HUMAN FACTOR AND X-RAY BAGGAGE SCREENING ON PROVISION OF SECURITY AND SAFETY OF UNIVERSITIES WITHIN NAIROBI CITY COUNTY, KENYA

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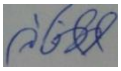
A RESEARCH PROJECT SUBMITTED TO THE SCHOOL OF SECURITY, DIPLOMACY AND PEACE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTERS IN SECURITY MANAGEMENT AND POLICE STUDIES OF KENYATTA UNIVERSITY

MAY, 2022

DECLARATION

This research project is my original work and has not been submitted to any learning institution other than Kenyatta University for the award of the degree of Masters in Security Management and Police Studies.

Sign 

Date: 11th May, 2022

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The research project has been submitted to the School of Security, Diplomacy, and Peace Studies with my consent as the Supervisor.

Sign 

Date: 11th May, 2022

Dr. Merecia Sirera, PhD.

The Chair, Dept. of Security and Correction Science

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DEDICATION

I would like to dedicate this research project to all the security personnel who play a vital role in provision of their services. Indeed, their work is a calling to serve humanity, particularly, all security guards who work around the clock to protect various institutions' infrastructure and personnel. I also dedicate this research project to my late father Washington Wachie Gwayi and my mother Sylvia Guada Wachie. After the passing on of my father, my mother's relentless effort saw her single handedly cater for all basic needs and high school fees for both my siblings and I, and that made me who I am today. Thank you my iron lady!

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Abstract

X-ray baggage screening has been found to be effective in prevention of unauthorized items from being sneaked into the institutions for provision of security and safety. The X-ray baggage screener has the capability to identify and detect items concealed in different ways; however, unauthorized items still continue to cause threat challenges to institutions across the world, Africa and Kenya. Human factor has been found to be important in the application of X-ray baggage screening for security and safety. Surprisingly, there has been little reflection on the effect of human factor on the effectiveness on screening using X-ray baggage scanner. Using, Technology Acceptance Model (TAM) and Perceived User Resource Model (PURM), this study sought to assess the interaction between human factor and X-ray baggage screening on provision of security and safety of selected universities within Nairobi City County, Kenya. The specific objectives of the study were: to examine the interaction between training and X-ray baggage screening on provision of security and safety in the universities; to analyze the interaction between supervision and X-ray baggage screening on provision of security and safety in the universities; to determine the interaction between experience and X-ray baggage screening on provision of security and safety in the universities; and, to identify the challenges faced by screeners in X-ray baggage screening task for provision of security and safety in the universities. A cross sectional survey research design was employed to undertake the study. A sample size of 250 respondents were selected for the study. To obtain the sample for the study, stratified and purposive sampling techniques were used to select the participants for the study. Questionnaires and interviews were the main methods of data collection. Quantitative data was analyzed using both descriptive and inferential statistics: Pearson's correlation and regression analysis. Qualitative data was categorized and analyzed thematically according to the objectives of the study. The study established that 83% of the screeners believed that X-ray baggage scanner was effective to promote security and safety of universities. The results of the regression, R-Square (0.173) demonstrates that training, experience and supervision affect 17.3% of the X-ray baggage screening on provision of security and safety. From the quantitative data, the study shows that there is a positive significant Correlation between Xray baggage screening whereby: Training (r=0.567, Supervision (r=0.642), Experience (r=0.668). The findings show that the main challenges experienced by screeners are: insufficient continuous serviceability of X-ray baggage machine (63.4%), and insufficient budget allocations for repairs at (61.2%). The study concludes that human factor interrelates and reacts with X-ray baggage machine to improve or weaken security and safety measures outcome depending on the knowledge and commitment of the security personnel. Therefore, objective supervision is important in nurturing guards' wellbeing to increase job performances. The study recommends that universities to consider budgeting for maintenance and repairs of the X-ray machine, and sensitize their communities on significance of X-ray machine searches, and that similar studies to be conducted with a wider scope in Kenyan rural and sub-urban universities to establish if there would be a variation of results.

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ACRONYMS AND ABBREVIATIONS

CSMs	Chief Security Managers
CUEA	Catholic University of Eastern Africa
IED	Improvised Explosive Device
IEF	Image Enhancement Function
KIIs	Key Informant Interviews
KRA	Kenya Revenue Authority
KU	Kenyatta University
KUERC	Kenyatta University Ethics Review Committee
MBSR	Mindfulness-Based Stress Reduction
NACOSTI	National Commission for Science, Technology, and Innovation
PEOU	Perceived Ease of Use
PURM	Perceived User Resource Model
PS	Perceived Satisfaction
PU	Perceived Usefulness
SPSS	Statistical Program for Social Science
TAM	Technology Acceptance Model
TIP	Threat Image Projection
UAE	United Arab Emirate
USIU-A	United States International University- Africa
US	United States
VC	Vice-Chancellor

DEFINITION OF TERMS

Enplanement	The Boarding of a plane.
Facility	A building or a place.
Human factor	A person's collective ability, knowledge, and talent are put to productive use at work.
Screening	An electronic device does searches.
Improvised Explosive Device (IED)	Crude bomb
Infrastructure	A facility.
Interaction	Connection
Safety	Is being free from physical and emotional harm.
Searches	Wide hunt for something.
Security	This is a level of protection against risk, harm, criminal activity.
System	A collection of components working together.
Technology	Equipment.
Threat:	The likelihood that something wrong may happen.
Unauthorized	Illegal/not allowed.
X-ray Baggage Scanner	It is a screening tool/machinery that uses a special light to ease searches.
X-ray Light	Emission/Imaging.
Device	Machine made for a particular task

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CHAPTER ONE

Introduction

1.1 Background of the Study

Institutions' security wellbeing has been a major drive that impacts the lives of the personnel and the safety of the property. X-ray screening technology is one of the techniques used in screening by institutions worldwide—for their security and safety (Buser, Sterchi, Schwaninger, 2020). Specifically, for conducive security and a safe environment, many institutions, including universities, have implemented X-ray baggage screening machines at their entrances for bags' inspection. It is noteworthy that the human element influences X-ray baggage screening machines to achieve its goal (Hattenschwiler, Mendes & Schwaninger, 2018). Indeed, security and safety in a given place promote human freedom from negative emotional aggression and physical harm; therefore, it is a high premium concept in society. It communicates the level of protection against risk, harm, or criminal activity. In addition, security and safety provisions for protection from threats guarantee safe conduct individual self-regulation, whereby there is an internal feeling of protection, being shielded against bodily harm, mental, social harm, and others (Bubnovskaia, Leonidova & Lysova, 2019). In ordinary terms, security is the ability of a given system/facility to resist unauthorized access to use its resources. One approach used to prevent unauthorized items from accessing a facility is an X-ray baggage scanner. This screening tool uses X-ray imaging to distinguish threat and non-threat items. This current study investigates the contribution of human factors in X-ray baggage screening on the security and safety of learning institutions and universities.

X-ray baggage scanner is a proven tool for baggage screening and security inspection (Astolfo, Olivo, Endrizzi, Haig & Price, 2016). According to Mireri, Kamau, and Kanyi (2016), X-ray

technology has been used for security screening since the 1970s. A standard X-ray baggage scanner can process about 500 bags in an hour (Mireri, Kamau & Kanyi, 2016). Hattenschwiler, Mendes, and Schwaninger (2019) believe that the technology's X-ray light assists in illuminating X-ray images with objects; thus, making the items' images clear for discrimination by a naked eye. As a result, unauthorized items can be identified and prevented from accessing an institution. Therefore, the technology ensures security and safety by assisting in screening tasks. With the implementation of X-ray baggage screening in academic institutions for security and safety, it is significant that the human factor in the X-ray baggage screening is assessed, and suitable strategies employed to ensure that the universities bridge the gap in X-ray baggage screening on the provision of security and safety in academic institutions.

X-ray technology screening has been demonstrated worldwide for its successes in promoting the security and safety of institutions where it is used. Nevertheless, successful X-ray technology screening has been frustrated when unauthorized items have passed through the screening machine undetected to occasion threats to the security and safety of institutions. For example, in the year 2001, terrorists managed to enter the United States (US) airline with knives and box cutters, which were used to stab the pilots and the cabin crews and hijacked the four planes, some of which were rammed into the US Twin Tower (Goodrich, 2002; Sperry, 2014). Although the airline had X-ray screening machinery, which has been credited for screening unauthorized items for security and safety, the terrorists still accessed the airline with unauthorized weapons. In addition, despite X-ray technology screening of unauthorized items, metallic weapons, fake bombs, pistols, and many others have been used in the attack as follows: Italian airline from Bagola to Paris in November 2002, Spanish airline from Mauritius to the Canary Islands in February 2007 and Italian flight from Paris to Rome in April 2011 (Newsome, 2014).

A study conducted in China on X-ray baggage screening on the provision of security and safety in public transportation by Rui-feng, Yang, and Wu (2016) showed that, in public transportation, it is a security requirement that passengers' carry-on baggage is screened to avert threats of knives, Improvised Explosive Devices (IEDs), drugs considered illegal in some countries among others from being sneaked in for security and safety of the facilities. The study established that the objective aspects (environment condition at work place, screening equipment) and subjective aspects (job stress, burn out) positively influence screeners' performance, impacting their screening accuracy. The study further notes that a sizable workload could result in overwork for the screeners who lack the skills and experience for work. Therefore, the study suggested a need for skill training and social support (supervision) of X-ray screeners by colleagues and their supervisors in security checkups. Thus, the study raises a concern on skill training and supervision as a form of social support to improve screening work. In this regard, supervision entails collective support by ensuring that the right person is assigned the right duty based on their skill training on screening tasks and job experience. This study informs the intended study by introducing human factors: training, supervision, and experience as significant for further analysis as far as X-ray baggage screening are concerned. Therefore, there is a need to examine the interaction between human factors (training, experience, and supervision) in X-ray baggage screening on the provision of security and safety that the current study needs to explore. According to this study, interaction means connection.

Interpretation of threat objects through an X-ray machine requires a very cautious reflection by a screener to utilize minimal time to decide whether an object is harmless or otherwise (Donnelly, Muhl-Richardson, Godwin & Cave, 2019). This means that screeners will check bags' contents one at a time and discriminate unauthorized items for elimination by visual screening accuracy for

security and safety of institutions. Screeners' training on X-ray baggage screening accuracy should equip them with knowledge and skills to check security and safety threats. Thus, they should possess practical knowledge and experience to discriminate against unauthorized items passed through X-ray baggage scanners. Supervision makes the screeners alert at work for conformity with a perfect screening. Supervision also corrects lapses that screeners may experience at work. Many institutions have considered these human factors concerning adopting X-ray baggage scanners for screening purposes. Despite all the training of practical knowledge on X-ray screening accuracy and supervision of screeners, many screeners seem to let unauthorized items keep infiltrating facilities with X-ray technology screening across the board. For example, according to The Global Terrorism Database (2017), there were 893 attacks on airports and aircraft with explosives, and 247 of the attacks happened post-2001 despite luggage screening.

Alsyouf, Kumar, Lubna, and Al-Hammadi (2018) did a study on X-ray baggage screening at European Arab Emirates (UAE) in the baggage handling system. The study revealed that from 2007 to 2016, improper handling of baggage by security personnel cost the airline industry approximately US $ 27 billion, whereby 47% of bags got mishandled, 77% of bags were delayed,16% were damaged, and 7% of bags were lost or stolen. The study established that the irregular flow of baggage in the X-ray machine brings baggage congestion that leads to improper handling of baggage; thus, resulting in low system dependability with potential high operational costs on lost and damaged customers' bags, hence the frustration of clients. The study asserted that the X-ray baggage screening has various challenges not limited to screeners mishandling baggage flow, which leads to mix-up and loss of baggage; therefore, an impact on delays on the queue to clients whose bags are passed through the X-ray baggage scanners. Other than the study mentioning general challenges encountered in X-ray baggage screening, it failed to examine

whether human factor (training, supervision, and experience) were the source of the various challenges encountered. This informed the current study by establishing some of the specific challenges encountered in X-ray baggage screening tasks by guards for the security and safety of universities.

