%

Key: AS-T/E-SS: Applied Sciences-Technology/Engineering-Social Sciences

AS-T/E: Applied Sciences-Technology/Engineering SS: Social Sciences

4.2.2.3 Reading OSHA and job title

The research aimed at assessing the level of knowledge and awareness about OSHA 2007 among workers in TVET institutions holding different job titles in different departments. 31 (14.9 %) employees had read OSHA while 177 (85.1 %) had not as shown in table 4.12. Teachers in institutions offering SS courses had the highest proportion of employees who had read OSHA 2007 at 28.6 % while none of the laboratory technicians in institutions offering AS courses had read the act as shown in figure 4.10. It can be observed that awareness about OSHA 2007 was low among laboratory and workshop technicians, which translates into low levels of compliance with legislation. It can be deduced that laboratory and workshop technicians were the least compliant with OSHA 2007, yet their work environment was more hazardous compared to other groups of workers.

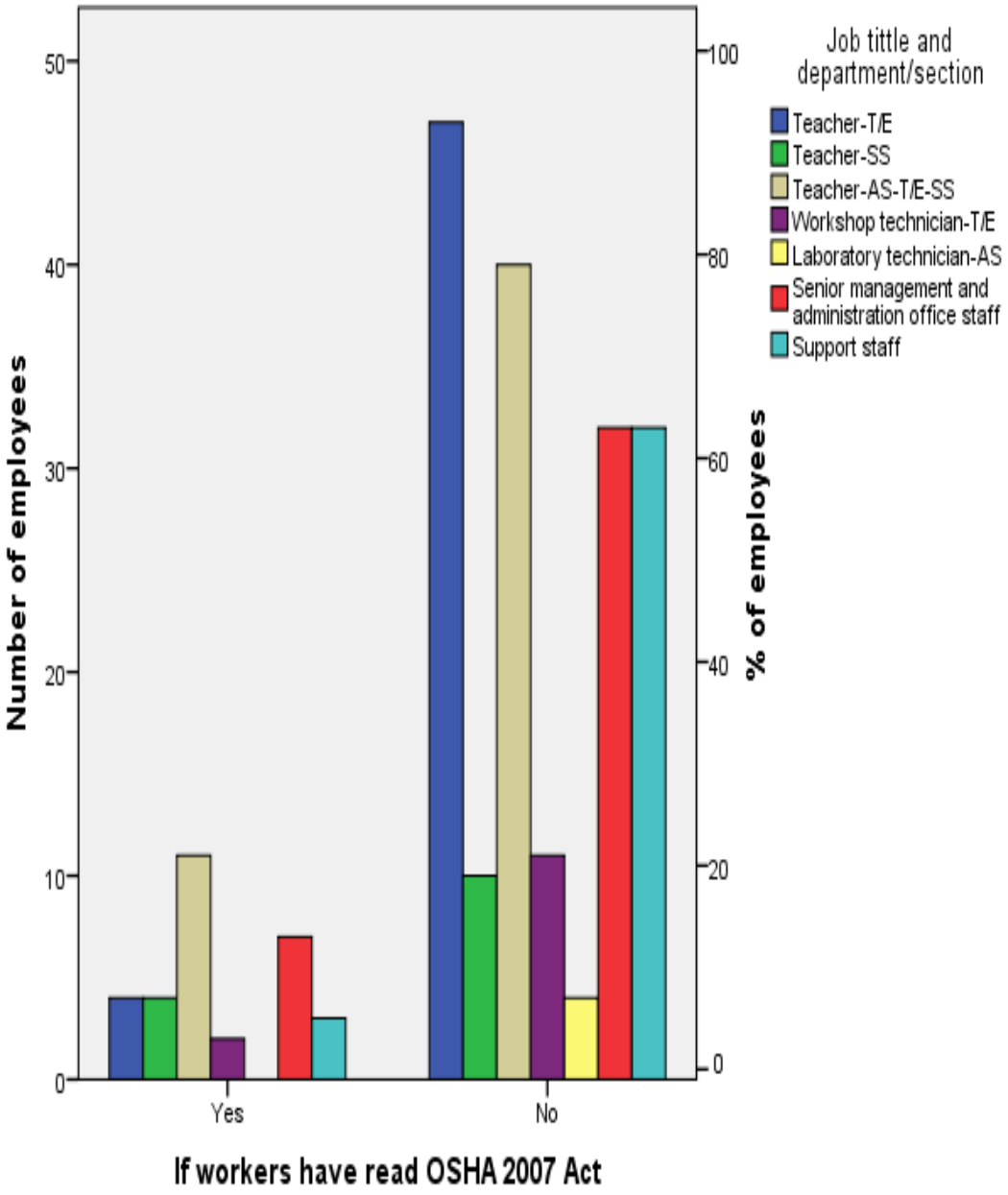

Figure 4.10: Reading OSHA among classes of workers

4.2.2.4 Educational Level and Reading of OSHA

The aim was to assess the level of knowledge and awareness about OSHA among workers in TVET institutions who had attained different levels of education. 31 (14.9 %) employees had read OSHA while 177 (85.1 %) had not as shown in the figure 4.11. Employees with undergraduate degrees comprised the highest proportion of workers who had read the act at 21.4 % while none of the workers with primary school qualifications had read the act. An X^2 was done to explore the relationship between reading of OSHA and level of education of workers.

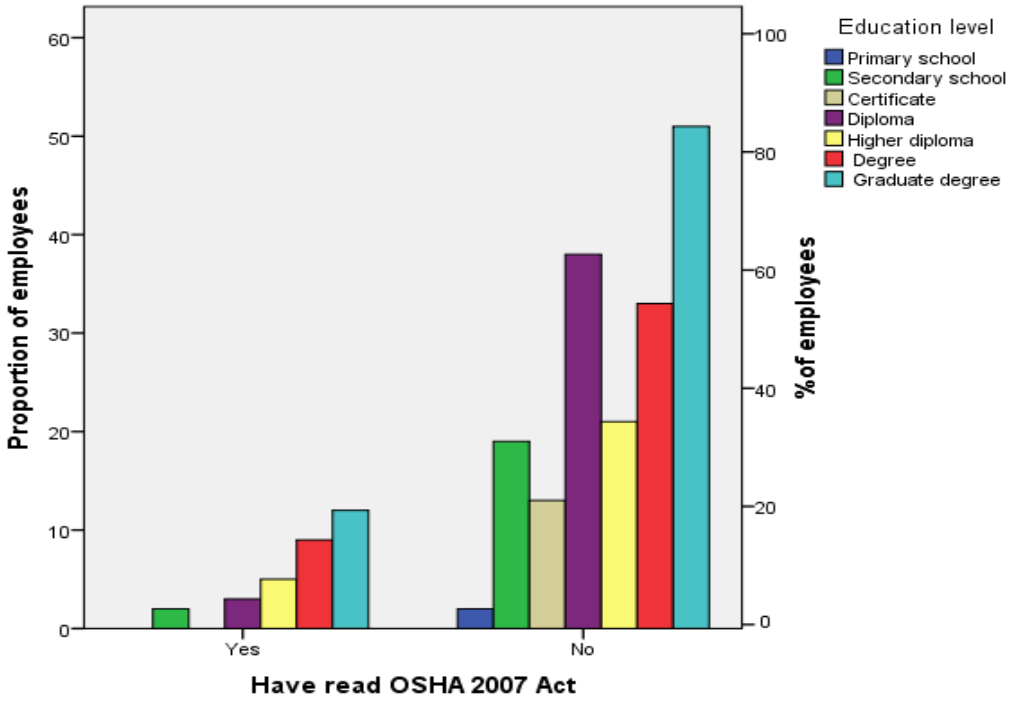

Figure 4.11: Reading of OSHA and level of education

The null hypothesis is set that; there is no relationship between reading of OSHA 2007 and level education of workers. From table 4.13 it is seen that χ (1) = 7.614, p =

.268.This tells us that there is no statistically significant association between reading OSHA 2007 and level of education of employees; since p> .05.

Table 4.13: Chi-square tests table on reading of OSHA and level of education

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.614[a]	6	.268
Likelihood Ratio	10.026	6	.124
Linear-by-Linear Association	4.957	1	.026
N of Valid Cases	208		

a. 5 cells (35.7%) have expected count less than 5. The minimum expected count is .30.

4.2.2.5 Reading of OSHA 2007 and Work Category

The study aimed at assessing the level of knowledge and awareness about OSHA among various categories of workers in sampled TVET institutions. Among sampled workers, teachers had the highest number of workers at 116 (55.8 %) while non-teaching managerial staff and non-teaching support staff each comprised 38 (18.3 %) employees and technicians 16 (7.7 %). 31 (14.9 %) employees had read OSHA while 177 (85.1 %) had not as shown in the table 4.14. Among the four classes of workers, non-teaching managerial staff had the highest proportion of employees who had read the act at 21.1 % while non-teaching support staff had the lowest at 5.3 %. It was noted that among employees who had read the act, 61.3 % were teachers and were the majority. It can be deduced that non- teaching managerial staff had the highest proportion of workers with high level of knowledge and awareness among various category of workers while teachers comprised the of majority workers who had knowledge and awareness about OSHA. The small number of workers who had read OSHA 2007 resulted in low compliance levels with legislation.

Table 4.14: Awareness of OSHA as per category of workers

			Category of work				Total
			Teaching	Laboratory/workshop technician	Non-teaching managerial staff	Non-teaching support staff	
Read OSHA 2007 Act	Yes	Number of employees	19	2	8	2	31
		% read OSHA 2007 Act	61.3%	6.5%	25.8%	6.5%	100.0%
		% category of work	16.4%	12.5%	21.1%	5.3%	14.9%
		% of Total	9.1%	1.0%	3.8%	1.0%	14.9%
	No	Number of employees	97	14	30	36	177
		% read OSHA 2007 Act	54.8%	7.9%	16.9%	20.3%	100.0%
		% category of work	83.6%	87.5%	78.9%	94.7%	85.1%
		% of Total	46.6%	6.7%	14.4%	17.3%	85.1%
Total		Number of employees	116	16	38	38	208
		% read OSHA 2007 Act	55.8%	7.7%	18.3%	18.3%	100.0%
		% category of work	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	55.8%	7.7%	18.3%	18.3%	100.0%

4.2.3 Safety Training

The aim was to assess the level of safety training among employees in sampled TVET institutions. This safety training level was compared with various factors such as; Type of Courses Offered, Job Tittle, Years worked in Institution, employees highest Educational Level, Reading of OSHA 2007 and Experiencing Accidents. This tested the effect of safety training on each of the factors.

.2.3.1 Safety Training among TVET Institutions

The aim was to assess the level of safety training among employees in sampled TVET institutions. 54 (26 %) employees had received safety training while 154 (74 %) had not as shown in table 4.15 TVET institution tvt03 had the highest proportion of their employees who were trained at 44.4 % while tvt07 had the lowest at 12.5 %.Among workers trained in safety ,tvt01 had the majority at 27.8%. It can be deduced that the small number of employees trained in safety implied low knowledge on OSH and hence low compliance.

Table 4.15: number of employees trained on safety per TVET institution

			TVET Institution's Code							Total
			tvt01	tvt02	tvt03	tvt04	tvt05	tvt06	tvt07	
received safety training	Yes	Number of employees	15	8	8	10	4	7	2	54
		% received safety training	27.8%	14.8%	14.8%	18.5%	7.4%	13.0%	3.7%	100.0%
		% Institution's Code	37.5%	32.0%	44.4%	22.2%	14.8%	18.9%	12.5%	26.0%
		% Total	7.2%	3.8%	3.8%	4.8%	1.9%	3.4%	1.0%	26.0%
	No	Number of employees	25	17	10	35	23	30	14	154
		% received safety training	16.2%	11.0%	6.5%	22.7%	14.9%	19.5%	9.1%	100.0%
		% Institution's Code	62.5%	68.0%	55.6%	77.8%	85.2%	81.1%	87.5%	74.0%
		% of Total	12.0%	8.2%	4.8%	16.8%	11.1%	14.4%	6.7%	74.0%
Total		Number of employees	40	25	18	45	27	37	16	208
		% received safety training	19.2%	12.0%	8.7%	21.6%	13.0%	17.8%	7.7%	100.0%
		% TVET Institution's Code	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	19.2%	12.0%	8.7%	21.6%	13.0%	17.8%	7.7%	100.0%

4.2.3.2 Safety Training and Type of Courses Offered

The research aimed at assessing the level of safety training among employees in sampled TVET institutions classified as per the type of courses offered. There were 82 (39.4 %), 92 (44.2 %) and 34 (16.3 %) employees in institutions offering AS-T/E-SS, AS-T/E and SS courses respectively as shown in table 4.16. 54 (26 %) employees had received safety training while 154 (74 %) had not. Institutions offering SS courses had the highest proportion of their employees trained in safety at 29.4 % while those offering AS-T/E-SS had the lowest proportion of their employees trained in safety. It can be deduced that institutions offering SS courses were more compliant with OSHA on safety training than all the others as they had a bigger proportion of employees trained in safety. Institutions offering AS-T/E-SS courses were least compliant.

Table 4.16: number of employees trained on safety in TVET institutions as per type of courses offered

			Type of courses offered			Total
			AS-T/E-SS	AS-T/E	SS	
Have received any safety training	Yes	Number of employees	17	27	10	54
		% received safety training	31.5%	50.0%	18.5%	100.0%
		% courses offered	20.7%	29.3%	29.4%	26.0%
		% of Total	8.2%	13.0%	4.8%	26.0%
	No	employees	65	65	24	154
		% received safety training	42.2%	42.2%	15.6%	100.0%
		% courses offered	79.3%	70.7%	70.6%	74.0%
		% Total	31.3%	31.3%	11.5%	74.0%
Total		employees	82	92	34	208
		% received safety training	39.4%	44.2%	16.3%	100.0%
		% Type of courses offered	100.0%	100.0%	100.0%	100.0%
		% of Total	39.4%	44.2%	16.3%	100.0%

Key: AS-T/E-SS: Applied Sciences-Technology/Engineering-Social Sciences
AS-T/E: Applied Sciences-Technology/Engineering SS: Social Sciences

4.2.3.3 Safety Training and Job Title or department

The aim was to assess the level of safety training among employees in sampled TVET institutions classified as per the job title and department. Teachers from institutions with departments offering T/E courses and AS-T/E-SS courses each comprised the majority of employees at 51 (24.6 %) as in table 4.17. 54 (26 %) employees had received safety training while 154 (74 %) had not. Non-teaching managerial staff had the highest proportion of staff trained in safety at 35.9 % while laboratory technicians from institutions with departments offering AS courses had no employees trained in safety. It can be deduced that institutions with departments offering AS courses were least compliant with OSHA on safety training. The findings indicated that the level of compliance with OSHA 2007 was lowest in institutions offering AS courses.

Table 4.17: Number of employees trained in safety as per job title and department

			Job title and department							Total
			Teacher-T/E	Teacher-SS	Teacher-AS-T/E-SS	Workshop technician-T/E	Laboratory technician-AS	Non-teaching managerial staff	Non-teaching Support staff	
Received any safety training	Yes	Number of employees	16	3	12	1	0	14	8	54
		Received safety training	29.6%	5.6%	22.2%	1.9%	0.0%	25.9%	14.8%	100.0%
		% Job tittle	31.4%	21.4%	23.5%	7.7%	0.0%	35.9%	22.9%	26.1%
		% of Total	7.7%	1.4%	5.8%	0.5%	0.0%	6.8%	3.9%	26.1%
	No	employees	35	11	39	12	4	25	27	153
		% received safety training	22.9%	7.2%	25.5%	7.8%	2.6%	16.3%	17.6%	100.0%
		% Job tittle and department	68.6%	78.6%	76.5%	92.3%	100.0%	64.1%	77.1%	73.9%
		% of Total	16.9%	5.3%	18.8%	5.8%	1.9%	12.1%	13.0%	73.9%
Total		Number of employees	51	14	51	13	4	39	35	207
		% received safety training	24.6%	6.8%	24.6%	6.3%	1.9%	18.8%	16.9%	100.0%
		% Job tittle	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	24.6%	6.8%	24.6%	6.3%	1.9%	18.8%	16.9%	100.0%

Key: AS-T/E-SS: Applied Sciences-Technology/Engineering-Social Sciences

AS-T/E: Applied Sciences-Technology/Engineering **SS:** Social Sciences

4.2.3.4 Safety Training and Number of Years worked in Institution

The research aimed at assessing the relationship between the level of safety training among employees and the number of years worked in sampled TVET institutions. Majority (59.1 %) of employees had worked for less than 15 years while 7.7 % had worked between 31 and40 years in the institution as shown in table 4.18. 54 (26 %) employees had received safety training while 154 (74 %) had not. Among the 54 employees who had received safety training, the majority had worked for a period less than 15 years at 66.7 % while the minority at 3.7 % had worked for between 31 and 40 years. It can be deduced that among employees trained in safety, the number of employees decreased as the number of years worked for increased. This indicated that more experienced workers lacked critical safety skills resulting to low compliance levels with OSHA 2007.This may appear to be contradictory but may be as a result of bias training policies where less experienced workers access safety training at the expense of more experienced employees.

Table 4.18: Safety training and number of years worked in institution

			Number of years worked in the institution				Total
			Less than 15	16-20	21-30	31-40	
Have received any safety training	Yes	Number of employees	36	11	5	2	54
		% received safety training	66.7%	20.4%	9.3%	3.7%	100.0%
		% number of years worked	29.3%	29.7%	15.6%	12.5%	26.0%
		% of Total	17.3%	5.3%	2.4%	1.0%	26.0%
	No	Number of employees	87	26	27	14	154
		% have received any safety training	56.5%	16.9%	17.5%	9.1%	100.0%
		% number of years worked in the institution	70.7%	70.3%	84.4%	87.5%	74.0%
		% of Total	41.8%	12.5%	13.0%	6.7%	74.0%
Total		Number of employees	123	37	32	16	208
		% have received any safety training	59.1%	17.8%	15.4%	7.7%	100.0%
		% number of years worked in the institution	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	59.1%	17.8%	15.4%	7.7%	100.0%

4.2.3.5 Safety Training and highest Educational Level

The study aimed at assess the relationship between the level of safety training among employees and the highest level of education attained by employees in sampled TVET institutions. Employees with post-graduate qualifications were the majority at 63 (30.3 %) as shown in table 4.19. 54 (26 %) employees had received safety training while 154 (74 %) had not.

Among those trained in safety, employees with post-graduate qualifications were the majority at 33.3 % while no employee with primary level education was trained in

safety. It can be deduced that the higher the level of education attained by workers, the higher were the number of employees trained in safety.

Table 4.19: Safety training and highest education level attained

			Highest education level attained							Total
			Primary school	Secondary school	Certificate	Diploma	Higher diploma	Under Graduate degree	Post graduate degree	
Have received any safety training	Yes	Number of employees	0	6	3	6	9	12	18	54
		% received safety training	0.0%	11.1%	5.6%	11.1%	16.7%	22.2%	33.3%	100.0%
		% highest education level	0.0%	28.6%	23.1%	14.6%	34.6%	28.6%	28.6%	26.0%
		% of Total	0.0%	2.9%	1.4%	2.9%	4.3%	5.8%	8.7%	26.0%
	No	Employees	2	15	10	35	17	30	45	154
		% received safety training	1.3%	9.7%	6.5%	22.7%	11.0%	19.5%	29.2%	100.0%
		% highest education level attained	100.0%	71.4%	76.9%	85.4%	65.4%	71.4%	71.4%	74.0%
		% Total	1.0%	7.2%	4.8%	16.8%	8.2%	14.4%	21.6%	74.0%
Total		employees	2	21	13	41	26	42	63	208
		% received safety training	1.0%	10.1%	6.3%	19.7%	12.5%	20.2%	30.3%	100.0%
		% highest education level	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	1.0%	10.1%	6.3%	19.7%	12.5%	20.2%	30.3%	100.0%

4.2.3.6 Safety Training and category of Work

The aim was to assess the relationship between the level of safety training among employees and the category of workers in sampled TVET institutions. There were 116

(55.89 %), 16 (7.7%), 38 (18.3 %) and 38 (18.3 %) teachers, technicians, non-teaching managerial staff and non-teaching support staff respectively. 54 (26 %) employees had received safety training while 154 (74 %) had not. Teachers constituted the highest number of workers who were trained in safety at 55.6 % while laboratory/workshop technicians were the least at 1.9 %. Non-teaching managerial staff had the highest proportion of workers trained in safety at 42.1% while laboratory/workshop technicians had the lowest at 6.3% as shown in figure 4.12. It can be deduced that the level of safety training among laboratory technicians is low yet their work environment is more hazardous than other workstations in institutions. This is an indicator of low levels of compliance with OSHA.

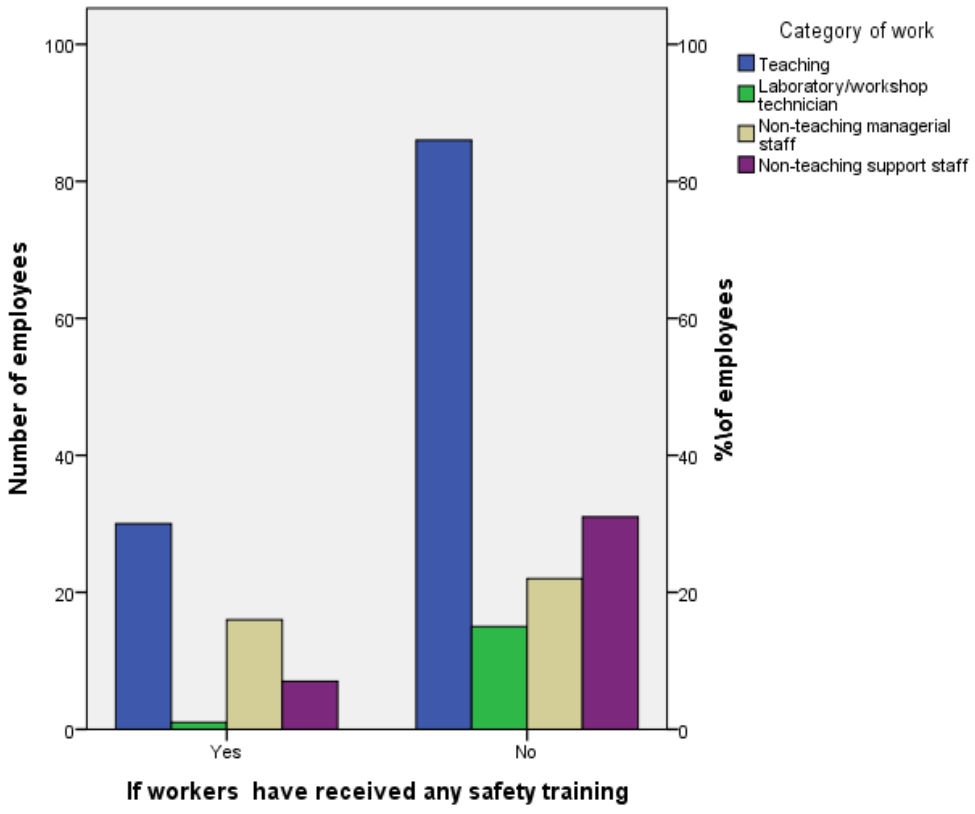

Figure 4.12: Safety Training and category of Work

4.2.3.7 Safety Training and of Reading of OSHA 2007

The research aimed at assessing the relationship between the level of safety training among employees and the understanding of OSHA 2007 by employees in sampled TVET institutions.