Regionally, in Namibia, Solvang (2017) researched engaging X-ray technology screening in identifying mineral ore dubbed 'black sand.' In the study, the X-ray diffraction method, which involves X-ray tube and X-ray screening, were used to discriminate the structure of the minerals. The study found that X-ray screening technology can identify heavy mineral distribution and composition, hence reducing the uncertainty of the mineral size deposits in given rocks. The study demonstrated that screening accuracy could be used for appropriate identification or elimination purposes. Therefore, screeners' keenness (human factor), which is a critical aspect in searches, is put into perspective as far as X-ray baggage scanner, which applies the same technology, is concerned with the security and safety of institutions. This study informs the current study that assessed the essence of expertise of screeners/guards in X-ray baggage screening to promote security and safety in the learning institutions.

Training is an element of human factor needed for a good human-machine interface to promote security and safety of an institution using x-ray machines for threat items' searches. In Kenya, Mireri, Kamau, and Kanyi (2016) conducted a study on assessment of security preparedness and adherence to international aviation standards at Wilson Airport whereby the study revealed that 43.9% of the respondents indicated that the airport was not safe since security guards, who were screeners, were not adequately trained despite the essence of X-ray technology screening in searches. On the other hand, 64% of the respondents agreed that the Wilson Airport had tough security measures. However, the study did not exhaustively look at the contribution of the human

element, training guards on the screening aspect of X-ray baggage scanners to ascertain the tough security measures. The study established that X-ray baggage screening is used to identify unauthorized items. The image interpretation as screened was found to depend generally on the training and abilities of screeners. The current study sought to evaluate what results would be obtained on screeners' specific abilities in terms of the interaction of training and experience on the X-ray baggage screening on the security and safety of universities.

There have been great concerns of heightened security and anxiety over insecurity in institutions of learning/universities in Kenya following the terror attack on Garissa University College on 2nd April 2015. Odhiambo et al. (2015) write that the terror attack on the Garissa University campus left 148 students dead. For security and safety reasons, some universities in Kenya adopted X-ray baggage screening technology to curb insecurities in universities. Yet, Kenyan University hostels continue to be hubs of hard drugs, among other unauthorized materials (Ouma, 2017). A report by the Kenya Ministry of Education Science and Technology (2015) and Ouma (2018) agree that there should be a Kenyan university's national minimum standard on safety and security guidelines to tame the insecurities in universities. Against this background, some universities installed X-ray baggage scanners coupled with the training and supervision of experienced guards. This was aimed at helping the technology screening curb security and safety threats. However, despite the emphasized security measures at the universities' entrances, hard drugs, infiltration of crude weapons, organized crime syndicate among other crimes, continue to be on the increase in the institutions of higher learning (Kenya Ministry of Education Science and Technology Report, 2015; Ouma, 2018). It is striking that X-ray baggage scanner as a security screening system depends on human beings, their training, experience, and supervision of screeners (guards) to function optimally as guaranteed (Sakano, Obeng & Fuller, 2016). Much of the studies on the

usage of X-ray baggage scanners for security and safety standpoints have been conducted in various non-academic institutions across Africa and Kenya. Besides, the studies have failed to exhaustively examine the interaction between human factors (training, experience, and supervision) in X-ray baggage screening on the security and safety of academic institutions. Few studies on the human factor in X-ray baggage screening on the provision of security and safety have been done in learning institutions in Kenya, yet, X-ray baggage screening has been introduced in the Kenyan universities to help conduct searches of threat materials.

1.2 Statement of the Problem

The X-ray baggage scanner is believed to be a powerful tool to help illuminate bags' contents so that unauthorized materials are prevented from accessing the facilities where X-ray machines are used for security and safety of the institutions, universities included. However, like all other machines, the effectiveness of the scanner is dependent on how it is utilized by the users. Despite, this understanding few studies have been conducted on effect of human factor and X-ray baggage screening on provision of security and safety of universities within Nairobi City, Kenya. Yet, there are continuous threats of unauthorized material finding their way in the universities in Kenya.

A report by the Kenya Ministry of Education Science and Technology (2015), for example, established that Kenyan University hostels are hubs of hard drugs among other unauthorized materials. The report further advised that there should be a national minimum standard on safety and security guidelines to tame the insecurities in universities. In addition, a study conducted by Mireri, Kamau and Kanyi (2016) at Wilson Airport, Kenya, revealed that 64.9% of the respondents indicated that the airport was not safe since the entry gates were not under tight security control despite the essence of X ray screening baggage technology used in searches. The infiltration of

unauthorized materials such as, crude weapons, and hard drugs among other items in the Kenyan universities to cause security and safety challenges is an indication that the X-ray baggage screening machines are not optimally operated for security and safety of our institutions. Therefore, the problem that provided the impetus of this study was that, although human factor (training, supervision and experience) could influence the outcome of X-ray baggage screening, there were limited studies conducted to assess the effect of interaction of human factor and X-ray baggage screening for safety and security of Kenyan universities. This study sought to bridge the gap by assessing the interaction between human factor and x ray baggage screening on provision of security and safety of selected universities within Nairobi City County, Kenya.

1.3 Purpose of the Study

The general purpose of the study was to assess the level of interaction between human factor and X-ray baggage screening on provision of security and safety of selected universities within Nairobi City County, Kenya.

1.4 Research Objectives

The general objective assessed the level of interaction between human factor and X-ray baggage screening on provision of security and safety of selected universities within Nairobi City County, Kenya.

1.5 The Specific Objectives

This study sought to:

i. To examine what the level of interaction is between training and X-ray baggage screening on provision of security and safety in universities within Nairobi City County.
ii. To establish what the level of interaction is between experience and X-ray baggage screening on provision of security and safety in universities within Nairobi City County.
iii. To evaluate how the level of interaction is between supervision and X-ray baggage screening on provision of security and safety in universities within Nairobi City County.
iv. To identify the specific challenges faced by screeners in X-ray baggage screening task on provision of security and safety for policy recommendations.

1.6 Research Questions

The study was guided by the following questions:

i. What is the level of interaction between guards/security screeners' training and X-ray baggage screening on provision of security and safety of universities within Nairobi City County?
ii. What is the level of interaction between security guards/screeners (user's) experience and X-ray baggage screening on provision of security and safety within Nairobi City County?
iii. How does the level of interaction between supervision and X-ray baggage screening affect the security and safety of the universities within Nairobi City County?

iv. What are the challenges faced by screeners in X-ray baggage screening task for provision of security and safety in universities within Nairobi City County?

1.7 Justification and Significance of the Study

An upsurge of threat items to universities is very influential for a study on the human factor in X-ray baggage screening on the provision of security and safety of the universities. X-ray technology is widely credited in screening hidden items that the naked human eyes cannot see. This capability of screening items by the X-ray baggage scanner makes it an excellent tool for security and safety searches at universities. It was essential to conduct this study to assess the interaction between human factor and X-ray baggage screening on the provision of security and safety, create awareness of human factor contribution on the betterment of the X-ray baggage screening technology in searches to provide a reference tool for university security across the board. Failure to consider the human element in X-ray baggage screening could result in security uncertainty, thus, undermining the essence of the X-ray screening technology investment venture by universities that have installed it. Few studies on the human factor in X-ray baggage screening have been done in universities. Therefore, this study would bridge the academic gap and generate new knowledge on the human factor in X-ray baggage screening for the security and safety of universities. The study would form future studies evaluating the effectiveness of the already existing X-ray baggage scanners that provide security and safety in universities. In this regard:

i. The study would be a reference source and blueprint to help shape the opinions of security managers, scholars, and stakeholders on the security and safety of universities.
ii. The findings would be important in gathering information for the university's strategic managers, security stakeholders, and policy makers to implement the ideas of adopting

X-ray baggage scanners at universities' checkpoints for the security and safety of university communities.

iii. The study would form a foundation for future studies on the subject matter for students interested in security and safety matters, for instance, on the success and consideratio n of human factors in optimal performance of the X-ray screening technology.

1.8 Scope and Limitation of the Study

The study was conducted in Nairobi City County, Kenya, with 59 public and private universities and their constituent college campuses: 35 being private and 24 being public. The study only focused on X-ray baggage scanners for screening unauthorized items for safety and security in universities but not any other security screening gadgets. However, only those who installed X-ray baggage scanners were purposively selected for the study. All the universities without X-ray baggage scanners were excluded from the study. The study engaged clustered respondents w ho were Chief Managers for security and safety, guard supervisors, deputy guard supervisors, and security screeners/guards working at the selected qualified universities. These respondents were considered because they were regular users of the screening technology in the universities.

The study was conducted in four universities within Nairobi City County, which may not represent all the universities in Kenya. Again, most institutions regard security issues as confidential; some targeted respondents felt not to participate in the study; thus, they were briefed on maintaining confidentiality by the researcher. Also, the respondents were informed that the research would be only for academic purposes. Out of 250 respondents, 227 participated, which gave a 91% response rate. The researcher recruited research assistants who assisted with the data collection. Thus, the researcher planned and worked within the available budget, which was sufficient and met all the requirements within a timeframe.

CHAPTER TWO

2.0 Literature Review

2.1 Introduction

The following section provides theories and conceptual frameworks that supported the study. The relevant theories (Technology Acceptance Theory, TAM, and Perceived User Resource Model (PURM) highlight pertinent issues by users on perceived usefulness and perceived ease of use, and factors that impact work performances: training, experience and supervision, which connect with the specific objectives of the study on the X-ray baggage screening on the provision of security and safety across the world. The literature review analyzes the issues in the previous research studies conducted on the topic, hence, detecting research gaps that the study pursued to address.

2.2 Theoretical Framework

2.2.1 Technology Acceptance Model (TAM)

Fred Davis (1989), in his concept of the Technology Acceptance Model (TAM), submits that when users are accorded a new system of technology, several variables impact their choice to either take or discard the new technological innovation. Farahat (2012) noted that the theory discussed the variables as users' perceived ease of use and usefulness. For example, if users believe that an X-ray baggage scanner is useful in guaranteeing security and safety, their alertness level will be high with the technology on its usefulness. Fred Davis defined perceived Usefulness (PU) as "the degree to which a person believes that using a specific system would increase his or her job performance". In contrast, Perceived Ease-Of-Use (PEOU) was defined as "the point to which a person believes that using a given system would be free from effort"(Davis, 1989). If an organization adopts a screening technology (X-ray baggage scanner) in screening, it does so to improve its environment's security and safety.

For this reason, security guards would have no choice but to accept the usage of the technology in screening tasks. Acceptance is positive regard for using a system (Taherdoost, 2018). In this regard, TAM has a shortfall by assuming that technology usage by security guards is voluntary and that there are no obstacles that would prevent the guards from using it. Other resource-related variables, user attributes, and support from others affect efficient technology usage (Mathieson, Peacock & Chin, 2001). To address the TAM's shortfall, Perceived User Resource Model (PURM) was used to bridge the gap.

2.2.2 Perceived User Resource Model (PURM)

According to Mathieson, Peacock, and Chin (2001), PURM has four key elements: **human attributes,** which includes user skill, user training, user educational level, time available to learn the technology; **support from others**: practical support, help desk; **system attributes**: technology user-friendliness and technology cost. In addition to the attributes, Musa (2006) conceptualizes other concepts as perceived positive impact aspects, perceived negative impact aspects, and individual perceptions on the usage of technology, for example, self-efficacy (ability to execute a specific task) (Al-Aulamie, 2013).

The 'ease of use' is associated with self-efficacy; thus, it is a product of relevant training and experience by users (screeners/guards), and subsequent perceived positive impact of technology (X-ray baggage screening) by users to use a system based on its easy to use principle (Mohammadi, 2017; Fayad & Paper, 2015; Taherdoost, 2018). In addition, the ease of use of a system influences external variables: user training, supervision, experience/skill, technical capacity: electric power supply, and computer infrastructural capacity for a serviceable X-ray baggage scanner for screening tasks. Concerning this study, the training of screeners on how to

operate and identify the items' images through the X-ray baggage scanner is very key to the success of the screening machine (Schwaninger & Merks, 2019). A system usage 'being free from effort' will only be guaranteed if users are well trained to have good experience to handle the system. Moreover, the screeners' supervision is also needed to reinforce screening work. In this regard, the X-ray baggage scanner will be easy to handle by guards without occasioning those being served unnecessary delays in the queue. According to the previous studies conducted on X-ray screening technology for security and safety reasons, a good screening task is depended on screeners' training, experience, and supportive supervision to work well with the screening machine (Schwaninger & Merks, 2019).