54 (26 %) employees had received safety training while 154 (74 %) had not as shown in table 4.20. 31 (14.9 %) employees sampled had read the act while 177 (85.1 %) had not. Among those trained in safety, 29.6 % had read the act while 74.4 % had not. Among those who had read the act, 51.6% had received safety training while 48.4% had not. Similarly, among those who had not read the act, 78.5% had not received any safety training while 21.5% were trained in safety. It can be deduced that, the level of understanding OSHA 2007 among employees was low as only 29.6 % had read the act. Similarly lack of safety training was directly proportional to the level of reading the act by employees. Training in safety lead to reading and applying the act and hence improvement in compliance. The converse was true as was observed that employees who were not trained in safety comprised the largest proportion of those who had not read the OSHA 2007 at 90.3%.

Table 4.20: safety training and of reading of OSHA 2007

			Have read OSHA 2007 Act		Total
			Yes	No	
Have received any safety training	Yes	Number of employees	16	38	54
		%received safety training	29.6%	70.4%	100.0%
		% read OSHA 2007 Act	51.6%	21.5%	26.0%
		% of Total	7.7%	18.3%	26.0%
	No	Number of employees	15	139	154
		% received safety training	9.7%	90.3%	100.0%
		% read OSHA 2007 Act	48.4%	78.5%	74.0%
		% of Total	7.2%	66.8%	74.0%
Total		Number of employees	31	177	208
		% received safety training	14.9%	85.1%	100.0%
		% read OSHA 2007 Act	100.0%	100.0%	100.0%
		% of Total	14.9%	85.1%	100.0%

4.2.3.8 Safety Training and Experiencing Accidents

The aim was to assess the relationship between the level of safety training among employees and the number of accidents experienced by employees in sampled TVET institutions.29 (13.9 %) experienced accidents while 179 (86.1 %) did not.54 (26 %) employees had received safety training while 154 (74 %) had not as shown in table 4.21. Among employees who had received safety training, 27.8% experienced work-related accidents while 72.2% did not. It can be deduced that the level of safety training among employees is low at 26 %.Among those who experienced accidents, 51.7% had received safety training while 48.3 % had not. It can be deduced that 48.3% of those who experienced accidents were not trained in safety and this comprised a significant proportion of this group of workers. Therefore a significant portion of those who experienced accidents were not trained in safety. It can also be deduced that safety training resulted in reduction of occupational accidents.

Table 4.21: safety trained and occupational accidents

			Have experienced work related accidents		Total
			Yes	No	
Received safety training	Yes	Number of employees	15	39	54
		% received safety training	27.8%	72.2%	100.0%
		% experienced work accidents	51.7%	21.8%	26.0%
		% of Total	7.2%	18.8%	26.0%
	No	Number of employees	14	140	154
		% received any safety training	9.1%	90.9%	100.0%
		% experienced work accidents	48.3%	78.2%	74.0%
		% of Total	6.7%	67.3%	74.0%
Total		Number of employees	29	179	208
		% received safety training	13.9%	86.1%	100.0%
		% experienced work accidents	100.0%	100.0%	100.0%
		% of Total	13.9%	86.1%	100.0%

4.3 Analysis of Key Dimensions on Level of Compliance with OSHA 2007

4.3.1 Introduction

In this study three variables as per the conceptual framework were measured by operationalization into ten key dimensions. The ten key dimensions analyzed were: 'safety training' (KD 1), 'communication on information on provisions of OSHA 2007' (KD2), 'information on administration and reinforcement of OSHA 2007' (KD 3), 'risk assessment' (KD 4), 'workplace inspections and audits' (KD 5), 'safety and health of work environment' (KD 6), 'safe work procedures, safety rules and permits to work'

(KD 7), ‘work machinery/equipment, materials and process safety (KD 8), duties of employers, employees and other stakeholders’ (KD9) and top management commitment to safety (KD10) . Each key dimension was analyzed on its own and then related key dimensions were transformed back into three variables in order to carry out regression analysis (Grace-Martin, K., 2014).Mean values from KD1, KD2 and KD3 were transformed to get mean values for the first independent variable ‘level of knowledge and awareness on OSHA 2007’. Mean values from KD4, KD5 and KD6 were transformed to get mean values for the second independent variable ‘OSH risk management practices’. Mean values from KD7, KD8, KD9 and KD10 were transformed to get mean values for the third independent variable ‘safe systems of work’.

Mean scores and standard deviations of key dimensions were analyzed to determine the employees perception of the level of compliance with Occupational Safety and Health Act 2007 in TVET institutions. The mean was obtained by getting the sum of all the Likert items in a question and dividing by the total number of items. The standard deviation is a standard measure of the spread of responses from the average mean within a variable. A large standard deviation indicates large variation of data points from the mean while low standard deviation indicates low variation among responses. The analysis of the means and standard deviations of key dimensions is a useful tool for evaluating employees perceptions towards safety and hence towards level of compliance with OSHA 2007 (Kao, 2008), (Lai, 2006) (Njeru, 2013).The mean score equivalent to 0.1 to 2.50 represented perceptions of level of compliance that was regarded as least acceptable (LA), an implication of non-existence of safety management systems on a continuous Likert scale ($0.1 \leq LA \leq 2.50$) as summarized in table4.3.1.2 .The mean score equivalent to 2.51 to 3.50 represented perceptions of level of compliance that was regarded as moderately acceptable (MA). MA implied presence of weak safety management systems on a Likert scale ($2.51 \leq MA \leq 3.50$). Scores equivalent to 3.51 to 5.0 were regarded as highly acceptable (HA) and represented perceptions of high level

of compliance with presence of visible and robust safety management systems on a Likert Scale (3.51≤ HA≤ 5.0) (Kao, 2008), (Lai, 2006) and (Njeru, 2013). Table 4.22 shows the mean scores and standard deviations obtained from the sampled TVET institutions spread across the key dimensions while table 4.3.1.3 shows a summary of findings from the key dimensions.

Table 4.22: Mean scores and standard deviations from the sampled TVET institutions across the ten key dimensions

TVET Code	Statistics	KD 1	KD 2	KD 3	KD 4	KD 5	KD 6	KD 7	KD 8	KD 9	KD 10
tvt01	Mean	2.46	2.65	2.57	2.80	2.57	3.20	3.07	2.61	2.46	3.22
	Std. Deviation	.628	.744	.717	1.026	1.049	.760	.619	.753	.914	.808
tvt02	Mean	2.34	2.80	2.70	2.76	2.40	3.32	3.37	2.81	2.76	3.03
	Std. Deviation	1.014	1.058	.735	.843	1.002	.840	.767	1.024	.893	.896
tvt03	Mean	2.61	3.06	2.84	2.74	2.66	2.95	3.17	2.83	2.91	3.36
	Std. Deviation	.811	.924	.810	1.193	1.065	1.201	1.280	*1.202*	1.087	.726
tvt04	Mean	2.21	2.52	2.40	2.46	2.19	3.34	3.28	2.89	2.36	2.98
	Std. Deviation	.985	1.023	.822	1.055	1.053	.897	.827	.936	1.154	.815
tvt05	Mean	1.97	2.31	2.18	2.19	2.17	2.86	2.73	2.25	2.28	2.41
	Std. Deviation	.555	.722	.638	.676	.752	.933	.748	.932	.779	.904
tvt06	Mean	2.09	2.36	2.21	2.24	2.21	3.29	2.80	2.64	2.61	2.95
	Std. Deviation	.852	.799	.904	.951	.963	.860	.813	.856	.872	.790
tvt07	Mean	2.53	2.80	2.94	3.27	2.66	3.48	3.21	2.86	2.39	3.07
	Std. Deviation	.768	.528	.895	.781	.668	*.372*	*.372*	.680	.498	.426
Total	Mean	2.28	2.59	2.49	2.57	2.37	3.22	3.08	2.69	2.51	2.99
	Std. Deviation	.838	.879	.818	.995	.978	.873	.816	.919	.945	.832

Table 4.23: Table for measuring and interpreting perceptions on level of compliance with OSHA 2007 from mean scores from key dimensions

Mean scores On Likert Scale	**Perceptions on Safety & Compliance with OSHA 2007 Act**	I**mplications**
0.1-2.50	Least Acceptable (**LA**)	Non-existence of Safety management systems/Compliance on Likert Scale
2.51-3.50	Moderately Acceptable (**MA**)	Existence of Weak Safety Management Systems /Compliance on Likert Scale
3.51-5.0	Highly Acceptable (**HA**)	Existence of visible management systems /compliance

Table 4.24: Summary findings from the key dimensions

Key Dimensions	Lowest mean (Range, Institution)	Highest mean (Range, Institution)	Interpretation(Compliance Level)
KD 1	1.97 (tvt05,LA)	2.61 (tvt03,MA)	5 institutions' means below 2.50-employes felt safety training was poor- **non-compliance**
KD 2	2.31 (tvt05,LA)	3.06 (tvt03,MA)	5 institutions means within MA , hence level of communication weak-**low** compliance level
KD 3	2.18 (tvt05,LA)	2.94 (tvt07,MA)	3 institutions with means below 2.50-information on administration and reinforcement of OSHA unavailable or unclear- **non-compliance**;4 institutions means within MA , hence- **low** compliance level
KD 4	2.19 (tvt05,LA)	3.27 (tvt07,MA)	5 means within MA range-employees felt there were weak risk assessment systems in place- **low** compliance
KD 5	2.17 (tvt05,LA)	2.66 (tvt03,MA)	4 institution's means below 2.50- non-existent inspection and audit systems-non- compliance; 3 within MA-inspections and audits systems weak-**low** compliance
KD 6	2.86 (tvt05,MA)	3.48 (tvt07,HA)	All institution's means within MA range- weak machine-process safety systems-**low** compliance
KD 7	2.73 (tvt05,MA)	3.37 (tvt02,HA)	All institution's means within MA range- weak systems to support work environment-**low compliance**
KD 8	2.25 (tvt05,LA)	2.89 (tvt04,MA)	6 institution's means within MA range-weak systems for safe work procedures-**low** compliance
KD 9	2.28 (tvt05,LA)	2.91 (tvt03,MA)	4 institution's means within LA-non-existence top management commitment to safety- **non-compliance;** 3 institutions means within MA-weak top management commitment to safety-**low** compliance
KD 10	2.41 (tvt05,LA)	3.46 (tvt03MA)	1 institution's mean within LA while 6 means within MA-weak systems to support awareness of duties of stakeholders under OSHA 2007-**low** compliance

4.3.2 Key Dimension 1: Safety Training

The research aimed at establishing the level and quality of safety training among employees across the TVET institutions sampled. All the mean scores in this key dimension lay between 1.97 (LA) in tvt05 and 2.61(MA) in tvt03 as shown in table 4.3.1. Two institutions tvt03 and tvt07 had their mean scores in the range of MA at 2.53. Responses from institution tvt07 indicated existence of weak safety management systems and hence low compliance on Likert Scale. Five institutions had their means below 2.50 and hence were in the category of LA. These were tvt01, tvt02, tvt04, tvt05 and tvt06.Employees in these six institutions perceived that safety training was non-existent and hence there was no compliance with OSHA 2007 that requires that employees be trained on safety upon hiring and periodically during the service. Therefore two institutions had low compliance on OSHA 2007 while five institutions did not comply. Hence, there was no compliance in this key dimension on safety training. This was consistent with findings from a study done on safety standards of public secondary schools in Nyamira County in Kenya where it was found that 27% of head teachers and 9% of teachers were trained in safety (Migiro, 2012).Similarly in a research on a case study of Egerton University on implementation of OSH management systems it was found that 88% of workers had not trained in safety (Njeru, 2014).