A person with high skill/expertise/experience would rate a technology used for screening purposes as easier than one with lower skill or expertise/experience (Mathieson, Peacock & Chin, 2001). This means that task-technology-fit is a crucial element in its ease of use, affecting the perception of work performance.

2.2.3 Summary of the Theoretical Framework

Technology Acceptance Theory (TAM) emphasizes that when a new technology is introduced in a system, certain variables impact on choice by users to either use it or abandon it; such a choice depends on users' perceived ease of use and the technology's usefulness in doing what it is intended to do. TAM assumes acceptance by guards to use the technology in the screening of threat items is volitional. TAM has a shortfall when guards use the technology for its perceived usefulness or ease of use, courtesy of them being guardians of security and safety in institutions without considering human attributes; hence another theory, the Perceived User Resource Model (PURM). PURM introduces significant human factors: user training, user skill /experience, and support from others (supervision) that form key variables in the study since they impact user performance of a

screening task using the X-ray baggage screening machine. Thus, the two theories collectively guided this study.

2.3 Training Screeners on X-ray Baggage Screening for Searches on Provision of Security and Safety

Various research done on X-ray baggage screening tend to agree that for the success of security screening system, frequencies of training conducted to the screeners should be considered into perspective since the efficiency of checked X-ray baggage screening hinges upon two items: efficiency of the screening tool (X-ray baggage scanner) and efficiency of security checks done by the screeners (Uchronski & Skorupski, 2018). How the screeners operate the X-ray baggage scanners to identify unauthorized items from the entrance to facilities makes the screeners key human components in screening searches conducted with the aid of the screening machine. For better usage of the X-ray baggage scanners, human beings/screeners play an important role in securing an environment where they work with the security screening systems in monitoring duties. This means that the screening and security checks may be determined by the efficiency of the work done by the screeners' guards. Indeed, Kenyan university's security and safety concerns have been the focus of the Kenya government education stakeholders, including security teams' training for security and safety.

Sterchi, Hattenschwiler, Michel, and Schwaninger (2017) did a study titled 'relevance of visual inspection strategy and knowledge about everyday objects for X-ray baggage screening.' The study had the key variables as professionalism, perceived safety, and dignity of passengers. The study found that perceived professionalism and safety were positively correlated with intentions of enplanement (boarding of a plane). At the same time, a threat to dignity was negatively associated with perceived safety, whereas screening measures were perceived as threatening one's sense of

dignity. Significantly, screeners' visual judgment on a person's bag being screened through an X-ray baggage scanner cannot make the specific bag have unauthorized contents. Thus, the study did not fully examine the real task performances of screeners on searches by the X-ray baggage scanner concerning training on screening accuracy on detection of illicitly disguised items, which are threats to the airport's security. This study focused on the human factor and X-ray screening on the security and safety of selected universities within Nairobi City County, Kenya. It also focused on non-academic institutions airports, but not a university.

Sterchi, Hattenschwiler, Michel, and Schwaninger (2018) agree that screeners must learn how unauthorized items appear as X-ray descriptions to be identified by graphic eyes searches. Secondly, the research established that pseudo colour as an image enhancement function (IEF) does not necessarily improve screening detection since prohibited items can still be concealed in containers. This requires a well-trained screener in searches to visually identify the prohibited items for the security and safety of universities; however, the study dealt with cargo and its contents to check prohibited items unaccustomed goods, but not necessarily items that are considered a threat to the airport's human and facility's security—for effective screening in any facility that employs an X-ray baggage scanner in searches, training the screeners in screening matters the most to achieve security and safety as the results. The research bridged the gap by examining the role of experience and supervision in screening duties by screeners in selected universities within Nairobi City County, Kenya. Rather than training screeners alone, this research did not check the elements of experience and supervision of screeners as far as screening accuracy is concerned.

In addition, study conducted by Thomas, Schwaninger, Heimgartner, Hedinger, Hofer, Ehlert, and Wirtz. (2014) on how stress-induced cortisol secretion impairs detection performance in X-ray

baggage screening for hidden weapons by screening novices, established that a screener's performance remains key in identifying threat materials/items in X-ray image bags and that stress increases the imperfect screening of such materials/items. Furthermore, the research listed cognitive processing as an important aspect of visual screening knowledge. Interestingly, the researchers emphasized that psychological stress impairs visual screening performance by releasing glucocorticoids (GC), a type of hormone responsible for impairment of cognitive functions, affecting the visual view. The research fell short of explaining whether training on screening accuracy could enhance screening knowledge (alertness) and whether the Perceived Ease Of Use of X-ray technology was reduced due to the stress element on screeners.

Mitroff, Ericson, and Sharpe (2017), in a study "predicting airport screening officers' visual search competency with a rapid assessment," employed the methodology, including interviews, a mobile technology application tool to identify screeners, and a pilot study. The study's key findings established that the rapid tablet-based assessment reliably predicted screeners on their job performance. Besides, aviation security screeners must accurately and quickly search passengers' bags. The study posits that while employing the best visual searchers, screeners can help improve security operations. Then again, the study noted the following gaps: the study had a specific and narrow focus- demonstrating that a rapid assessment tool could successfully predict professional screeners on the job performance rather than screeners' supervision on screening accuracy in searches. The current study gauged the impact of supervision on screeners' successful performances with X-ray baggage scanners in the screening of bags contents on the security and safety of universities.

Skorupski and Uchroski (2016), in a study on "a fuzzy system to support the configuration of X-ray baggage screening device at an airport," found that human factors and technical factors should

be considered simultaneously time. That exchange of screening personnel between terminals is key to better performance of the screener's work with the X-ray baggage scanners. In addition, the study established that there was no need to change the device or system configuration since the difference was insignificant. Still, the study had the following gaps: it did not exhaustively observe whether human factors or technical factors were to blame in cases of contraband items getting their way into the airport. The study only generalized the two factors as important but did not clarify their considerations on what scales the provision of security and safety of the facility is concerned. The current study examined the human factor: training, experience, supervision, and noted the influence the variables play in X-ray baggage screening on providing security and safety of the universities.

2.4 Influence of Supervision on Screeners' X-ray Baggage Screening Task on Provision of Security and Safety

For proper security and safety of a facility to be guaranteed, the screeners/guards need good supervision. Supervision relates to human capital management. Some scholars have argued that the concept of 'security' will remain contested as security keeps evolving to bring a shift in the way security is managed through human-technology interaction (Lum, 2021). Human beings have become an important influence on the optimal use of technology.

Michael, Mendes, de Ruiter, Koomen, and Schwaninger (2014) did research on "increasing X-ray image interpretation competency of cargo security screeners and established that not everyone is a potential X-ray machine screener since definite qualities matter (amplitude and abilities) and that even after training of screeners, a need of improvement ever existed. Such improvement can only be assured through specific training and supervision. The research failed to highlight the type of such abilities and aptitude so mentioned.

Lum (2021) observes that technology and human factors are inseparable; hence, there must be an interaction between technology and human factors to result in a certain societal impact. Although the X-ray baggage screening technique is used to identify unauthorized items and curb their access to a facility, users have a major question about whether the screeners are skilled at threat identification (Chung, Jung & Sohn, 2017). Moreover, X-ray detection technology requires a human component that influences X-ray detection and that training, experience, and supervision enhance their screening efficiency for security and safety.

In Africa, Cairo International Airport, Port Elizabeth international airport, Mohammed V International Airport, O.R. Tambo International Airport, and Cape Town International Airport, among others, have conducted studies into the usage of X-ray baggage screening. All agree that the X-ray baggage screening technology depends on the alertness of screeners (Lubbe, Douglas & Zambellis, 2011). The research concluded that the screeners must be experienced for tight security. This study is still valid because related studies on X-ray baggage machines and security screeners require their alertness. This study will check if the supervision of screeners may affect their screening performance at work with the X-ray baggage scanner for the security and safety of universities in Kenya and compare the findings.

Ogalo (2013) studied "implementation challenges of operations strategy in the airline aviation industry in Kenya." The study's key findings were that the security of the cargo and baggage depended on screeners' professionalism. It also established that security remains a great challenge to airline/aviation operations strategy implementation. The study had the following gaps: the study was too general on security as a challenge without specifying how it is a challenge in screening the cargo through X-ray technology, which depends on the human element as an integral interface. Besides, the study dealt with the airline, but not a university. Still, the study did not specify the

security of the cargo through the X-ray system; yet, cargo is inspected by the X-ray system. The current study investigated specific human factors in X-ray baggage screening on the security and safety of universities in Kenya. The study is still valid as far as operational challenges in the Kenyan airports are concerned, even though it failed to look at the X-ray baggage machine, a common search machine for security and safety at various airports.

Moreover, previous research studies on the usage of X-ray baggage scanners at various non-academic institutions in the world, Africa and Kenya established that the X-ray baggage scanners as used for security and safety of the institutions found either the same issues on user satisfaction, delay of luggage through the X-ray screening machines, effects of training, screeners experience, screeners' supervision vis-a-viz the screeners' performances, the efficiency of the machines, risk factors and visual fatigues as factors associated with the use of the X-ray baggage scanners for security and safety. The studies looked at X-ray baggage screening on the provision of security and safety concerns of various non-academic institutions. Still, few studies have looked at human factors in X-ray baggage screening on the security and safety of academic institutions and universities. Specifically, such studies on the usage of X-ray baggage screening for security and safety have been conducted in Kenya's maritime, airports, seaports, medical facilities/labs, and cargo industries. This study bridged that gap and assessed human factor and X-ray baggage screening for searches on security and safety of universities in Kenya concerning the selected universities within the Nairobi City County, Kenya.

2.5 Screeners Experience on X-ray Baggage Screening Performance on Provision of Security and Safety

As the world keeps experiencing new technological advancement, various organizations' technol ogical environment also change to catch up with the ever increasing and changing technology (Fay, 2011). Technology has been incorporated almost in all sectors of the economy to achieve fruitful results including security field. Marx and Byrne (2011) underscore the different types of technol ogy being soft and hard technology, which X-ray baggage scanner falls in the category of hard technology. For this reason, security industry has not been left behind by this technological appeal to use technology in provision of security and safety. These security technological gadgets bring a new security administration regime, which any average institution needs to emphasize on; hence, the technological the installation of X- ray baggage scanners at the access points/entrances by universities. The rapid changes being experienced on the usage of X-ray baggage scanners in institutions of higher learning is largely being driven by the urge to secure the learning institutions.

Adoption of X-ray baggage screening by universities for provision of security and safety has not only transformed how the universities security team works, but has demanded a whole new way of thinking on safety and security at the institutions. However, the usage of the X-ray baggage scanners by universities, which have installed them have had challenges on provision of security and safety that this study sought to assess. Bottles of hard drugs and certain crude weapons continue to find their ways on campuses despite the installations of the X-ray baggage scanners at the entrances of the universities with the screening machines, X-ray baggage scanners (Kenya Ministry of Education Science and Technology Report on university security and safety (2015).

It is remarkable that the X-ray baggage scanners are used for security inspections for their perceived reliability as used in detection of contraband or object threats (ammunition, weapon

etc.) to prevent their entrance to vital infrastructure, and strategically important buildings (Mery, Saavedra & Prasad, 2020). For example, the X-ray baggage scanners are used to help contextualize the nature of the bag contents. As a result, it is hoped that the X-ray baggage scanners will do a thorough X-ray of all baggage that is screened through it by identifying unauthorized materials which may find their way into universities, and assist to intercept unauthorized items: assorted drugs, and crude weapons among others accessing the campuses as well.

The availability of X-ray baggage scanners alongside other pieces of equipment has assisted both private and government law enforcement agencies to better their security administration. With the unpredictable terror related attacks across the world, the technology is installed to help reduce such incidences of security and safety threat causing materials from accessing facilities. In this regard, the decision for usage of X-ray baggage scanners for screening of items has not only been realized in non-academic institutions, but also many organizations including universities in Kenya. For the sake of keeping safe and secure, learning organizations strive to adapt to modern technological innovations right from the access points to their interior.