4.3.3 Key Dimension 2: Communication on Information on Provisions of OSHA 2007

The research aimed at establishing the level of awareness on information on provisions of OSHA 2007 among employees across the TVET institutions sampled. The researcher also wanted to establish the effectiveness of communication from employers to employees on information on provisions of OSHA 2007 across the TVET institutions sampled. Mean scores in this key dimension ranged from 2.31(LA) to 3.06(MA) for tvt05 and tvt03 respectively as shown in table 4.24. Institutions tvt05 and tvt06 had their means within least acceptable range as they were below 2.50.This indicated non-

existence of safety management systems on communication on information on provisions of OSHA 2007 as well as no awareness of provisions of OSHA 2007 among employees. Therefore there was no compliance with OSHA 2007 on a Likert Scale in institutions tvt05 and tvt06. Institutions tvt01, tvt02, tvt03, tvt04 and tvt07 had their means within moderately acceptable range. Therefore the effectiveness of communication on provisions of OSHA from employers to employees was weak. The results also indicate that the level of awareness among workers on provisions of OSHA was low. Responses from the five TVET Institutions in this key dimension indicated existence of weak safety management systems on communication on information on provisions of OSHA 2007 and on awareness of provisions of OSHA 2007 and hence low compliance with OSHA 2007 on a Likert Scale. Therefore, in this key dimension, two institutions had zero compliance while five institutions had low compliance with OSHA 2007.Consequently; the level of compliance was very low on communication on information on provisions of OSHA 2007 as well as on awareness of provisions of OSHA 2007 among employees. This results were consistent with findings from study on workplace fire safety preparedness among KMTC Colleges in Kenya. The findings from KMTC Colleges found that only 48.2 % of staff had adequate safety knowledge while the rest had no knowledge (Mwikali, 2014).

4.3.4 Key Dimension 3: Information on Administration and Reinforcement of OSHA 2007

The aim of the study was to establish the level of awareness on information on administration and reinforcement of OSHA 2007. The researcher also wanted to establish the effectiveness of administration and reinforcement of OSHA 2007 among sampled TVET institutions. All the mean scores in this key dimension lay between 2.18 (LA) for tvt05 and 2.94 (MA) in tvt07 as shown in table 4.24.Three institutions had their means below 2.50 (LA). These were tvt04, tvt05 and tvt06. These results indicated non-existence of safety systems to create awareness on information on administration and reinforcement of OSHA 2007 and ineffective administration and reinforcement of

OSHA 2007. This indicated non-existence of safety management systems and hence non-compliance with OSHA 2007 on Likert scale. Four TVET institutions had their means within 2.51-3.50 (MA) range. These were tvt01, tvt02, tvt03 and tvt07.This range of means between 2.51 and 3.50 indicated that in the four institutions there existed weak safety management systems and hence low Compliance on Likert scale. The results indicates in these four institutions there was low level of awareness on information on administration and reinforcement of OSHA 2007 as well as low effectiveness of administration and reinforcement of OSHA 2007 among sampled TVET institutions. Therefore, the level of compliance in this key dimension was very low. The findings concur with those of a similar study done to establish status of safety in public secondary schools in Kenya. It was found that only 20% of schools had an OSC Committee, implying the administration of OSHA 2007 was weak.

4.3.5 Key Dimension 4: Risk Assessment

The research aimed at establishing the risk assessment programmes and practices put in place and their effectiveness in sampled TVET institutions. The researcher also wanted to establish the perception of employees regarding the types and level of risks they were exposed to at work, and the controls in place as indicators of the level of compliance with OSHA 2007. All the mean scores in this key dimension lay between 2.19 (LA) for tvt05 and 3.27 (MA) in tvt07 as shown in table 4.24. Three institutions tvt04, tvt05 and tvt06 had mean scores of 2.46, 2.19 and 2.24 respectively and were below the value of 2.50 (LA). This indicated a non-existence of safety management systems to effect risk assessment programmes at the workplace. The results indicate that employees were exposed to diverse risks at high levels at work. It can be deduced that, the level of compliance with OSHA 2007 in institutions tvt04, tvt05 and tvt06 is non-existent. Four institutions tvt01, tvt02, tvt03 and tvt07 had mean scores of 2.80, 2.76 and 3.27 respectively, which were in the range of 2.51 to 3.50 (MA).These results indicated existence of weak safety management systems as regards implementing risk assessment programmes and exposure to high levels of risks among employees. Therefore these four

institutions had low compliance with OSHA 2007 while the remaining three institutions were non-compliant. Consequently, the compliance level in risk assessment was very low. The results were consistent with findings from a study done in Nyamira County, Kenya on status of implementation of safety standards in public secondary schools which indicated that 91% of schools did not conduct drill sessions on disasters and only 9% had put in place disaster evacuation maps and fire assembly points in the compounds (Migiro, 2012).

4.3.6 Key Dimension 5: Workplace Inspections and Audits

The aim of the study was to establish workplace inspections and audits programmes and practices put in place and the organizational strengths and weaknesses in OSH management in sampled TVET institutions. The researcher also wanted to establish the perception of employees regarding the types and level of hazards they faced at work, and the controls in place as indicators of the level of compliance with OSHA 2007. The TVET institutions had varied means from 2.17 (LA) in tvt05 to 2.66 (MA) intvt03 and tvt07 as shown in table 4.3.1.Four institutions; tvt02, tvt04, tvt05 and tvt06 had mean scores below 2.50.These results indicated that there were no safety management systems in place regarding workplace inspections and audits programmes. The results also indicated that employees were exposed to very high levels of hazards at work and the hazard controls in place were non-existent. The results indicated that the level of compliance with OSHA 2007 among institutions tvt02, tvt04, tvt05 and tvt06 was non-existent. Three institutions;tvt01, tvt03 and tvt07 had mean scores in the range from 2.51 to 3.50 (MA).These results indicated that in these institutions there were weak safety management systems regarding workplace inspections and audits programmes. The employees were also exposed to high levels of hazards and hazard controls were weak. The level of compliance with OSHA 2007 among institutions tvt01, tvt03 and tvt07 was low. Four institutions had low compliance with OSHA 2007, while three institutions were non-compliant. Consequently, the compliance level in this key dimension was extremely low.

4.3.7 Key Dimension 6: Safety and Health of Work Environment

The research aim was to establish workplace programmes and practices put in place and their effectiveness to ensure the safety of the work environment in sampled TVET institutions. The researcher also wanted to establish the perception of employees regarding the level of safety and health of work environment and the programmes and practices put in place which formed the indicators of the level of compliance with OSHA 2007. The TVET institutions had varied means from 2.86 (MA) in tvt05 to 3.48 (MA) in tvt07 as shown in table 4.3.1.All the mean scores in this key dimension were in the range 2.51 to 3.50 (MA). These results indicated that there were weak safety management systems in place regarding safety and health of work environment programmes. The results also indicated that workers perceived the level of safety and health of work environment was low and safety programmes were weak and hence not effective. These results translated into existence of weak safety management systems and hence low compliance with OSHA 2007 on a Likert Scale. This results were consistent with findings from a study done in Nyamira County, Kenya on status of safety in public secondary schools where only 36% of schools had fully implemented safe school environment (Migiro, 2012).

4.3.8 Key Dimension 7: Safe Work Procedures, Safety Rules and Permits to Work

The study aimed at establishing the safe work procedures and the safety rules implemented for routine work and the use of Permits to Work for non-routine work as well as their effectiveness in sampled TVET institutions. All the mean scores in this key dimension lay between 2.73(MA) for tvt05 and 3.37 (MA) in tvt02 as shown in table 4.3.1. In this key dimension, all the mean scores were in the range 2.51 to 3.50 (MA). These results indicated that there were weak safety management systems in place to enforce safe work procedures, safety rules and the use of Permits to Work. These results translated into existence of weak safety management systems and hence low compliance with OSHA 2007 on Likert Scale.

4.3.9 Key Dimension 8: Work Machinery/Equipment, Materials and Process Safety

The aim of the study was to establish if there were systems to ensure workstations, materials and processes were safe for use by workers. All the mean scores in this key dimension lay between 2.25(LA) for tvt05 and 2.89 (MA) in tvt04 as shown in table 4.3.1. Institution tvt05 had mean score of 2.25 (LA) and hence there were no systems to ensure the safety of workstations, materials and work processes. All the other six institutions in this key dimension had mean scores within the range 2.50 to 3.50 (MA).These results indicated that there were weak safety management systems in place to ensure workstations, materials and processes were safe for use by workers. These results translated into existence of weak safety management systems and hence low compliance with OSHA 2007 on Likert Scale. The findings coincide with findings of a study done in Nyamira County on implementation of Ministry of Education (MOE) safety standards in public secondary schools. The study found that only 55% of schools had implemented MOE standards (Migiro, 2012).

4.3.10 Key Dimension 9: Duties of Employers, Employees and Other Stakeholders

The research aimed at establishing if employers, employees and other stakeholders were aware of their obligations under OSHA 2007 and the extent to which they adhered to the requirements of the Act. All the mean scores in this key dimension lay between 2.28(LA) for tvt05 and 2.91 (MA) for tvt03 as shown in table 4.3.1. Four institutions tvt01, tvt04, tvt05 and tvt07 had mean scores of 2.46, 2.36, 2.28 and 2.39 respectively and were below the value of 2.50 (LA). This indicated a non-existence of safety management systems at the workplace to ensure that employers, employees and other stakeholders are aware of their duties and comply with OSHA 2007 requirements. It can be deduced that, the level of compliance with OSHA 2007 as regards duties of employers, employees and other stakeholders in institutions tvt01, tvt04, tvt05 and tvt07was non-existent. Three institutions tvt02, tvt03, and tvt06 had mean scores of 2.76, 2.91 and 2.61 respectively, which were in the range of 2.51 to 3.50 (MA).These results

indicated existence of weak safety management systems as regards understanding of duties of employers, employees and other stakeholders among workers sampled TVET institutions. Therefore these three institutions had low compliance with OSHA 2007.

4.3.11 Key Dimension 10: Top Management Commitment to Safety

The study aimed at establishing the extent to which top management of TVET institutions were committed to ensure safety at work and the impact this commitment had on safety of employees. All the mean scores in this key dimension lay between 2.41(LA) for tvt05 and 3.36 (MA) for tvt03 as shown in table 4.24. Six institutions.tvt01, tvt02, tvt03, tvt04, tvt06 and tvt07 had mean scores within the range 2.50 to 3.50 (MA).These results indicated that there were weak safety management systems in place as regards top management commitment to safety and the impact this commitment had on safety of employees was low. These results translated into existence of weak safety management systems and hence low compliance with OSHA 2007 on Likert Scale. The findings are consistent with findings of a similar study done in Nyamira County, Kenya on implementation of safety standards in public secondary schools. The study found that senior management was uncooperative on implementation of safety standards (Migiro, 2012).

4.3.12 Standard deviations interpretations and General Compliance

In this study, the standard deviations of the key dimensions were found to be varied indicating the extent of variations of the responses. A smaller standard deviation (tending to zero) implied small variation of the respondents in the institution while a larger standard deviation (tending to one) indicated a bigger variation of respondents in the institution (Lai, 2006) and (Njeru, 2013).The largest variation (1.202) for responses was recorded on key dimension 8 by respondents in tvt03 as shown in table 4.25. These findings gave respondents variation of perception towards safe work environment, implying low compliance with OSHA 2007.The lowest standard deviation (0.372) was

recorded in key dimensions 6 and 7 by respondents in tvt07.These findings indicated the small variation in workers' perception on the level of safety and health of work environment programmes as well as on safety management systems to enforce safe work procedures, safety rules and use of permit to work.

Table 4.25: Standard deviations interpretations

STD Deviation	Perception variation	Institution	Key Dimension	Interpretation
0.372	Low	Tvt07	KD6 and KD7	Small variation on willingness of respondents towards improving compliance
1.202	High	Tvt03	KD8	Respondents variation of perception towards safe work environment-low compliance

The study findings indicated that the compliance with OSHA 2007 is low as established by the low mean scores across the ten key dimensions studied. These results are consistent with findings on study carried out to assess the level compliance with OSHA 2007 for universities in Kenya (Njeru, 2013).

4.3.13 Level of Compliance and Type of Management

Table 4.26: Analysis of Level of Compliance of institutions under MOEST management

Institutions under Management of MOEST											
TVET Code	**Statistics**	**KD 1**	**KD 2**	**KD 3**	**KD 4**	**KD 5**	**KD 6**	**KD 7**	**KD 8**	**KD 9**	**KD 10**
tvt04	Mean	2.21	2.52	2.40	2.46	2.19	3.34	3.28	2.89	2.36	2.98
tvt06	Mean	2.09	2.36	2.21	2.24	2.21	3.29	2.80	2.64	2.61	2.95
	Sum	4.3	4.88	4.61	4.7	4.4	6.63	6.08	5.53	4.97	5.93
	Average of means	2.15	2.44	2.44	2.35	2.2	3.32	3.04	2.8	2.49	2.97

Table 4.27: Analysis of Level of Compliance of institutions under management of other government ministries

TVET Code	**Statistics**	**KD 1**	**KD 2**	**KD 3**	**KD 4**	**KD 5**	**KD 6**	**KD 7**	**KD 8**	**KD 9**	**KD 10**
tvt01	Mean	2.46	2.65	2.57	2.80	2.57	3.20	3.07	2.61	2.46	3.22
tvt02	Mean	2.34	2.80	2.70	2.76	2.40	3.32	3.37	2.81	2.76	3.03
tvt03	Mean	2.61	3.06	2.84	2.74	2.66	2.95	3.17	2.83	2.91	3.36
tvt05	Mean	1.97	2.31	2.18	2.19	2.17	2.86	2.73	2.25	2.28	2.41
tvt07	Mean	2.53	2.80	2.94	3.27	2.66	3.48	3.21	2.86	2.39	3.07
	Sum	14.19	16.21	15.72	16.33	14.83	19.03	18.63	16.05	15.31	18.08
	Average of means	2.84	3.24	3.14	3.27	2.97	3.81	3.73	3.21	3.06	3.62

From Table 4.26 the averages of the means of institutions under management of MOEST were in the range of 0.1≤LA≤2.50 for KD1, KD2, KD3, KD4, KD5 and KD9. This range represented a level of compliance that was least acceptable (LA), an implication of non-existence of safety management systems in these key dimensions in institutions managed by MOEST. This implied there was no communication on provisions of OSHA 2007, no information on administration of OSHA 2007, non – existent systems of risk assessment, no workplace inspections and audits, and no safety training of employees. KD6, KD7 and KD8 were in the range 2.51≤ MA≤ 3.50 implying weak safety management systems for safety of work environment, safe work procedures and work process safety. Hence, the compliance level of institutions under MOEST was very low.

Table 4.27 shows that institutions managed by other government ministries had averages of the means in the range 2.51≤ MA≤ 3.50 for seven key dimensions KD1, KD2, KD3, KD4, KD5, KD8 and KD9 implying non-existent safety systems for staff safety training, communications on information on provisions of OSHA 2007, information on administration of OSHA 2007, risk assessment, workplace inspections, audits and work process safety and duties of stakeholders in OSHA 2007. KD6, KD7, and KD10 had means in the range 3.51≤ HA≤ 5.0.This implied that there were weak safety management systems for safety of work environment, safe work procedures, safety rules and top management commitment to safety. Hence, the compliance level of institutions under other government ministries was very low.

Table 4.26 shows that six of the averages of the means of institutions under management of MOEST, were in the range of 0.1≤LA≤2.50. These were for KD1, KD2, KD3, KD4, KD5 and KD9 and represented a level of compliance that was least acceptable (LA), an implication of non-existence of safety management systems in these key dimensions. Table 4.27 shows that, in institutions managed by other government ministries, none of the averages of the means was in the range of 0.1≤LA≤2.50, as they were higher. This implied that in institutions managed by other ministries all had either weak safety

management systems or robust ones but none had non-existent safety management systems. It can be deduced that institutions managed by other government ministries had better safety management systems across the ten key dimensions, than those under MOEST. Hence, institutions managed by other ministries had a higher level of compliance with OSHA 2007 than institutions managed by MOEST.

4.3.14 Level of Compliance and Courses Offered

Table 4.28: Analysis of Level of Compliance of institutions offering AS-T/E-SS Courses

TVET Institution Offering AS-T/E-SS Courses											
TVET Code	**Statistics**	**KD 1**	**KD 2**	**KD 3**	**KD 4**	**KD 5**	**KD 6**	**KD 7**	**KD 8**	**KD 9**	**KD 10**
tvt01	Mean	2.46	2.65	2.57	2.80	2.57	3.20	3.07	2.61	2.46	3.22
tvt02	Mean	2.34	2.80	2.70	2.76	2.40	3.32	3.37	2.81	2.76	3.03
tvt04	Mean	2.21	2.52	2.40	2.46	2.19	3.34	3.28	2.89	2.36	2.98
tvt05	Mean	1.97	2.31	2.18	2.19	2.17	2.86	2.73	2.25	2.28	2.41
tvt06	Mean	2.09	2.36	2.21	2.24	2.21	3.29	2.80	2.64	2.61	2.95
Total	Mean	2.28	2.59	2.49	2.57	2.37	3.22	3.08	2.69	2.51	2.99
	Average of means	2.67	3.05	2.91	3.00	2.78	3.85	3.67	3.18	2.99	3.52

Table 4.29: Analysis of Level of Compliance of institutions offering SS Courses only

TVET Institutions offering SS Courses only											
TVET Code	**Statistics**	**KD 1**	**KD 2**	**KD 3**	**KD 4**	**KD 5**	**KD 6**	**KD 7**	**KD 8**	**KD 9**	**KD 10**
tvt03	Mean	2.61	3.06	2.84	2.74	2.66	2.95	3.17	2.83	2.91	3.36
tvt07	Mean	2.53	2.80	2.94	3.27	2.66	3.48	3.21	2.86	2.39	3.07
	Sum	5.14	5.86	5.78	6.01	5.32	6.43	6.38	5.69	5.3	6.43
	Average of means	2.57	2.93	2.89	3.01	2.66	3.22	3.19	2.85	2.65	3.22

Table 4.28 shows that three averages of the means; KD6, KD7, and KD10, were in the range 3.51≤ HA≤ 5.0. This indicated that there were robust safety management systems for addressing safety of work environment; safe work procedures, safety rules and permits to work and top management commitment to safety. Seven averages of the means; KD1, KD2, KD3, KD4, KD5, KD8 and KD9 were in the range 2.51≤ MA≤ 3.50. This implied that there were weak safety management systems for institutions that offered AS-T/E-SS courses, that addressed safety training, communication on information on provisions of OSHA 2007, information on administration of OSHA 2007, risk assessment ,workplace inspections and audits, work process safety (KD 8) and duties of stakeholders under OSHA 2007. It can be deduced that institutions offering AS-T/E-SS courses had low compliance with OSHA 2007. Table 4.29 shows that institutions offering SS courses had averages of means in the range 2.51≤ MA≤ 3.50 across all the ten key dimensions. This implied that there were weak safety management systems in institutions hence low compliance with OSHA 2007.

It was observed that table 4.28 had three means of averages in the range 3.51≤ HA≤ 5.0 and seven in the range 2.51≤ MA≤ 3.50. Table 4.29 shows that, all the means of averages across the ten key dimensions were in the range2.51≤ MA≤ 3.50. This implied that institutions offering AS-T/E-SS courses had stronger safety management systems

than those offering SS courses across all the ten key dimensions. Hence the level of compliance with OSHA 2007 was higher in institutions offering AS-T/E-SS than in institutions offering SS Courses only.

4.4 Multiple Linear Regression Analysis

4.4.1 Introduction

This study sought to establish the extent to which three independent variables predicted the study's dependent variable as explained below through multiple linear regression analysis.

The adjusted minimum sample size was 261 for respondents. Stratified random sampling was used to obtain the adjusted minimum sample size proportional to the total population of employees in sampled public TVET institutions in Nairobi County. The following ten key dimensions were considered in this study:

KD 1**:** safety training

KD 2: communication on information on provisions of OSHA 2007

KD 3: information on administration and reinforcement of OSHA 2007

KD 4: risk assessment

KD 5: workplace inspections and audits

KD 6: safety and health of work environment

KD 7: safe work procedures, safety rules and permits to work

KD 8: work machinery/equipment, materials and process safety

KD 9: duties of employers, employees and other stakeholders

KD 10: top management commitment to safety

Three independent variables were generated by transformation of the ten key dimensions mean values to get mean values for each independent variable. The transformation of means from key dimensions to get means for the three objectives was done according to how they related to each other in the conceptual framework as per the researcher's experience and literature review (Grace-Martin, K., 2014). This resulted to the following variables listed below.

- Level of knowledge and awareness about Occupational Safety and Health Act 2007 among public TVET Institutions in Nairobi County(variable 1)
- Occupational safety and health risk management practices in public TVET institutions in Nairobi County(variable 2)
- Safe systems of work in public TVET institutions in Nairobi County (variable 3)

In this study the dependent variable considered was: the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County.

The variable 1 comprised KD 1, KD2 and KD3; variable 2 comprised KD4, KD5 and KD6 while variable 3 comprised KD 7, KD8, KD9 and KD10.

Multiple regression analysis is used to determine whether a group of variables predict a given dependent variable (Mugenda & Mugenda, 2003).

Multiple linear regression uses F-test and t-test to test whether the model and the estimated coefficients can be found in the general population the sample is drawn from. The F-test tests the overall model. The null hypothesis for the F-test is that the independent variables have no influence on the dependent variable. The F-test of the

multiple linear regression tests whether the $R^2=0$ (Gupta, 2000).It is also possible to test for the statistical significance of each of the independent variables. This tests whether the unstandardized (or standardized) coefficients are equal to zero in the population. If $p < .05$, one can conclude that the coefficients are statistically significantly different to zero. The t-value and corresponding p-value are located in the "t" and "Sig." columns, respectively, in the regression coefficient tables generated (Leard Statistics, 2013).

In this study, a standard multiple regression analysis was done as the researcher was unsure of the impact of each of the independent variables on the dependent variable. Multiple regression analysis determines whether and how the three independent variables predict the dependent variable (Mugenda & Mugenda, 2003). The multiple linear regression equation used in this model was:

$$\boldsymbol{Y = B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + e}\text{.....equation 4.4.1}$$

Where: Y= the dependent variable; the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County.

X_1= Independent variable; level of knowledge and awareness about Occupational Safety and Health Act 2007 among public TVET Institutions in Nairobi County

X_2= Independent variable; occupational safety and health risk management practices in public TVET institutions in Nairobi County

X_3= Independent variable; safe systems of work in public TVET institutions in Nairobi County

B_0=Constant

B_1, B_2, B_3 = the regression coefficients or change induced in Y by each X

e =Error.

The findings of multiple regression analysis are discussed below.

4.4.2 ANOVA and Statistical significance

Table4.30: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	104.981	3	34.994	169.050	.000[b]
	Residual	42.229	204	.207		
	Total	147.210	207			

a. Dependent Variable: indicate level of compliance with OSHA 2007

b. Predictors: (Constant), Variable 1 Level of knowledge and awareness on OSHA2007, Variable 2 OSH Risk Management Practices, Variable 3 Safe Systems of Work

The last column (Sig.) in table 4.30 indicates the goodness of fit of the model. The lower this number, the better the fit (Gupta, 2000). When the "Sig" value is equal to or less than the level of significance, it can be concluded that the model fits the data. The significance in this model was .05 as the model was analyzed at 95% level of confidence. The F-ratio in the ANOVA table 4.30 tested whether the overall regression model was a good fit for the data and to determine if the relationship between dependent and independent variables in the sample can be generalized to the entire population. The table 4.30 indicated that the independent variables statistically significantly predicted the dependent variable, $F(3, 204) = 169.050$, $p<.0005$. Therefore, since the F-test was highly significant, it could be deduced that the regression model is a good fit of the data. This was interpreted to mean that there was a statistically significant relationship between the set of independent variables collectively and individually and the dependent variable. The highly significant F-ratio indicated that the model can be found in the general population the sample was drawn from and hence the findings in this study can be generalized for the entire population of TVET institutions in Kenya. This means that

the compliance level of TVET institutions in Nairobi is similar to the level of compliance of TVET institutions across the whole country.