Owing to the effectiveness of the X-ray screening mechanism on provision of security and safety of facilities, Mery, Saavedra, and Prasad (2020) posit that it is frequently used at high-end security operations, for example, private or public sectors, biomedical research institutions for pathogens' inspection, transportation systems, maritime, cargo industries for search of items before acceptance; thus, it plays a significant role in identification of security and safety threats. It is no doubt that X-ray technology has been successfully used in various facilities to conduct screening searches.

On the X-ray success in screening, Taylor (2013) advances that in Nigeria, airport security officials have used X-ray technology to identify drugs on passengers on board to United States of America.

On the other hand, certain technological hitches on the X-ray technology have caused the airlines due to the machine's inability to discriminate items as required. As such, there has always been a debate on whether it is the human error (lack of training, experience or lack of supervision of screeners) or the technological error (faulty machinery), on the value added advantage of the X-ray technology to war on crime when items pass through X- ray machine undistinguished (Mireneko, 2011). As a result, users may cast doubt on the usefulness of the X-ray technology if unauthorized items still access the screening machine. For example, in July, 2009, a suicide bomber, Abdullah Hassan Tali al- Asiri sneaked in his body 1 kg of explosive and a detonator, and managed to go through two airports with high-end X-ray technology searches, the terrorist discharged the bomb near a prince of Saudi causing injuries to many as well (Mironeko, 2011).

Besides, the terrorist managed to reach his target by bypassing 15 X-ray scanners at Schiphid airport his point of first boarding of the airplane (Mironeko, 2011). The terrorist bypassed the X-ray technology searches hence remains a subject of some of the major flows of screeners' capacity of conducting searches, and effectiveness and efficiency of X-ray technology for security and safety of facilities.

Min, Shin, Lim, Park, Cho & Park (2015) did a research in Korea on the improvement of marine security using X-ray scanning technology and established that X-ray screening devices are not used by many organizations due to external influencers and organizational characteristics, which includes employee resistance on the technology's PEOU. In addition, the study found that the X-ray machine may not be adopted by many organizations due to the high cost of its installation and users' not conversant to its usage (EOU). Further, the study expounded that X-ray technology is used in maritime to curb smuggling of unaccustomed goods and contraband hence prevent theft for users' Perceived Satisfaction (PS) of its general organizational benefits. Despite the benefits of

X-ray technology in maritime, the study failed to comprehensively examine the contribution of screeners' experience as a capacity required by screeners to distinguish items through the X-ray machine. The study was also conducted in maritime. The current study was conducted in universities to establish the level of users' experience on PEOU and Usefulness as far as working with the X-ray baggage screening device is concerned for security and safety of the universities.

In the year 2014, a research studied the screening of Canadian students at a Canadian university on their opinion about their security at the entrance, and the research revealed that majority of the students had on their mind that justice had been done to their security at entrance by allowing everyone to pass through a security screening machine (Alards-tomalin, Ansons, Reich, Sakamoto, Davie, Leboe-Mcgowan & Leboe-mcgowan, 2014). According to the students, they perceived that threat to one's dignity resulting from humiliation experienced during security screening, would lead to making undesirable impression of injustice done in the name of enhancing security and safety through screening processes; thus, brings elements negativity on usefulness of a system in provision of security and safety of their university. Furthermore, the study tested the security screeners' professionalism on their training, confidence in making right or wrong decisions and their behavior at work, which factors do influence standard of searches by X-ray screeners using the X-ray screening technology. The current study sought to establish users' levels of experience in terms of Ease of Use (EOU) and usefulness of X-ray baggage scanner for security and safety of Kenyan universities.

2.6 Summary of Literature Review

The chapter illustrates how the two theories that this study was anchored upon (TAM and PURM) guided this research. Also, the chapter highlights important issues on human factor in X-ray baggage screening on security and safety in non-academic institutions. Further, the review

explores on specific human factor: training, screeners' experience and supervision as human skillset needed for ideal searches of threat materials by X-ray baggage scanner for security and safety reasons. However, despite the consideration of human factor in X-ray baggage screening, problems of unauthorized materials/items are still recorded on campuses in Kenya. The review literature has identified the gap that this study sought to bridge by assessing human factor (training, experience and training) in X-ray baggage screening on security and safety of academic institutions, whereby the study focused on selected universities within Nairobi City County, Kenya.

2.7 Conceptual Frame Work

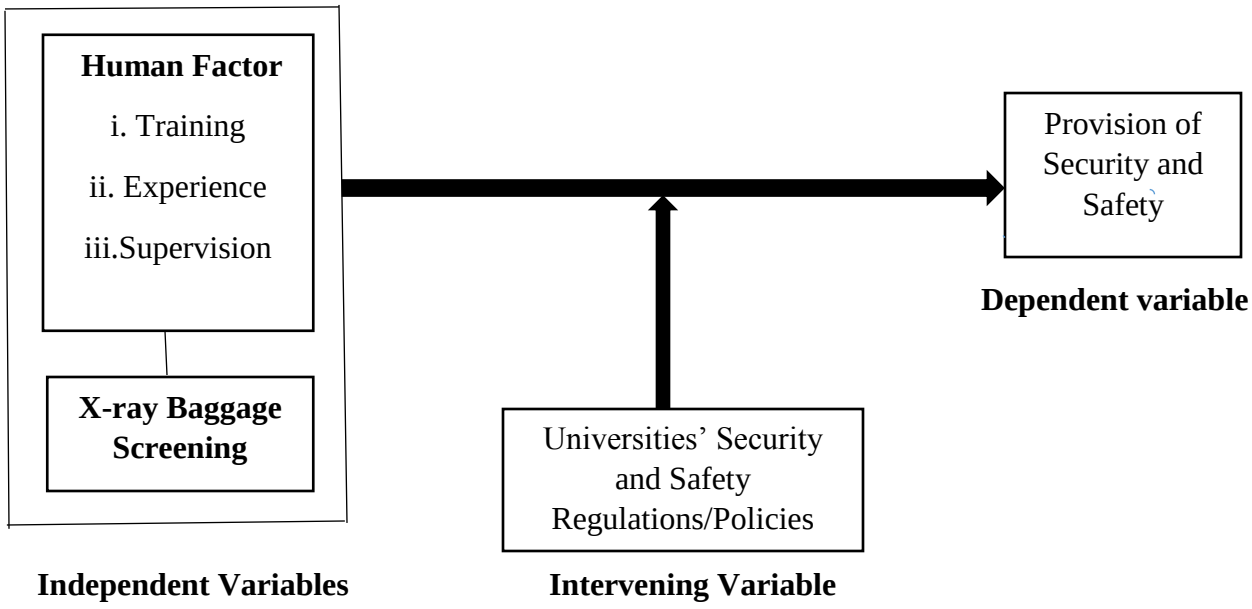

Fig 2.1. By the Researcher (2019)

CHAPTER THREE

3.0 Research Design and Methodology

3.1 Introduction

This chapter discusses the research methodology that was applied in this study. It explains the research design that was adopted. Various methodological issues are discussed, including population choice, sampling techniques, sampling frame and size, and data collection and analysis methods used to conduct the study. A summary of the research methodology is provided at the end of the chapter.

3.2 Research Design

The study adopted a cross-sectional survey design. Creswell (2014) writes that a cross-sectional survey design gathers data to make comparative inferences and interrelations among different variables about a population of concern at one point in time. Cross-sectional surveys can be done utilizing any mode of data collection (Creswell, 2014). Therefore, this study used both qualitative and quantitative approaches to collect data. This data collection method gives diverse angles to an issue under inquiry to provide more evidence. In this study, the information on secur ity guards' training, their experience, and supervision in x-ray baggage screening for security and safety was gathered from a selected population sample at one point in time.

3.3 Research Site of the Study

The universities within Nairobi City County, Kenya that qualified as the only ones with X-ray baggage scanners were three main universities and a campus. The purposively selected universities were private and public universities, which had all the categories of the targeted population within Nairobi City County, Kenya.

3.4 Targeted Population

Cooper and Schindler (2003) describe a population as the total collection of elements from which samples are picked for measurements. The study's target population was security personnel in the security departments both employed and contracted by the selected universities within Nairobi City County, Kenya, which installed and used X-ray baggage scanners to screen for security and safety. The respondents were drawn from Chief Security Managers, deputy security managers/assistants, security guard supervisors, guard deputy supervisors, junior and senior security guards working for the various universities targeted for the study. Consequently, the population offered adequate information concerning human factors in X-ray baggage screening on the security and safety of the selected universities in Nairobi City County, Kenya.

3.5 Sampling Technique and Sample Size

Mugenda and Mugenda (2003) describe sampling as a systematic procedure of selecting several persons for a study to represent the entire population from which they were selected. The researcher employed probability sampling (stratified sampling technique) in the selection of the human population (recruitees), and non-probability sampling (purposive sampling technique) was used to get the universities with X-ray baggage scanners for the study. The stratified sampling technique provided uniform subgroups of the security guards performing X-ray screening in day and night shift duties at the entrances. In addition, security guard supervisors and their deputy supervisors are security and safety players at diplomatic levels. The Chief Security Managers are overall security and safety professionals who were interviewed as Key Informants for data collection. The subgroups of the entities were divided as follows: junior security guards, senior security guards, deputy guard supervisors, guard supervisors, and Chief Security Managers. After

that, a random sample was taken from each subgroup proportional to the size of the subgroup to get the sample size for the study.

A scientific formula (Yamane, 1967) was used to calculate the sample size to represent the entire population for the study within the scope of the study as follows: n= N/1+N (e) ^{2,} whereby n is the sample and N is the population size. This means that at a 95% confidence level, the precision level (e) is 5% or 0.05

University	**Screeners/Guard Strength**	**Sample**	
A	Chief Security Manager and Assistant = 2	2/93x35	1
	Supervisors = 4	4/93 x 35	2
	Deputy Supervisors = 3	3/93 x 35	1
	Senior security guards = 39	39/93 x 35	15
	Junior security Guards = 45	45/93 x 35	17
	Total = **93**	93/657 x 248	**36**
B	Chief Security manager and Assistant= 2	2/90x34	1
	Supervisors = 4	4/90 x 34	2
	Deputy Supervisors = 4	4/90 x 34	2
	Senior Security guards = 38	38/90 x 34	14
	Junior security guards = 42	42/90 x 34	16
	Total = **90**	90/657 x 248	**35**
C	Chief Security Manager and Assistant=Nil	-	-
	Supervisors = 2	2/32 x 12	1
	Deputy Supervisors = 2	2/32 x 12	1
	Senior Security guards = 15	15/32 x 12	6

	Junior security guards = 13	13/32 x 12	4
	Total = **32**	32/657 x 248	**12**
D	Chief Security manager and Assistant=2	2/442x167	1
	Supervisors =14	14/442 x 167	5
	Deputy Supervisors = 6	6/442 x 167	2
	Senior Security Guards = 135	135/442 x 167	51
	Junior Security Guards = 285	285/442 x 167	108
	Total = **442**	442/657 x 248	**167**
Total Population	**657**	Sample population	**250**

Fig 2: Table showing Population Size

Source: Universities' Security Offices

Yamane (1967) sample size formula where n= N/1+N (e^2)

= 657/1+(657x0.05^2)= 248.2= 248

Therefore, n= **248**

3.6 Inclusion Criteria

The researcher collected data from the respondents (security guards) on-site during the data collection time. The same applied to the Key Informants being deputy guard supervisors, guard supervisors, and Chief Security Managers of the selected universities for the study. Data was collected from the security guards who must have performed X-ray baggage screening duties for at least one year—in any given shift or job rotation—at the entrances of the selected universities.

3.7 Exclusion Criteria

While X-ray baggage scanner technical vendors and Information Communication Technology (ICT) staff are crucial as service providers to ensure that the machine is serviceable, universities' staff/faculty are also subjected to searches by the security team. Their inclusion would have made the study unfeasible for the ICT staff, and the staff/faculty play technical roles. Also, the time frame to reach out to such vendors and university staff/faculty made their exclusion essential. Also, the study excluded security guards who had never performed X-ray screening duties at the universities' entrances and those security teams who were not present at the research sites.

3.8 Data Collection Methods

The study collected data by using Key Informant Interviews (KIIs) and structured questionnaires. The researcher developed interview guides for the study sites. The structured questionnaires that were administered included closed and open-ended questions. This was because closed-ended questions ensured that the respondents were restricted to certain categories in their responses, while open-ended questions provided an insight into new ideas. In addition, the structured questionnaires were organized in various parts as follows:

There was general information on the respondents' age, and gender, among others. Part one contained questions on the interaction between training and x-ray baggage screening on the provision of security and safety in universities within Nairobi City County. Part two contained questions on interaction between supervision and X-ray baggage screening) on the provision of security and safety in universities within Nairobi City County. Part three contained questions on the interaction between experience and X-ray baggage screening in providing security and safety in universities within Nairobi City County, Kenya. Lastly, part four contained questions on

challenges screeners face in x-ray baggage screening tasks to provide security and safety in universities within Nairobi City County, Kenya.

3.9 Validity and Reliability

In this study, both validity and reliability were ensured as follows: on validity, the research questions were given to research experts and the Supervisor to review them for a revision of the questions. The customized questions from the previous publications in the study area were put to a pilot test by non-participants in the main study to ensure validity. Also, content validity was ensured by using both open-ended and closed-ended questions in the tool used. There were enough appropriate questions that equally tested all the study's objectives. Construct validity was ensured by using appropriate theories that the study hinged upon. The theories explained the human attributes that the study measured and made inferences that evidence supported the theories chosen.

The reliability of this study was taken care of by asking the same questions to the rest of the respondents across the selected universities for the study. A reliability test was conducted on the independent and dependent variables. A Cronbach's alpha was obtained to check internal consistency; a level of 0.7 to 1.0 was acceptable, and it showed that the data was reliable.

3.10 Data Collection Procedures

Data was collected through structured questionnaires whereby respondents were given one struct ured questionnaire each and Key Informant Interviews (KIIs) using screeners in four Nairobi City County, Kenya universities. The researcher himself administered the structured questionnaires with the help of two trained research assistants. Introduction to the respondents was done using a cover letter seeking the respondent's authority and acceptance to conduct the research. Also, the researcher officially requested the sampled universities' administrative offices to permit data

collection in their premises. The respondents administered the structured questionnaires during the universities' business hours. Both qualitative and quantitative data were collected at the same time and concurrently. Due to convenience in some sites, the researcher dropped the structured questionnaires and picked later.

Also, the researcher employed Key Informant Interviews with volunteer respondents, who were six deputy security guards' supervisors, ten security supervisors, and three Chief Security Managers at the study sites. The interviews were conducted with the key informants to gather information from respondents who had a deeper understanding of security and safety operations at their organizations. The researcher did a summary of the interview answers, which were obtained. The researcher self-administered the interviews and took notes. While the security supervisors and their deputies work at both tactical level (supervision of subordinates) and operational level (screening personnel and luggage before granting access to organizations), the Chief Manager Security and safety team of the organization work cut across all security and safety operational level, tactful level and strategic level (setting security protocols and procedure); thus, they provided great insights of the issues under study. The data collected was then subjected to analysis accordingly.

3.11 Pilot Study

A pilot study was conducted at the Kenya Revenue Authority (KRA) office in Thika, Kiambu County. During the pilot study, the researcher used a similar population that mirrored the sample target population for the study, who were given structured questionnaires that tested and had errors rectified before the actual study took place. The result from the pilot study was used to analyze the feasibility of the study before conducting the main study by testing the instruments used for

measurements in the study. Also, the training of researchers and research assistants helped rephrase some of the questions.

3.12 Data Analysis

The data collected from different sites were first sorted and cleaned to ensure completeness. Descriptive and inferential statistics were employed in data analysis. Quantitative data was then coded, collated, and fed into the computer Statistical Package for Social Science Version 25 (SPSS Version 25) tool for computation, data summaries, interpretation, and presented in tables, graphs, percentages, and pie charts. Pearson's correlation was used to test correlation. In addition, Regression analysis was employed to establish a relationship between the dependent and the independent variable; hence it established statistical significance in the study. The data from interviews from the three sources were then grouped according to the study objectives' themes and presented in the discussions in the way of narratives.

3.13 Ethical Issues

After the research proposal was approved by the Kenyatta University (K.U) School of Graduate Studies Board, the researcher sought clearance to conduct the study from Kenyatta University Ethics Review Committee. Further, a permit to conduct research was obtained from research institutions (National Commission for Science, Technology, and Innovation (NACOSTI). Authority to collect data in all the universities sampled for the study was sought, whereby a copy of the research permit from NACOSTI was attached for their reference. The researcher did a requested letter of introduction to the respondents attaching the copies of the authority to conduct the study.

Since security and safety are issues of concern to many organizations, questions touching on the same were required to be handled with their deserved care. The researcher obtained informed consent from all the respondents by having an informed consent form signed accordingly. Additionally, the structured questionnaires were administered to the respondents on a voluntary participation basis. For these reasons, all the collected information from the respondents was treated with confidentiality. The researcher ensured that research ethics was of concern for the ethical standards required: all respondents were kept anonymous to safeguard their identities and guarantee confidentiality. In addition, all materials authored by others and all support received concerning the study were acknowledged.

3.14 Care and Protection of Participants

The study was conducted in the selected universities within Nairobi City County, Kenya, during surging cases of the COVID 19 pandemic. For this reason, the researcher ensured that The Ministry of Education guidelines to learning institutions on health protocols were observed when collecting data at all sites: by ensuring that all volunteer participants and the researcher wore their face masks, cleaned hands with soap and water available at specific points of the learning institutions or sanitized hands before and after handling the structured questionnaires. For KIIs, the researcher ensured that at least one meter of social distance between the researcher and each interviewee(s) was realized. In some sites, the interviews were conducted in open and well-ventilated areas. Also, participation in the study was voluntary, with an informed consent form signed by each respondent. The researcher also explained to the respondents their voluntary participation in a language they understood. The researcher treated all the information obtained in the research with utmost confidentiality that the data collected was used only for academic purposes. All the participants

were accorded a cellphone number/contacts of the Supervisor and Kenyatta University Ethical Review Committee Secretariat just in case they would have questions about their rights.

3.15 Community Considerations

The selected universities within Nairobi City County, Kenya, were the sites for the study. As academic centers for research, teaching, and learning, the universities have students, staff, and faculty as university communities. In that regard, the universities communities' security and safety interests are taken care of by the security teams employed as security and safety guardians therein. Also, prospective students and visitors access the selected universities after being served by the security team at the entrances.

The scope of this study assessed the level of interaction between human factors and X-ray baggage screening on the provision of security and safety of universities within Nairobi City County, Kenya. Other than security guards, security guard supervisors, and their deputies being the respondents for the study, Chief Security Managers (CSMs) of the selected universities also formed part of the research respondents. The researcher conducted Key Informants Interviews with the CSMs, and university employees with great knowledge of sensitive security and safety matters; thus, they were representatives of the universities and their communities in the study courtesy of the data collected from them. Also, the study was relevant to the universities communities' security and safety concerns. The researcher acknowledged the universities communities as players of a vital part of the research. For this reason, the researcher shared copies of the final study report findings with the respective universities.

CHAPTER FOUR

4.0 DATA PRESENTATION AND DISCUSSION

4.1 Introduction

This study aimed to assess the interaction between human factors and x-ray baggage screening on the provision of security and safety of selected universities within Nairobi City County, Kenya. The study was guided by four objectives which are:

i. To examine what the level of interaction is between training and X-ray baggage screening on provision of security and safety in universities within Nairobi City County.
ii. To establish what the level of interaction is between experience and X-ray baggage screening on provision of security and safety in universities within Nairobi City County.
iii. To evaluate how the level of interaction is between supervision and X-ray baggage screening on provision of security and safety in universities within Nairobi City County.
iv. To identify the specific challenges faced by screeners in X-ray baggage screening task on provision of security and safety for policy recommendations.

The study findings are presented and discussed as per the study objectives. The presentation begins with the response rate, the effectiveness and role of the x-ray machines in promoting the security and safety of universities, and presentation and discussions of the findings of the main objectives.

4.2. Response Rate.

According to Stoop, Billiet, Koch, and Fitzgerald (2010), a high response rate is reflected as pointers for data quality, and the minimum target response rate should be 70%. This study targeted a sample of 250 respondents, and 227 successfully responded, leading to a 91% response rate, in line with the literature on response rates. The 91% was considered high and adequate to provide information that would address the concern of this study.

4.3 Demographic Characteristics of the Respondents

Data was collected on the following demographic characteristics: gender, age, years of experience with the screening machine, years of experience as a security officer, and understanding of the role and effectiveness of the x-ray screening machines. The results are presented in the consequent section.

4.3.1 Gender of Participants

The study grouped gender into two categories to signify the percentage of male and female respondents who participated. Gender was measured to determine the percentage of gender inclusivity in the study. A summary of their response is shown in figure 4.1 below:

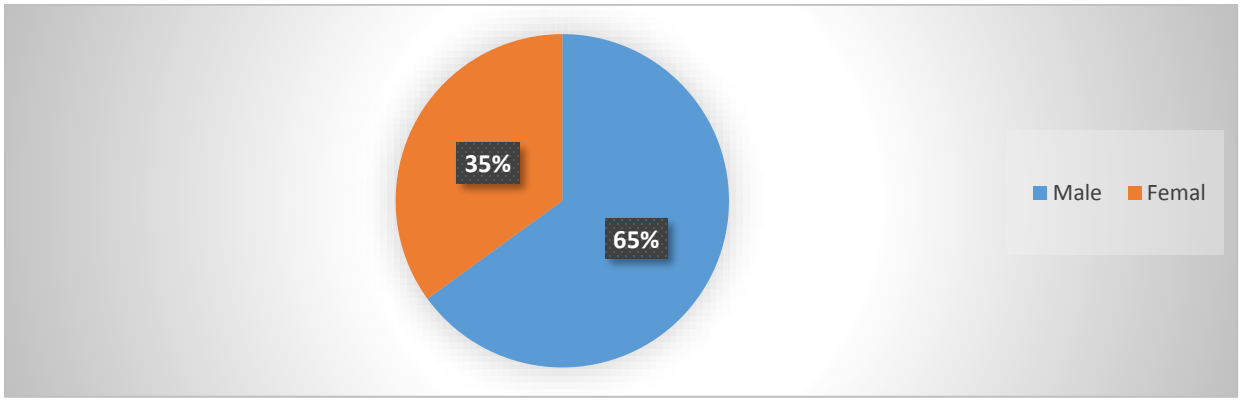

Figure 4.1: Distribution Showing Response by Gender

Out of the 227 respondents, 35% were female, while 65% were male. This finding is consistent with the previous research by Sakano, Obeng, and Fuller (2016) on "airport security and screening satisfaction," whereby there were more males than females in the study, with 84% of the participants being male, while 16% were female. Further, they established that females display less confidence in x-ray screening task performance for security and safety.

Security work entails a lot of masculinity. To support this, it is necessary to stress that the males' statistics are kept higher than the females in the security service industry for the kind of work they

do and their preference over the females. By maintaining a high number of males in the workforce of the security firms, they are assured that there would be seamless task performance by the males whose number exceeds the females.

Also, this study resonates with a study by Koller, Drury, and Schwaninger (2009). They undertook a study related to the study area on "effects of age, gender, experience and training on x-ray screening performance" and established that males perform a little better in x-ray inspection (screening) than their female counterparts. These findings on age, gender, and experience are still concerns in the security industry; thus, the past study is still appropriate to the current study. The age, gender, experience, and training study findings remain relevant. This could explain why security firms recruit more males than females as security and safety keepers, including the screening task using x-ray baggage scanners in universities. In addition, security is associated with long working and challenging work environments,s as indicated by (Murunga 2014). Thus, the security task could be more challenging for females for the type of work involved; hence females tend to be underrepresented, as this study confirmed. The outcome of these two studies on working long hours and the males preferred by the security firms is still the situation to date. Thus, the studies are still valid for the findings on the masculinity associated with security and safety work for more males than females.