4.4.3 Model Summary of Regression Analysis

Table 4.31: Model Summary

Model	R	R Square	Adjusted R Square	Durbin-Watson
1	.844[a]	.713	.709	1.640

Model Summary table above provides the *R*, R^2 and adjusted R^2, which can be used to determine the strength of the relationship between a set of independent variables and the dependent variable. *R* is the multiple correlation coefficient and can be considered to be one measure of the quality of the prediction of the dependent variable (Leard Statistics. (2013).The table above indicates that the value of R is 0.844. A value of 0.844 indicates a good level of prediction of the dependent variable; "the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County"; as it is closer to 1.0 (Sekaran, & Bougie, 2010).

The "R Square" or R^2, is called the coefficient of determination. It is the proportion of variation accounted for by the regression model above and beyond the mean model (Leard Statistics, 2013). R^2 measures the proportion of the variation in the dependent variable that was explained by variations in the independent variables. An R^2 value can be calculated as the square of the correlation coefficient between the original and modeled data values. In this case, the value is not directly a measure of how good the modeled values are, but rather a measure of how good a predictor might be constructed from the modeled values, by creating a revised predictor of the form $\alpha + \beta f$ (Gupta, V., 2000). In regression, the R^2 coefficient of determination is a statistical measure of how well the regression line approximates the real data points. An R^2 of 1 indicates that the regression line perfectly fits the data. Table 4.31 shows that, "R Square" had a value of 0.713. This statistic indicated that the independent variables explained 71.3 % of the

variability or variation of the dependent variable; "level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County'. 28.7 % variation was explained by other factors outside this study. Further research need to be done to examine these factors not addressed in this study. Adjusted R-square measures the proportion of the variance in the dependent variable that was explained by variations in the independent variables. (Gupta, 2000). The table 4.31 shows that adjusted R-square had a value of 0.709. It was deduced that 70.9 % of the variance in the dependent variable was explained by variations in the independent variables.

4.4.4 Estimated model Regression Coefficients

Table 4.32: Model Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
(Constant)	-.392	.130		-3.025	.003	-.648	-.137		
Variable 1 Level of knowledge and awareness on OSHA2007	.383	.069	.356	5.584	.000	.248	.519	.345	2.897
Variable 2 OSH Risk Management Practices	.416	.074	.381	5.583	.000	.269	.563	.302	3.309
Variable 3 Safe Systems of Work	.215	.059	.192	3.662	.000	.099	.331	.511	1.955

a. Dependent Variable: indicate level of compliance with OSHA 2007

The multiple linear regression equation used in this model was:

$$Y = B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + e \ldots \text{(equation 4.4.4)}$$

Therefore, the general form of the equation to predict Y from X_1, X_2, X_3, on substituting for regression model was found to be:

Predicted $Y = -0.392 + (0.383x\ X_1) + (0.416x\ X_2) + (0.215x\ X_3) + e$,

$Y = -0.392 + 0.383X_1 + 0.416\ X_2 + 0.215\ X_3 + e$, where the values of the symbols were as defined in the model equation.

This was obtained from the coefficient table 4.32 Prediction from the regression model indicated that the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County would be at -0.392 (reduce by factor of 0.392), holding level of knowledge and awareness about occupational safety and health Act 2007 among public TVET Institutions in Nairobi; occupational safety and health risk management practices in public TVET institutions in Nairobi County and safe systems of work in public TVET institutions in Nairobi County, constant at zero. The research findings in this study shown in the table 4.4.4 indicated that a unit increase in level of knowledge and awareness about occupational safety and health Act 2007, among public TVET Institutions in Nairobi County, would lead to an increase in the level of compliance with occupational safety and health Act 2007 in public TVET institutions in Nairobi County, by a factor of 0.383 whereby the p value was 0.0005 ($r=0.383$, $p=0.0005$ $p<.05$).These findings implied that there existed a positive relationship between the level of compliance with OSHA 2007 and the level of knowledge and awareness about Occupational Safety and Health Act 2007 among public TVET Institutions in Nairobi County. Therefore an increase in the level of knowledge and awareness about occupational safety and health Act 2007 in public TVET Institutions in Nairobi County would lead to increased practical knowledge of general management functions, safety practices and procedures to enable employees and managers to understand organizational objectives, safety and health principles,

regulations, standards and work processes. This would result in improved level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County and the country as a whole.

In this research it was found that a unit increase in the improvement of occupational safety and health risk management practices in public TVET institutions in Nairobi County, would lead to an increase in the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County by a factor of 0.416, whereby the p value was 0.0005 (r=0.416, p=0.0005 p<.05).The implication of these findings was that a positive relationship existed between level of compliance with OSHA 2007 and improved OSH risk management practices in public TVET institutions in Nairobi County. Improvement of occupational safety and health risk management practices in public TVET institutions in Nairobi County, would lead to increased effective control of OSH risks, and improvement of OSH performance. This would lead to better prevention of occupational injuries or diseases, better compliance with regulations and legislation, a more productive and healthy workforce and reduced costs of running the TVET Institutions.

The study established that a unit increase in the improvement of safe systems of work in public TVET institutions in Nairobi County, resulted in an increase in the level of compliance with Occupational Safety and Health Act 2007, in public TVET institutions in Nairobi County by a factor of 0.215 where the p value was 0.0005 (r=0.215, p=0.0005 p<.05) .A positive relationship existed between the level of compliance with OSHA 2007 and improvement of safe systems of work in public TVET institutions in Nairobi County. Improvement of safe systems of work in public TVET institutions would lead to application of safe work procedures for routine operations and procedures as well as use of permit to work for non-routine high risk activities.

Beta values express the relative importance of each independent variable in standardized terms. Higher beta values indicate a higher impact an independent variable has on the

dependent variable (Statistics Solutions, 2014). The findings in this study showed that all the independent variables predicted the dependent variable Table 4.4.4 shows that OSH risk management practices had the highest impact on the level of compliance with OSHA 2007(beta=0.381), followed by the level of knowledge and awareness on OSHA 2007 (beta =0.356) and safe systems of work had the least effect (beta=0.192).

4.4.5 Testing Assumptions of Multiple Linear Regression Analysis

In multiple linear regression analysis, a linear relationship is assumed between dependent variable and each of the independent variables, and also the dependent variable and the independent variables collectively. This was tested by inspecting plots of residuals versus predicted values from SPSS Statistics which reflected linear relationships.

Multivariate normality is assumed and is tested using either a histogram (with a superimposed normal curve) and a Normal P-P Plot or a Normal Q-Q Plot of the studentized residuals. The data had normal distribution as shown in the figure 4.13.

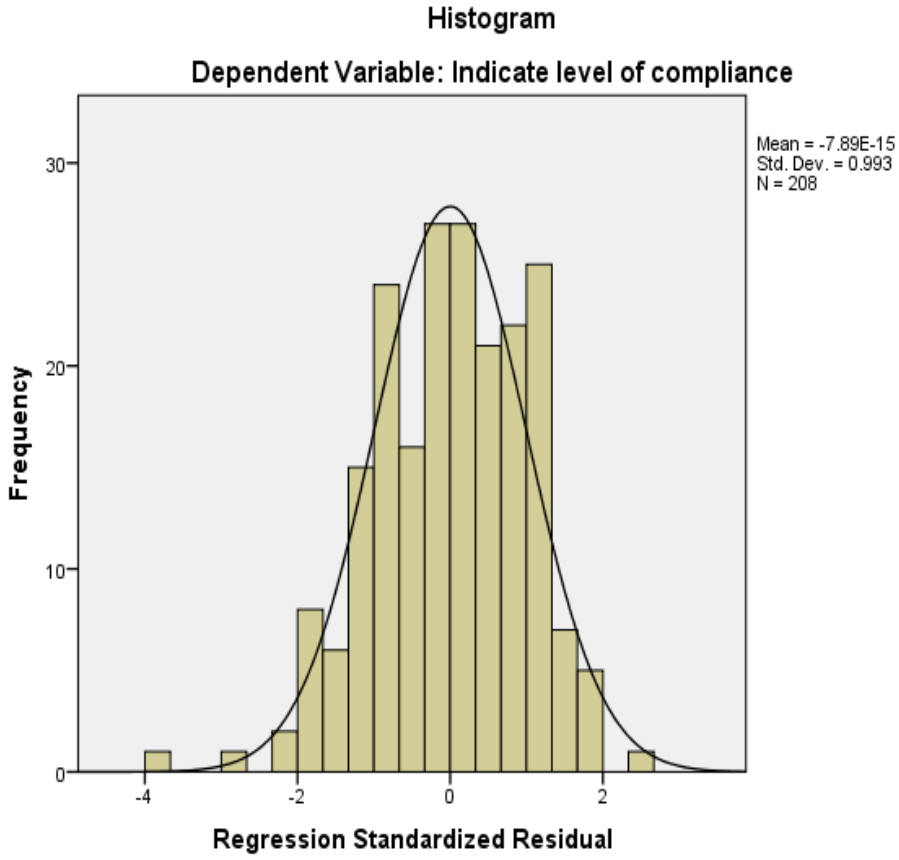

Figure 4.13: Normally distributed data

This was collaborated by Kolmogorov-Smirnov test (chosen since n>50) shown in the table 4.11 since p (.294) was found to be greater than 0.05, it was deduced that it was not different from the population that is normally distributed. Hence data was found to be normally distributed.

Table 4.33: Test of normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Indicate level of compliance with OSHA2007 on Likert scale	.294	208	.000	.788	208	.000

a. Lilliefors Significance Correction

It is assumed that there should be independence of observations or residuals and no linear auto-correlation as tested by Durbin-Watson test. The Durbin-Watson, d value is used in determining linear auto-correlation in the multiple linear regression data. When $1.5 < d < 2.5$, it can be assumed that there is no first order linear auto-correlation in our multiple linear regression data (Statistics Solutions, 2014). Table 4.33 indicates that d value was 1.640 and hence it was within range of $1.5 < d < 2.5$. Therefore it was deduced that there was no first order linear auto-correlation in the multiple linear regression data. The data should also show homoscedasticity by having variances along line of best fit remaining similar along the line (Statistics Solutions, 2014).This was confirmed by inspecting the regression standardized residue versus predictive plot.

The dependent variable must be measured on a continuous scale and there be at least two independent variables. The data set in this study had continuous scale with three independent variables. It is also assumed that there are no significant outliers and this was confirmed from the scatter plots and the normal distribution histogram in figure 4.12.

The data must not show Multicollinearity, which occurs when you have two or more independent variables that are highly correlated with each other. Multicollinearity was tested using the measures of tolerance value and the variance inflation factor (VIF), which is an inverse of the tolerance value. VIF is a better measure than tolerance as it

indicates the magnitude of the inflation in the standard errors associated with a particular beta weight that is due to Multicollinearity. VIF is said to be a factor of standard errors. (Hair**,** Anderson, Tatham, & Black, 1995). Table 4.33 shows the values of VIF generated by this test for the three variables considered in this research. Tolerance should be >0.01(or VIF<10) (Sekaran, & Bougie, 2010).The lower the VIF values the lower the Multicollinearity and the more reliable the regression coefficients. The values of VIF for variables 1, 2, and 3 were 2.897, 3.309 and 1.955 respectively and were all low as they were below the critical value of 10. Therefore the findings indicate low values of VIF for the three variables implied that multicollinearity was very low and hence the regression coefficients were more reliable.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The main objective of this research was to assess the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County. The research findings resulted to the conclusions discussed below.