4.3.2 Age of Respondents

The study grouped age into four categories to denote the number of personnel in a given age distribution that took part in the study. Age was important to study to understand what each age category shares in common easily. The respondents were asked their age groups, and the results are shown in Fig. 4.2:

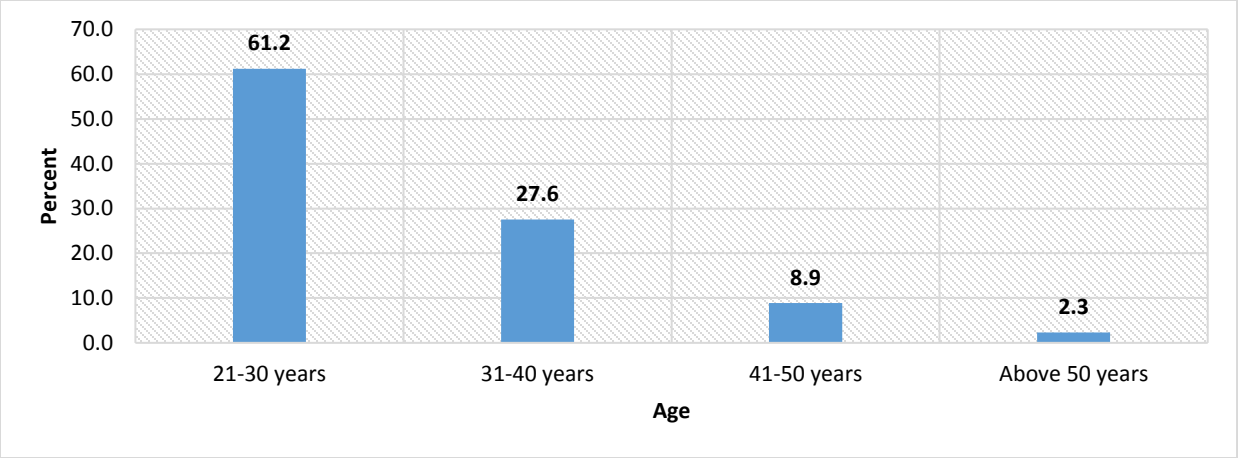

Figure 4.2: Distribution Showing Response by Age

The findings, as summarised in the figure above, indicate that 61% of the respondents were of age 21-30 years, 28 % were of age 31-40 years, 9% were of 41-50 years, and 2% of the respondents were above 50 years of age. The findings depict that the respondents' ages were spread from the age bracket of 21-30 years followed by 31-40 years. Sakano et al. (2016) did a study related to this research study on x-ray screening and security satisfaction, and it found that the most frequent age group of x-ray screeners was 35 years or less. This study falls in the age range of the previous study, whereby the majority were security x-ray screeners who were in the age bracket of 20-35 years, which is in line with this study. Moreover, the results show that the age group of 41-50 years and above 50 years represented only 11% of the respondents who have used the x-ray screening machine. This shows that few security personnel in the age bracket between 41-50 and 50 years and above were respondents in the study.

A study on "the effects of working conditions of private security guards on service delivery" by Murunga (2014) found that the dominant age group of guards in the security service industry is 21-30 years, which this study corroborates as well. Moreover, the study found that the number of security personnel in the age category of 41-50 years could decrease the personnel statistics as their age advances. In a study conducted by Koller, Drury, and Schwaninger (2009) on "change of

search time and non-search time in x-ray baggage screening due to training," they observed a constant deterioration in task performance measures with x-ray screeners as their ages increase. The study validity of the decline in task performance as screeners' ages advance still stands. This could explain why few respondents of advanced ages between 41-50 years and above 50 years were only 11.2% in the current study and could reveal that security firms would employ security guards who are considered energetic for better task performance.

Moreover, the current study also found the same results on task performance and age. The previous study analyzed and agreed that the security field requires very active personnel as security and safety keepers. This could imply that those security guards who could present deteriorating job performances due to challenges brought by their advanced ages could not be recruited. If they are left working for the security firms, only very few of such guards with advanced ages would be retained by the security firms. Therefore, this could mean that only security personnel in the age bracket between 21-30 years would be more than any other category, as confirmed by this study.

Moreover, in their writing, Correia, Barroso, and Nieto (2018) underscored that human beings exhibit reduced physical and cognitive abilities as their ages advance. This could explain why few x-ray screeners are considered old in the age bracket of between 41-50 years and 50 years and above being assigned screening duties. They are considered sluggish both in their motor and cognitive abilities while performing security duties. This study agrees with the previous studies on the search of threat items in x-ray baggage screening, which agreed that age-associated decline resulted in reduced efficiency in perceptual, cognitive abilities: lower detection performance of threat items, decrease in pupil diameter, visual challenges, and disparity in sensitivity (Timar, 2014; Donnelly, Muhl-Richardson, Godwin & Cave, 2019).

X-ray screeners who have reduced motor and cognitive abilities due to advanced age cannot conduct efficient screening tasks using the x-ray baggage scanner. Thus, for the security and safety of the universities not to be compromised, that security personnel considered energetic and alerted while at work, that is, those in the age bracket of between 21-40 years, will be assigned x-ray screening duties more than those in the age bracket of 41-50 years, and 50 years and above as documented by this study.

4.3.3 Level of Education

The study grouped respondents' levels of education into three categories to reveal their level of education. A summary of respondents' education levels in the security and safety industry is shown in Fig. 4.3 below:

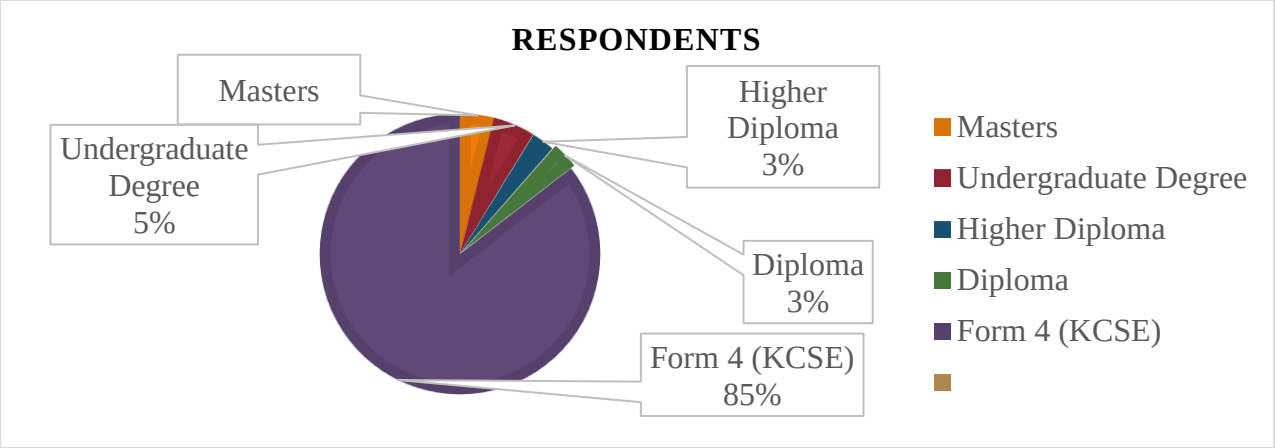

Fig 4.3: Showing Distribution of Response by Level of Education

Out of the 227 respondents, 85% had form four (4) or the Kenya Certificate Education (KCSE), 3% had a diploma and higher diploma in each category, and 5% had an undergraduate degree. In contrast, 4% of the respondents had a master's degree. The study results are inconsistent with Mugisha (2018) study, which established that 79% of security guards were high school certificate

holders. This could indicate that security firms recruit more high school level education holders as security guards than other levels of education. This could be the major reason why this study also confirmed a similar trend among respondents who participated in the study.

4.3.4 Years of Work Experience with an X-ray Baggage Scanner

The study grouped the respondents' years of work using the x-ray baggage scanner to screen bags into four categories to demonstrate their range of experience. A summary of the respondents' work experience with the x-ray baggage scanner (machine) is shown in Fig. 4.4 below:

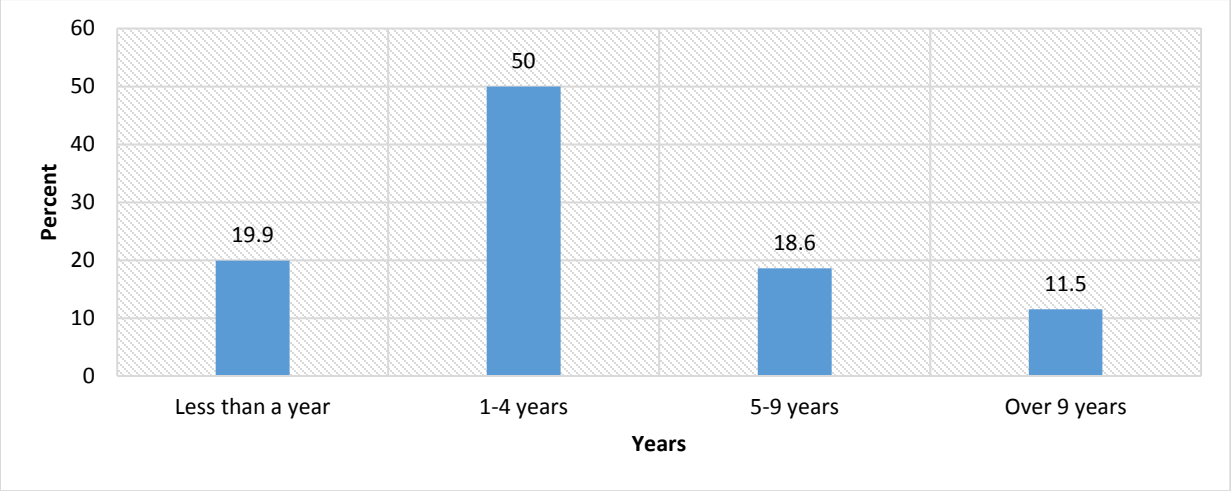

Figure 4.4: Distribution Showing Response by Years of Experience

The results show that most respondents (50%) had worked with an x-ray baggage scanner for 1 to 4 years. 19.9 % of the respondents had worked with the machine for less than one year. 18.6% of the respondents had used the machine for 5 to 9 years, while 11.5 % had used the x-ray machine for over nine years.

A past study by Hattenschwiler, Sterchi, Mendes, and Schwaninger (2018) on "Automation in airport security X-ray screening of cabin baggage, which examined the value of computerized explosives detection, showed that experienced X-ray baggage screeners were good at detection of

threat items even without the assistance of detection system kit. This study agrees with the previous studies on the related area of x-ray baggage screening task experience by x-ray screeners. This could mean that X-ray screeners with more X-ray screening task experience would demonstrate considerably more situational understanding of x-ray screening task performance than guards who are inexperienced and less experienced in x-ray baggage screening tasks. This could show that security X-ray screeners with good X-ray screening task experience would be highly likely to be assigned screening duties to reduce the cost of training new guards.

According to Sivatte, Gordon, Olmos, and Simon (2019), job experience improves personnel while at work; as a result, making them more effective job performers. Consequently, x-ray baggage x-ray screeners with more than three years of x-ray screening task experience would be effective at x-ray screening tasks to identify threat items that could get into the universities. This would make the universities safe and secure havens for learning and researching by communities in the universities. With good x-ray screening task experience, guards could be consistent with screening tasks and quick at screening bags through the X-ray baggage scanner. The amount of time spent by experienced x-ray screeners to identify threat items would be less; hence this could mean a faster and steady flow of baggage in the queue. Therefore, the security and safety of universities could be assured.

Wahab (2020), in her study on "the impact of time management on the success of service organizations", found that time was an important factor in all work environments. Her study found a statistically significant correlation between time management and service goals to be achieved at a workplace. Security personnel work around the clock; this makes time management essential for them to achieve their major goal, which is uninterrupted and flawless security and safety of the universities. Good time management skills could allow security x-ray screeners to achieve a set of

deliverables; thus, it makes the x-ray machine reliable in providing security and safety in universities.

4.3.5 Years of Serving as a Security Officer

The study grouped the respondents' years of service into four categories to expound on their level of service delivery as security officers. A summary of the respondents' service delivery as security officers is shown in Fig. 4.4 below.