In respect to objective one (to determine the level of knowledge and awareness about Occupational Safety and Health Act 2007 among public TVET Institutions in Nairobi County) the following conclusions were arrived at. The low key dimensions (KD1, KD2 and KD3) mean scores on level of knowledge and awareness on OSHA 2007 indicated non-existent safety management systems for addressing safety training of workers, effective communication on provisions of OSHA and effective administration and reinforcement of OSHA 2007 among sampled TVET institutions. The findings in this study have shown that the employees' perception of safety levels in TVET institutions were lowly scored implying low levels of compliance with OSHA 2007. Employees in public TVET institutions perceived that the level of knowledge and awareness on OSHA 2007 among workers was low. This was indicated by perceptions of inadequate safety training among workers. Majority of the institutions sampled had non-existent safety systems to address safety training and hence there was no compliance with OSHA 2007 that requires that employees be trained on safety upon hiring and periodically during the service. Lack of training among workers indicated that workers were unaware of safe methods for carrying out tasks; safe use of equipment or substances; use of health and safety control measures and safe use of personal protective equipment; accident reporting and emergency procedures; and their responsibilities for health and safety. Also, institutions had weak and ineffective systems for communication on provisions of

OSHA. Poor communication resulted to poor exchange of information between workers and employees resulting to inadequate pool of knowledge that is useful in making strategic decisions that improve safety at work. Lack of communication implied that workers were not involved in the consultation process and hence did not own the risk identified and the treatment of those risks. The findings indicated that majority of the institutions sampled had low level of effective administration and reinforcement of OSHA 2007 while in the rest of institutions these were non-existent. This implied that the implementation of the Act in institutions was ineffective.

In respect to objective two (to investigate the compliance with safety legislation of occupational safety and health risk management practices in public TVET institutions in Nairobi County) ; the following conclusions were arrive at: The low mean scores from the key dimensions (KD4, KD5 and KD6) on OSH risk management practices, indicated non-compliance with OSHA 2007.

These results indicated existence of weak safety management systems as regards implementing risk assessment programmes and exposure to high levels of risks among employees. Majority of institutions had weak safety management systems on risk assessment while the rest had none. Therefore, the compliance level in risk assessment was very low. Among sampled institutions, majority had non-existent safety management systems for workplace inspections and audits programmes while the rest had none. This implied that, there were weak safety management systems for workplace inspections and audits programmes. Workers perceived the level of safety and health of work environment was low and safety programmes were weak and hence not effective. Therefore, compliance with safety legislation of safety and health risk management practices in public TVET institutions in Nairobi County was low.

As regards objective three (to investigate the compliance with safety legislation of safe systems of work in public TVET institutions in Nairobi County); the following conclusion was were arrived at: Employees in public TVET institutions perceived that

the status of ‘safe systems of work’ did not comply with OSHA 2007.This was indicated by low mean values of key dimensions (KD7, KD8, KD9 and KD10) on safe systems of work. Therefore, there were weak safety management systems in place to enforce safe work procedures, safety rules and the use of Permits to Work. Also, there were weak safety management systems for ensuring workstations, materials and processes were safe for use by workers. There existed weak safety management systems to ensure understanding of duties of employers, employees and other stakeholders among sampled TVET institutions. Top management commitment to safety was low and the impact this commitment had on safety of employees was also low. Therefore this translated into existence of weak safety management systems and hence low compliance with OSHA 2007. OSH risk management practices had the highest impact on the level of compliance with OSHA 2007, followed by the level of knowledge and awareness on OSHA 2007, while safe systems of work had the least effect. Institutions managed by other ministries had a higher level of compliance with OSHA 2007 than institutions managed by MOEST.

5.2 Recommendations

Based on the study findings and the conclusions made, the following recommendations are proposed:

- The study recommends that the level of knowledge and awareness on OSHA 2007 should be raised in public TVET institutions.
- Workers in TVET institutions should be trained on safety immediately on recruitment as well as periodically during their service.
- Employers need to put in place systems that ensure effective communication on provisions of OSHA from employers to employees.
- Senior management of TVET institutions should provide information on effective administration and reinforcement of OSHA 2007 in work places.

- This study recommends strengthening of OSH risk management practices in TVET institutions such as risk assessment programmes and workplace inspections and audits programmes
- Senior management of TVET institutions should put up robust hazard controls systems to reduce exposure to high levels of hazards.
- Robust safety management should be put up to ensure a safe system of work to enforce use of safe work procedures, safety rules and the use of Permits to Work.
- TVET institution workers should be sensitized to understand duties of employers, employees and other stakeholders among workers in TVET institutions.
- Top management in TVET institutions should put in place robust systems that clearly demonstrate its commitment to occupational safety.
- The study recommends that TVET institutions should improve compliance across the ten key dimensions/areas identified in this study.
- Hence institutions managed by MOEST should improve compliance with legislation.

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APPENDICES

Appendix i: Data Collection Instruments: Questionnaire A; Chief Executive Officers

QUESTIONNAIRRE A

Date_____ Serial Number_____

This questionnaire will be answered by Chief Executive Officers (Principal/Manager/Managing Director) of TVET institutions

I am a postgraduate student pursuing a MSc (Occupational Safety and Health) degree. I kindly request you to answer the following questions formulated to provide information on the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County in Kenya. The data collected will be treated with confidentiality, research tools will not identify you by name and research will be used for academic purposes only.

SECTION 1: PERSONAL INFORMATION

Tick (√) the most appropriate answer in the box provided to the right of each item or write down the answer

1. Name of the TVET institution (Optional)

_____

2. Please indicate your job tittle_____

3. Please indicate your terms of employment

Permanent		Contract		Temporary	

4. Please indicate your gender.

Gender		Male		Female	

5. Marital

Married		Unmarried	

status

6. Age in years

18-30		31-40		41-50		51-60		Over60	

7.Number of years worked in the institution:

Less than 15		16-20		21-30		31-40		more than 40	

8.Highest education level attained

Primary school		Secondary school		Certificate		Diploma	
Higher diploma level		Undergraduate degree		Post graduate degree		None	

9.Which category best describes your work?

Teaching		Non-teaching managerial staff	
Laboratory/Workshop Technician		Non-teaching support staff	
CEO (Principals/Director/Manager)			

10. Have your employees received any safety training?

Yes		No	

If yes state the area of training and the number of employees trained in the last twelve months

_____

_____

11. Has the management established an Occupational Safety and Health Committee?

Yes		No	

12. Has the institution been registered as a workplace by the government?

Yes		No	

13. Is the workplace regularly audited as per OSHA 2007?

Yes		No	

If yes what is the date of the last audit report submitted and who was it submitted to?

_____

14. Who is in charge of safety in your institution?

_____

15. Does the institution have a general register /occurrence book for registering accidents and incidents?

Yes		No	

16. Has there occurred any work-related accident in the institution in the last twelve months?

Yes		No	

If yes state the number of accidents and explain briefly the source and the nature of the accidents

_____
_____
_____

17. Does the management have an occupational safety and health policy in place?

Yes		No	

If yes, briefly explain how it was developed and who developed it._____
_____
_____

18. State the percentage/proportion of your institution's annual expenditure that is spent on safety and health
programmes_____

If the institution incurs some expenditure on safety and health, state the key areas/items of safety and health where money is spent and the percentage of the annual safety and health budget spent on each of the key areas/items.

_____

_____

SECTION 2: SCALE OF LEVEL OF COMPLIANCE WITH OSHA 2007

Legend:

- Strongly disagree (SD) = 1
- Disagree (D) = 2
- Neither agree nor disagree (N) = 3
- Agree (A) = 4
- Strongly agree (SA) = 5

Tick (√) the most appropriate answer in the box provided to the right of each item

Key Dimension 1: Safety training

S/NO	QUESTION	SD	D	N	A	SA
1.	Senior management is aware of Occupational Safety and Health Act 2007 standards on training					
2.	Safety training of employees has a positive effect on safety of workers					

Key Dimension 2: Communication on information on provisions of OSHA 2007

S/NO	QUESTION	SD	D	N	A	SA
1.	There are clear communication channels for safety within the workplace					
2.	Employees access and read Occupational Safety and Health Act 2007 at the workplace					
3.	Employees are sensitized on the provisions of OSHA 2007					

Key Dimension 3: Information on administration and reinforcement of OSHA 2007

S/NO	QUESTION	SD	D	N	A	SA
1.	There is an effective system of administering and reinforcing OSHA 2007 at the workplace					

Key Dimension 4: Risk assessment

S/NO	QUESTION	SD	D	N	A	SA
1.	Senior management regularly maintain risk assessment records of the workplace					

Key Dimension 5: Workplace Inspections and audits

S/NO	QUESTION	SD	D	N	A	SA
1.	Senior management is always informed of the observed unsafe conditions, acts and practices after inspections and audits					
2.	The institution has a strong safety management system at workplace					
3.	Corrective actions on safety at work are only undertaken after accidents					

Key Dimension 6: Work machinery/equipment, materials and process safety

S/NO	QUESTION	SD	D	N	A	SA
1.	Work machinery/equipment are tested for safety before use at workplace					
2.	It is the responsibility of supplier of chemicals/materials to test, classify and mark chemicals as per their characteristics					
3.	Use of personnel data of workers to assign tasks to workers has a positive effect on safety					

Key Dimension 7: Safety and health work environment

S/NO	QUESTION	SD	D	N	A	SA
1.	Senior management is aware of and applies the standards of a safe and healthy work environment					
2.	The benefit of safety programmes at work outweighs the cost					

Key Dimension 8: Safe work procedures, safety rules and Permits to work

S/NO	QUESTION	SD	D	N	A	SA
1.	The employer is aware of the requirements of the use of a Permit to Work at the workplace					

Key Dimension 9: Top management commitment to safety

S/NO	QUESTION	SD	D	N	A	SA
1.	Senior management integrates safety and health issues in routine work and in planning					
2.	Setting of safety and health objectives and targets has improved safety at work					
3.	Senior management incorporates safety and health performance in appraisal system of workers					
4.	Establishing an effective organizational structures improves safety at work					
5.	The overall legal responsibility for health and safety rests with the employer					
6.	The cost of compliance with legislation outweighs the benefits of compliance					

Key Dimension 10: Duties of employer, employee and other stakeholders

S/NO	QUESTION	SD	D	N	A	SA
1.	The management is aware of the duties of the employer under OSHA 2007					
2.	Establishing an Occupational Safety and Health committee has improves safety at work					

Please explain how compliance with OSHA 2007 can be improved in the institution in order to improve safety and health

_____
_____
_____
_____

Data Collection Instruments: Questionnaire B; General Employees

QUESTIONNAIRRE B

Date_____ Serial Number_____

This questionnaire will be answered by general employees including those in middle-level management of TVET institutions

I am postgraduate student pursuing a MSc (Occupational Safety and Health) degree. I kindly request you to answer the following questions formulated to provide information on the level of compliance with Occupational Safety and Health Act 2007 in public TVET institutions in Nairobi County in Kenya. The data collected will be treated with confidentiality, research tools will not identify you by name and research will be used for academic purposes only.

SECTION 1: PERSONAL INFORMATION

Tick (√) the most appropriate answer in the box provided to the right of each item or write down the answer

1. Name of the TVET institution

   (Optional)_____

2. Please indicate your job tittle_____

3. Please indicate your terms of employment

Permanent		Contract		Temporary	

4. Gender

Gender		Male		Female	

5. Marital status

Married		Unmarried	

6. Age in years

18-30		31-40		41-50		51-60		Over60	

7. Number of years worked in the institution:

Less than 15		16-20		21-30		31-40		more than 40	

8. Highest education level attained

Primary school		Secondary school		Certificate		Diploma	
Higher diploma level		Undergraduate degree		Post graduate degree		None	

9.Which category best describes your work?

Teaching		Non-teaching managerial staff	
Laboratory/Workshop Technician		Non-teaching support staff	
Contracted worker			

10. Have you read the Occupational Safety and Health Act 2007?

Yes		No	

If yes, state how you accessed it and state any one duty of employees as prescribed in the Act?