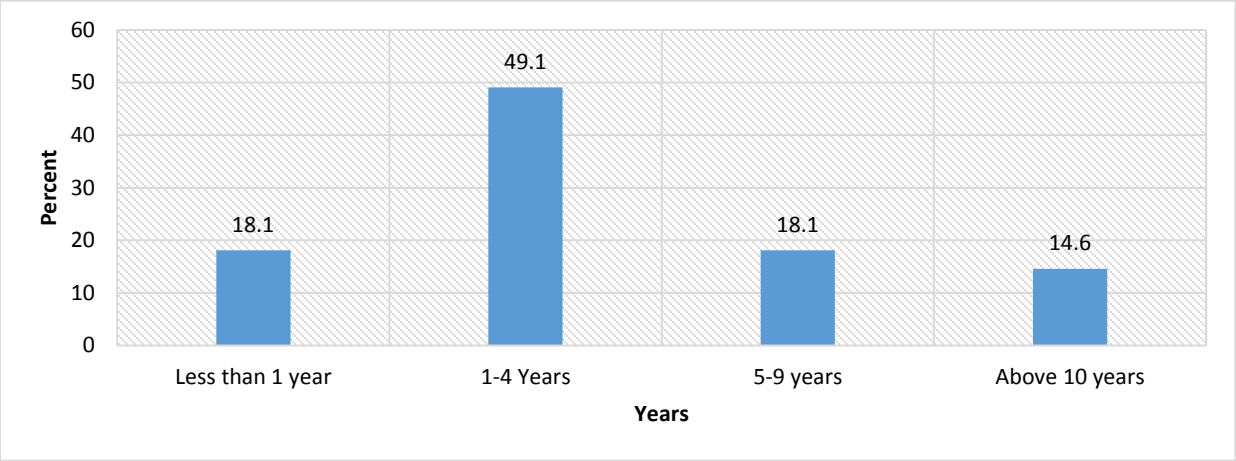

Figure 4.5: Distribution Showing Response by Year of Service Delivery

The results indicate that 18.1% of the respondents had served for less than one year, 49.1 % of the respondents had served as security officers for a period of 1 to 4 years, 18.1% had served for a period of 5 to 9 years, and 14.6 had served for a period of above ten years. This study agrees with previous studies that established that due to age-related factors, security and safety personnel numbers decrease in the security industry as their ages advance, hence their years of service (Donnelly et al., 2019). Moreover, in a journal written about the dynamic relationship between aging and job performance, Timar (2014) observed that when the experience was held constant, employees' job performance decreased as age increased. Therefore, this could explain why only 2% of security guards are x-rayed baggage screeners of 50 years and above were

respondents in the study. Security work involves many hours of both physical cognitive attentiveness expected of guards; hence those considered to be slow job performers, in this regard, are never retained by the security firms as security guards for x-ray screening tasks. This could explain why this study results show that those security officers with above ten years of service were fewer than the rest of the security officers in other years of service categories as established in the study.

Murunga (2014) studied "the effects of working conditions of private security guards on service delivery" and established that security guards work for many hours with poor wages. This study finding underscored the very challenges still experienced by guards in the security industry; thus, the study is still relevant to date. The previous research established that guards worked between 52-72 hours a week and earned between Ksh 10,000 to Ksh 15,000/= as net wages. As a result, the long working hours and poor work conditions with poor wages; thus, led to less number of years in the service by guards. Further, the study by Murunga (2014) found that 98% of guards would leave the security guarding service for other employment sectors. This study aligns with the previous study on reducing the number of guards in the security service as the years of service increase. This could suggest that guards hardly stay in the security service industry to serve for long as security x-ray baggage screeners, the study shows.

4.3.6 The Effectiveness and Role of X-ray Baggage Screening in Promoting Security and Safety of Universities

Before testing any objective of the study, the respondents' opinions were sought on the effectiveness and role of x-ray baggage scanning on the security and safety of universities. Establishing how the respondents assess and rate the X-ray baggage scanner (machine) to promote universities' security and safety. Whether the machine effectively plays a role in the universities

for security and safety purposes determines whether training x-ray screeners as users could add security and safety value to universities. Thus, respondents were asked a dichotomous question of '**Yes** and **No**' respectively, on the effectiveness and role of x-ray baggage screening in promoting the security and safety of universities. A summary of respondents' reactions to 'Yes and No' is shown in Figure 4.5 and Fig. 4.6 below:

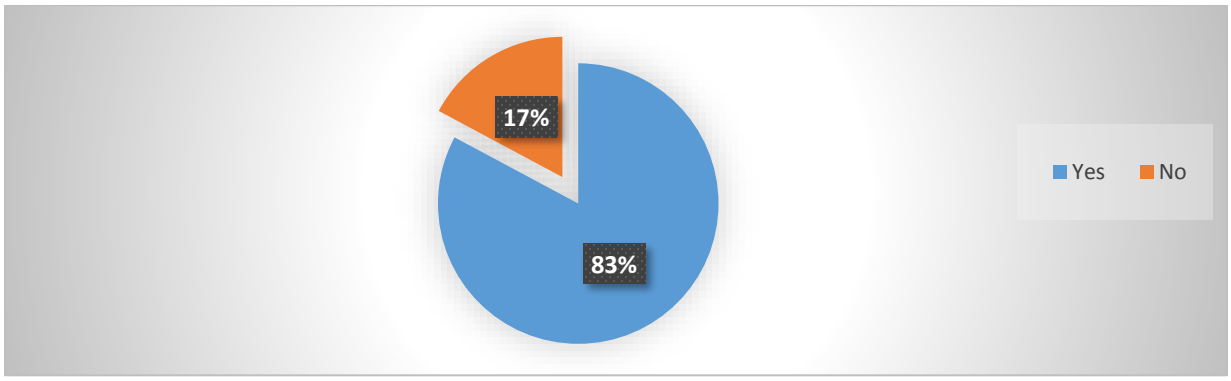

Fig. 4.6 Distribution Showing Response on Effectiveness and Role of X-ray Baggage Screening in Promoting Security and Safety of Universities

The result shows that out of 227 respondents, 188 respondents that were representing 83%, agreed that x-ray baggage screening machine is effective; thus, promoting the security and safety of the universities, whereby 39 respondents that were representing 17%, disagreed that X-ray baggage screening is effective and promotes security and safety of universities. This quantitative data is supported by the quantitative data in which the respondents said in the quotes below:

"a *lot of luggage will be screened within a short period without unnecessary inconveniences resulting in quick screening of threat items to bar them from accessing campus, which helps promote security and safety in universities" (Respondent. 27.10.2020).*

While another respondent replied as follows:

"Yes, *the machine is very effective in screening threat items. It is very quick and easy for the guards (x-ray screeners) to work with. The machine screens many items for the shortest time possible, making screening tasks fast"* (Respondent. 20.11.2020).

As such, the x-ray baggage scanner plays a huge role in promoting security and safety, for its saves time for the x-ray screeners with the x-ray screening task. The guards reportedly do a faster screening task to see through the baggage carried as passed through the machine. When work can be done effectively and efficiently within the shortest time possible, much time is saved for customers, and this could mean that value of time-saving at work would lead to good time management.

Zafarullah and Pertti. (2017) posit that time management is a meaningful effort made by a person to become effective and efficient at handling tasks at hand with conscious experience. When x-ray screeners use the machine in the shortest time possible to screen bags, the machine plays an important role it is designed to do since time is a crucial component for job performance by x-ray baggage x-ray screeners.

Indeed, the x-ray baggage scanner promotes the security and safety of the universities by being a time-saver; hence the x-ray machine plays an effective role in the security and safety of universities. The research findings on the machine's effectiveness and ability to promote security and safety are in agreement with previous studies, which agreed that x-ray baggage screening had identified threat items hidden in packages, baggage, and containers, and that knifes, guns, Improvised Explosive Devices (IEDs), and several contrabands, which were stopped from entry; thus, its effectiveness and efficiency in promoting security and safety of the facilities (Min, Shin, Lim, Park & Cho, 2014; Sterchi, Hattenschwiler, Michel & Schninger, 2017). Furthermore, another respondent clarified that*:*

"…security work is full of many challenges, but the machine makes the task easy, quick and efficient hence its accepted effectiveness to improve detection of threat items; thus, the machine strengthens security and safety of the universities. Yes, I like to use it to screen items before they

*are allowed access to campus" (*Respondent. 27.10.2020). Suppose an x-ray machine can make security work easy, quick, and efficient, as corroborated by the interviewed respondent. In that case, the X-ray machine could make guards' work lighter and help in boosting their morale by lowering possible stress, which security workers could post to the guards. Happy guards whose morale is boosted in this regard could suggest that X-ray screeners would not compromise the security and safety of universities. This could suggest that the x-ray machine plays an effective role in promoting security and safety in universities. Also, Murunga (2014) clarified that security work was full of challenges, such as long working hours, strict supervision of guards by supervisors, and poor remuneration. The previous study corroborates the respondent's reaction. This could imply that if an x-ray machine makes the task easy, quick, and efficient, the many challenges cited by the respondent could worry them just a bit.

Another respondent noted that "*the gadget does not discriminate personnel to be searched since even men can screen ladies bags, some task men cannot do by physical searches of ladies' bags. In addition, the gadget screens the contents of bags without necessarily getting into physical contact with the bags, hence it makes the searches very effective and healthy to the guards, particularly during the corona 2019 pandemic" (*Respondent. 18.11.2020).

Concerning Covid19, which brought significant challenges to workplaces worldwide, this is the best security gadget to search personnel's bags at entrances. The x-ray machine is gender blind, which means even men could conduct searches on bags for female customers and male ones ago. In the Covid 19 pandemic, where the safety of personnel matters a lot, both the x-ray screeners and personnel's bags as subjected to x-ray screening would be safe since traditional searches involving physical contact by guards with the bags searched would be greatly reduced. This could suggest that a healthy work environment is always assured, and the possible spread of the Covid

19 virus would be controlled. The ability of the x-ray machine to help university communities—whose bags are passed through it— and the x-ray screeners minimize physical contact on touch surfaces contributes a lot to promoting not only a healthy but also a secure and safe work environment for all. Additional respondents indicated this by saying that:

"*…after the metal has been detected, a security screener will request the bag owner with the metal as detected to declare it, and the same should be brought to the attention of the management or security in charge. In many instances, guards have captured sharp knives, unauthorized guns, and metal rods; the X-ray machine has detected all these. Security guards will not allow such threat items to access campus. This detection and prevention of threat items from accessing campus promote the universities' security and safety"* (Respondent. 19.11.2020).

By the x-ray baggage scanner detection of threat items, the same are prevented from accessing the universities; hence the machine plays an effective role to make the academic institutions secure and safe for learning and researching activities by the universities' community. Therefore, the machine is highly valued by the guards interviewed, as some respondents noted in a quote:

"*…the machine does not inconvenience people as it discriminates threat items from non-threat items, which are allowed access into the universities... the machine should be installed and adopted by universities for its accuracy in searches...but human beings will still be the operators….*"

A machine that is accurate and does not inconvenience nor discriminate against personnel at entrances of the universities makes the personnel value its role since it checks through all bags passed through it with high precision of accuracy. Indeed, universities are academic places where people value convenience in conducting their main objective, learning, and research. The majority of the respondents in this study, with 83%, believed that the machine is effective and promotes security and safety are, in line with a previous study where 84% of adopters of X-ray baggage scanners used the X-ray machine is not only big but busy facilities to identify threat items; thus, making the machine convenient, effective and efficient in promotion of security and safety (Michel et al. 2014).

The respondents interviewed corroborated the machine's accuracy in screening bags and noted that human beings still play a huge role as machine operators. This study finding on the machine accuracy and human factor playing a role as operators are consistent with a previous study by Cao et al. (2019) on "toward human-in-the-loop prohibited item detection in x-ray baggage images", which found that X-ray screening accuracy of humans was between 80-90%, whereby either between 10-20% accuracy was lost to human error caused by fatigue. The previous study further discussed that human accuracy could be increased to 100% by considering a detection method, which includes human x-ray screeners' cognitive capacities with intelligent procedures. This method an improved intelligence-based cognitive approach and crossbred improved intelligence with human-computer co-operation, a complete human factor interaction (Cao et al., 2019). The human factor in x-ray screening is essential for promoting the security and safety of universities. Accordingly, the machine effectively screens threat items for secure and safe universities. Besides, the X-ray machine keeps data of all images screened through it. This was corroborated by one respondent who reiterated that:

…just as I mentioned earlier, the X-ray baggage screening helps the security team…it can store data in case of a review by the universities' security managers or bosses every time they wish to conduct some investigations later on bags found with threat items. The machine's capacity to store such data or graphics, for that matter, makes it promote security and safety since such later reviews could help strengthen lapses if any" (Respondent. 30.11.2020).