_____

_____

11. Have you ever received any safety training?

Yes		No	

If yes please state the area you were trained in _____

12. Have you ever experienced work related accidents?

Yes		No	

If yes, explain briefly the source, the nature of accident and if you reported the accident

_____

_____

_____

SECTION 2: SCALE OF LEVEL OF COMPLIANCE WITH OSHA 2007

Legend:

- Strongly disagree (SD) = 1
- Disagree (D) = 2
- Neither agree nor disagree (N) = 3
- Agree (A) = 4
- Strongly agree (SA) = 5

Tick (√) in the most appropriate answer in the box provided to the right of each item

Key Dimension 1: Safety training

S/NO	QUESTION	SD	D	N	A	SA
1.	Employees are aware of the existence of Occupational Safety and Health Act 2007(OSHA 2007)					
2.	Occupational Safety and Health Act 2007 Abstract, rules, and notes prominently displayed at workplace					
3.	Workers are aware of their responsibilities about safety as per OSHA 2007					
4.	All new employees receive safety induction training					
5.	There is employee participation in safety improvement initiatives					
6.	Training needs identified through considering nature of task, experience and education level of employee					
7.	Additional training provided to workers in case of new work processes and materials					

Key Dimension 2: Communication on information on provisions of OSHA 2007

S/NO	QUESTION	SD	D	N	A	SA
	Employees are aware of the provisions of the institution's Safety and Health Policy					
1.	Employers always provide clear information on safe work procedures to employees					
2.	Employees are aware of the requirement of pre-employment, periodic and post-employment medical examination					
3.	Safety signs for floors, steps, stairs, passages, walkways , way of exit/access, fire exits, dangerous working spots and activities and first aid facilities are displayed in the workplace					

4.	Employees have information on safety and health standards of Machinery, equipment, personal protective equipment, appliances and hand tools used in all workplaces.					
5.	Employees are trained on fire prevention systems and fire safety and emergency procedures					
6.	First aid procedures, names and telephone contacts of first aiders is provided at the workplace					

Key Dimension 3: Information on administration and reinforcement of OSHA 2007

S/NO	QUESTION	SD	D	N	A	SA
1.	Employees are aware of the offences and penalties under OSHA 2007					
2.	Employees are aware they should co-operate with their employer and safety government agencies in complying with the OSHA 2007					
3.	Procedures for reporting hazardous situations and any accident at the workplace are provided					
4.	Employees are aware they are responsible of their own safety and that of other persons who may be affected by his actions at the workplace					
5.	Employers provide information to all persons at workplace on risks and imminent danger					
6.	Manufacturers provide employers with adequate information about safety of articles used at workplace by employees					
7.	Employees are aware the Kenya government reinforces Occupational Safety and Health Act 2007					
8.	Employees are aware that persons found in the workplace should inform Government Occupational safety and health officers who is the occupier/employer of the workplace					
9.	A general register is kept at work for registering accidents /occupational diseases and all safety reports					

Key Dimension 4: Risk assessment

S/NO	QUESTION	SD	D	N	A	SA
1.	Workplace activities and processes are regularly assessed and evaluated to identify work-related hazard/danger to workers					
2.	Assessment of work activities and processes result to identification of type of hazard/danger and its effect on workers					
3.	Risk assessment result to putting in place adequate measures to control work-related hazards/danger to workers					
4.	Risk assessment result in periodic review of work-related risk control measures for effectiveness					
5.	Workplace activities and processes are regularly revaluated when there are changes in processes, materials and machinery/equipment					
6.	Assessment of work activities and processes establishes if safe work procedures for work activities such as operating machines/equipment have been established and documented					
7.	Assessment of work activities and processes establishes if there are work-related risk to visitors and general public at the workplace					

Key Dimension 5: Workplace Inspections and audits

S/NO	QUESTION	SD	D	N	A	SA
1.	Workplace safety inspections and audits are regularly done to identify and control hazards at workplace					
2.	Workplace inspections are done to assess effectiveness of air pollution, noise and vibration control measures at work					
3.	Workplace inspectors listen to the concerns of workers with respect to OSH issues					
4.	Workplace audits are regularly done to identify the organizational strengths and weaknesses in OSH management					
5.	Workplace audits results to periodical review to ensure the OSH management system remains relevant to organizational needs					

Key Dimension 6: Work machinery/equipment, materials and process safety

S/NO	QUESTION	SD	D	N	A	SA
1.	Employees are provided with manufacturer's' safety operational manuals of machines/equipment					
2.	Machinery/equipment are only used for purpose intended and operated by competent person					
3.	Machines /equipment are well maintained and moving parts have guards/covers					
4.	Workstations, machines/equipment and tasks are designed to fit employees' ability and to prevent work-related injuries/diseases					
5.	Manufacturers provide material Safety Data Sheet of hazardous work materials and chemicals for use by workers					
6.	Work materials are stored and handled safely to prevent injury to workers					
7.	Workers are provided with safe work procedures and processes					

Key Dimension 7: Safety and health of work environment

S/NO	QUESTION	SD	D	N	A	SA
1.	Workplace is not crowded, clean, well lit ,well ventilated and has well drained floors					
2.	Workplace is supplied with drinking water, clean toilets/latrines separate for each gender and adequate sitting facilities					
3.	Workplace has adequate firefighting equipment and workers trained on their use					
4.	Workplace has well maintained and unobstructed means of escape in case of a fire					
5.	Workers are provided with emergency procedures which are regularly tested					
6.	Flammable substances are safely stored and handled to prevent					

	fires					
7.	First aid facilities are provided at workplace and staff trained on their use					
8.	Inexperienced workers are supervised and trained					
9.	Workers are provided with personal protective equipment if needed and trained on their use					
10.	Offices, workshops, classrooms and laboratories have workstations, floors, stairs, walkways and exit/access ways of sound construction and are properly maintained.					

Key Dimension 8: Safe work procedures, safety rules and Permits to work

S/NO	QUESTION	SD	D	N	A	SA
1.	Clear, accurate and easily available safe work procedures are provided at work					
2.	Safe work procedures available at work are the one used for training workers					
3.	Safe work procedures describe practical and realistic methods for performing tasks					
4.	Formal written instructions to manage risks (Permit to work) of highly dangerous non-routine work are provided for use at workplace					
5.	Safety rules for routine work are provided for every workstation					

Key Dimension 9: Top management commitment to safety

S/NO	QUESTION/ITEM	SD	D	N	A	SA
1.	The institution senior management gives high priority to safety and there is safety representative in the management committee					
2.	There is safety representative in the Occupational Safety and Health committee from my section					
3.	Managers respond positively when health when safety and health issues are raised by staff					
4.	The institution allocates sufficient resources for safety and health programmes					
5.	Senior management chairs and participates in Occupational Safety and Health Committees					

Key Dimension 10: Duties of employer, employee and other stakeholders

S/NO	QUESTION	SD	D	N	A	SA
1.	Employer causes the preparation and communicates an occupational safety and health policy					
2.	Employer provides a safe working environment for workers					
3.	Employer has established an effective Occupational Safety and Health Committee					
4.	Employees are not discriminated at the workplace					
5.	Employees report any accidents, injuries and hazardous situations at work					
6.	Work-related articles supplied by manufacturers are safe for use by workers					

Level of compliance with OSHA 2007

S/NO	QUESTION	SD	D	N	A	SA
1.	I feel satisfied by the level of safety at my workplace					
2.	I attribute reduction in accidents occurrences to high level of compliance with OSHA 2007 at workplace					
3.	My workplace adheres to/ obeys OSHA 2007 regulations and standards					

Please explain how compliance with OSHA 2007 can be improved in the institution in order to improve safety and health

Appendix ii: Tables

Table 1: Determining a Sample Size from a Given Population

Population size	Sample size
10	10
20	19
30	28
40	35
50	44
60	52
70	59
80	66
90	73
100	80
150	108
200	132
250	162
300	169
400	196
1500	306
2000	322
3000	341
4000	351
5000	357
10,000	370
20,000	377
50,000	381
100,000	384

Table 2 TVET Institutions Managed by MOEST

S/No.	TVET Institutions	Number of Employees
1.	PC Kinyanjui Technical Training Institute	108
2.	Nairobi Technical Training Institute	151
3.	Kenya Technical Teachers College	178
4.	Kabete Technical Training Institute	209
Total		**646**

Ministry of Education Science and Technology

Table 3 TVET Institutions Managed by Other Government Ministries

S/No.	TVET Institutions	Number of Employees
1.	NYS Institute of Business Studies	51
2.	Kenya Water Institute	85
3.	Kenya School of Monetary Studies	55
4.	Kenya Institute of Surveying and Mapping	67
5.	Kenya Institute of Business Training	20
6.	Kenya Armed Forces Technical College	258
7.	Kenya Institute of Highways and Building Technology	118
8.	K.P.L.C. Technical Training Institute	33
9.	G.S.U. Training School-Embakasi	233
10.	NYS Engineering School	55
Total		**975**

Ministry of Education Science and Technology

Appendix iii: Letters of Introduction and Authority

REQUEST TO THE IDENTIFIED INSTITUTIONS TO CARRY OUT RESEARCH

Dear Sir/Madam,

REQUEST FOR PERMIT TO CONDUCT RESEARCH IN TVET INSTITUTIONS IN NAIROBI COUNTY

I am graduate student at Jomo Kenyatta University of Agriculture and Technology, reg. no. EET32-2176/2011. I am pursuing a Master of Science degree in Occupational Safety and Health. I am also an employee of the Ministry of Education Science and Technology in the Directorate of Technical Accreditation and Quality Assurance.

I intend to carry out my research through a survey research design. My study will involve the use of a questionnaire entitled "**Assessment of the level of compliance with occupational safety and health Act 2007 in public TVET institutions in Nairobi County, Kenya".** Your institution is among the public TVET institutions identified for sampling. The data corrected will be used with confidentiality and the research findings will not be used for any other purpose other than academic progress only.

Please consider this letter a request to conduct a survey in the institution.

Looking forward to your kind consideration for this request.

Yours faithfully,

Peter Thobora Mwangi

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

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DIRECTORATE OF TECHNICAL ACCREDITATION & QUALITY ASSURANC
TELEPOSTA TOWERS
P.O. BOX 9583-00200
NAIROBI

1st November, 2013

TO WHOM IT MAY CONCERN

PETER THOBORA MWANGI

The above named person is an employee of this Ministry deployed at the Directorate of Technical Accreditation and Quality Assurance. He is pursuing a Master of Science degree in Occupational Safety and Healthat Jomo Kenyatta University of Agriculture and Technology. He is currently working on his research project on "**Assessment of the Level of Compliance with Occupational Safety and Health Act 2007 in Public TVET Institutions in Nairobi County, Kenya.**" The data collected will be treated with confidentiality and the research will be used for academic purposes only.

This letter is therefore a request to offer him any assistance that he may require in data collection.

Thank you

Yours faithfully

MUTINDA MWAA
Ag. DIRECTOR, TECHNICAL ACCREDITATION AND QUALITY ASSURANCE

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Assessing The Level Of Compliance Of Occupational Safety And Health Risk Management Practices With Occupational Safety Legislation In Public TVET Institutions In Nairobi, Kenya

Peter Thobora

Assistant Director, Quality Assurance and standards, Directorate of Research Management and Development: Ministry of Education Science and Technology, Kenya

Samuel Thuita

Ag. Deputy Director, Directorate of Occupational Safety and Health Services: Ministry of Labour, Social Security and Services, Lecturer Institute of Energy and Environmental Technology-Jomo Kenyatta University of Agriculture and Technology

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ABSTRACT

This study assessed the level of compliance of occupational safety and health risk management practices with Occupational Safety and Health Act, 2007 (OSHA 2007) in public TVET institutions in Nairobi County in Kenya. A cross sectional survey was done on a population of fourteen TVET institutions with 1621 employees. Proportionate, stratified random sampling produced 50% of institutions and 261 employees. Employees sampled were proportional to the number of the five classes of workers. Means and standard deviations of three key dimensions; risk assessment, workplace inspections and audits, and safety of work environment, were analyzed using SPSS. Four institutions had weak safety risk assessment programmes. Most institutions sampled had weak or non-existent safety workplace inspections and audit programmes. Safety and health of work environment was low. 16.7 % of institutions had safety audits while 83.3 % did not. OSH risk management practices did not comply with OSHA 2007as indicated by the low mean scores from the key dimensions on OSH risk management practices.

Keywords: OSHA 2007, Nairobi, Kenya Occupational Safety and health in public TVET Institutions, Kenya, OSH risk management practices, OSH legislation compliance