Storing data for future use by the security team is another important role the X-ray machine plays. This could mean that the security officers and their management team at the universities would review the stored images at their inconvenience. Keeping data makes the x-ray machine helpful in investigating access breaches by unsuspecting people at the universities. Thus, the role played by the x-ray machine in this storage of data for review makes the machine more of a firsthand 'informant' with good evidence in real-time than witnesses at any given scene of the crime who

could state inconsistent statements. This capacity to keep data in graphic images makes the x-ray machine promote the security and safety of universities. In that regard, it could make it possible for the security management at the universities to review the data as captured and stored for their decision-making to rectify security lapses and organize training sessions for the guards to know how to identify threat items. Muhl-Richardson et al. (2021) studied "improved x-ray baggage screening sensitivity with 'target less' search training," whereby they discussed and agreed that the test training for x-ray baggage screeners would involve viewing stored images to determine their safety to be allowed in a facility. Still, images of items would be considered dangerous if they contained a prohibited item in a given status. Further, another respondent specified that:

… *"the gadget also makes a unique noise when it senses a metal in a bag passed through it. This noise alerts x-ray screeners to mark the item for further scrutiny. Guards have been trained to identify such unique noise made by the gadget when it comes across an item considered a threat."* (Respondent. 27.10.2020).

This capacity for the machine to make such a unique noise makes it very effective in promoting the security and safety of the universities. It is a requirement in the security industry that security guards (the x-ray screeners) be very alert and attentive. A machine that has this capacity to alert a screener to check further an item labeled with such a noise creates alertness, which any good x-ray screener should not ignore. Such alarms that create alertness to guards are a key factor in the security industry for bringing early warning signs to personnel at work. The alert sounds for such unique noise created by the x-ray machine could be used to train security x-ray screeners to cultivate sustained attention to detail. The kind of training as guided by unique alarms for threats captured by the x-ray machine could be used to train x-ray screeners to identify threat items following unique sounds made by the x-ray machine.

The x-ray machine plays an effective role in giving alarms and alerts that could be used to conduct customized training to the X-ray screeners to provide security and safety in universities. Arrabito et al. (2015) studied "human factor and sustained attention in auditory and visual monitoring tasks." They found that alertness (that they termed sustained attention) by x-ray screeners was key for security service delivery in work environments. The ability of x-ray screeners to retain attention for an extended time at screening tasks could lead to the detection of threat items. In contrast, the failure of x-ray screeners to withstand such required attention in screening tasks could increase the likelihood that dangerous alert signals would not be recognized. The failure of the x-ray screeners to attend to the alerts at the required time could pose dire security and safety consequences.

4.4 Findings of the Study Objectives

It was established that x-ray screeners valued x-ray machines in conducting searches. Also, the x-ray machine was very useful for its role and effectiveness in access control of threat items at the universities. For this reason, it could imply that x-ray machine promotes the security and safety of universities. Therefore, the study sought to assess the level of interaction between human factors and x-ray baggage screening on the provision of security and safety of universities within Nairobi City County, Kenya. This was operationalized in different objectives. The first objective focused on the level of interaction between training and x-ray baggage screening on the provision of security and safety, and the findings are presented in the following sections.

4.4.1. The Level of Interaction between Training and X-Ray Baggage Screening on Provision of Security and Safety

To measure the level of interaction between training guards (x-ray screeners) in x-ray baggage screening on provision of security and safety, the respondents were presented with five indicators to answer. Responses for every indicator were on a 5- point Likert Scale: (1 –Strongly Disagree,

2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree). Starting with quantitative data, which is corroborated with the qualitative data correspondingly, the findings are presented as follows:

Table 4.1: Training X-ray screeners (Guards) on X-ray Baggage Screening Task

Statement	Attributes				
	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
X-ray baggage screening task training improves x-ray screeners ' detection skill of threat items	3.2%	3.2%	7.30%	25.10%	61.20%
X-ray baggage screening task training makes X-ray baggage screening easier to understand	0.9%	2.6%	6.2%	15.9%	74.4%
X-ray baggage screening task training enables x-ray screeners to accomplish X-ray baggage screening tasks more quickly	1.8%	3.1%	10.1%	28.6%	56.4%
X-ray baggage screening task training enhances x-ray screeners visual skills	3.7%	6.8%	14.2%	31.1%	44.3%
X-Ray baggage screening task training depends on the level of computer literacy	21.7%	14.6%	15.5%	21.2%	27.0%

(Field Data, 2020)

Tables 4.1 Demonstrates the scoring on the measures tested, whereby 61.2% of respondents strongly agreed that x-ray baggage screening task training improves x-ray screeners ' detection skill of threat items, 74.4% strongly agreed that x-ray baggage screening task training makes x-ray baggage easier to understand, 56.4% strongly agreed that x-ray baggage screening task training

enables x-ray screeners to accomplish x-ray baggage screening task more quickly, 44.3% strongly agreed that screening task training enhances x-ray screeners ' visual skills. In comparison, 27% strongly agreed that x-ray baggage screening task training depends on the level of education of x-ray screeners.

Sangkala, Ahmed, and Pahi (2016) discuss that training is a dynamic process to increase employees' skills and abilities to improve the workplace's goals and objectives. Indeed, training brings efficiency and effectiveness to workers at a workplace. Sangkala, Ahmed, and Pahi (2016) further agree that even though the training is a required element that improves job performance, it does so only when relevant to the type of work involved since tools and work environment do change. All these require new skills to be developed by workers through continuous updating of knowledge and grasping the skills- that is why training is dynamic.

This study found that 61.20% of the respondents strongly agreed that x-ray baggage screening task training improves x-ray screeners' detection skills of threat items. X-ray screeners' skills in detecting threat items will improve only when x-ray screeners are continuously given relevant training. This would mean not just general training but definite training on how the x-ray screeners can detect threat items through an x-ray screening machine. In a study by Ivanova (2020) on "interesting moments of the work during specialized training of staff working with ionizing radiation, " the researcher established that employees' specific training was key to making them work well with machines in an ever-changing industry. Specific training makes employees classified for such training depending on the tools and machines each operates. Therefore, Ivanova (2020) concluded that there were two kinds of training for employees: specific training for them to handle specific machine operations and general training for the trainees to fit the work environment wholesomely. This could imply that x-ray screeners would be trained on relevant

detection skills they must possess based on the type of x-ray machine the universities have installed, whether those x-ray machines produce colored x-ray images or black and white x-ray images. Training x-ray screeners on the difference between the two x-ray images are relevant for the x-ray screeners to equip themselves with appropriate detection skills.

Training benefits workers and the organization they work for on several fronts. According to Sangkala, Ahmed, and Pahi (2016), training increases workers' output, increasing capacity and quality. As the x-ray screeners are trained on appropriate detection skillset, their security and safety—which is of primary concern—would come first as frontline workers before the security and safety of other university communities. There would be better detection skills to prevent threat items from entering the universities as the x-ray screeners are capacitated to serve courtesy of relevant training offered to them.

Well-trained security x-ray screeners require less or no supervision; subsequently, they can perform detection tasks with minimal or no supervision. Therefore, training would result in good cost containment measures by the organizations as the institutions would reduce the number of x-ray baggage screening supervisors employed. This makes the training beneficial to both the screener and the workplace. It is against this background that Ivanova (2020) states:

> …any institution of higher learning or business whose goals are to survive and prosper in this present-day diverse and regressed economy has found it imperative to invest in ongoing training and development to improve proficiencies in production and acquire the greatest return in investment… (p.1).

A previous study by Donnelly, Muhl-Richardson, Godwin & Cave (2019) on "using eye movements to understand how security x-ray screeners search for threats in x-ray baggage" found

that training makes the x-ray screeners know how to differentiate and identify objects which could appear more differently while passed through x-ray baggage machine than they are in their natural setting while in the outside environment. Also, objects captured by the x-ray baggage machines are presented in graphics pictures. These pictures require prior knowledge by x-ray screeners for their detection skills to be enhanced to identify threat items through the x-ray machine. When x-ray screeners are taken through secondary x-ray image templates, which are then compared to raw x-ray images as they appear on the x-ray monitor's screen, the x-ray screeners' detection skills could be enhanced to differentiate x-ray images in different settings. As the training carries on, the x-ray screeners' detection skills become practical at work, ultimately improving. Well-trained x-ray screeners could have work-related anxiety reduced, hence high job satisfaction, leading to improved detection performance.

In the study, 74.4% of the participants agreed that screening task training makes x-ray baggage easier to understand. Detection of threat items does depend on both understanding-based and image-based aspects, whereby image-based involves whether x-ray screeners would detect threat signals, which are: false, correct hit rate or miss rate, whether signals' sensitivity rate would be high, and x-ray screeners' decision during searches would correspond accurately to signals detected (Sterchi, Hattenschwiler, Michel & Schwaninger, 2017). Since several objects that pass through x-ray machines could have certain unknown positions, it is important to equip the x-ray screeners with all these possible scenarios to improve their understanding of threat items through training. Thus, training comes in handy for the x-ray screeners to know what materials are prohibited. Trained x-ray screeners would be able to assess objects accurately and make correct decisions while applying their signal detection abilities to understand the threat items as they conduct searches easily. Thus, training conducted more often enhances detection skills and understanding

of threat items by security x-ray screeners. Such training equips them with end-user operational detection skills to work with the x-ray machine.

One of the participants who were interviewed substantiated that training improves search skills by x-ray screeners (guards), and the respondent noted that:

"…yes, *training guards who are x-ray screeners who will be using X-ray machines for searches of threat items should be conducted more often. They just don't need general training. X-ray screeners need relevant training since most of the guards may not be computer literate. Guards must be taught basic computer literacy to know how to move the X-ray machine conveyor belt and identify items through the computer screen… many items may appear different while passed through the X-ray machine from how they may appear in their natural setting. This, guards need to know to recognize the items very well"* (Respondent. 28.10.2020).

Security x-ray screeners need to be computer literate to understand the computer parts involved in conducting a given search through the x-ray machine. This could mean that specific training of x-ray screeners on how to conduct searches includes providing them with basic computer knowledge to understand the operations of the x-ray machine, which is itself computer components. Moreover, the material could present different x-ray images while appearing on the x-ray machine's screen; hence relevant training to the x-ray screeners is key for them to be equipped with detection skills required to identify, interpret and analyze threat materials. Training x-ray screeners on searches using x-ray machines could greatly impact knowledge gathering by the x-ray screeners geared towards eliminating threat items from the universities that have installed x-ray machines at their entrances for searches.

Michel et al. (2014) studied "increasing x-ray image interpretation competency of cargo security screeners". They established a significant increase in detection and interpretation performance of x-ray screeners by 14.9% after three months of training. This could imply that there should be continuous training for the x-ray screeners so that their detection performance is continuously on a trajectory trend. Indeed, detecting threat items that pass through the x-ray machine depends on

knowledge-based factors gathered through relevant training to differentiate diverse signals with the ultimate goal, improvement of detection skills of x-ray screeners to improve their knowledge to make them easily understand various signals produced by x-ray machines. Through relevant training, x-ray screeners could easily understand the threat items.

Furthermore, Donnelly et al. (2019) observed that x-ray baggage screening performance by x-ray screeners is connected with their basic perceptual skills. The capacity for x-ray screeners to see objects through the X-ray machines, interpret them as a threat or otherwise, then make meaning out of the same interpretation would their easy the understanding of the objects so that they perform their work for any successful security searches of threat items by x-ray screeners, their perception skill of the objects to be looked for matters a lot since this kind of interpretation would lead to easy understanding for the sake of training. Untrained x-ray screener who has never used an x-ray screening machine could be challenged to reach this kind of easy understanding of objects through an x-ray screening machine. This skill by x-ray screeners makes them either interpret objects correctly or misinterpret them altogether. X-ray screeners who are taken through training—to practically see objects' appearance on x-ray monitor's screens for comparisons and contrasts on how the very objects would appear in their natural setting—could have an easier understanding of what threat objects look like. Jain (2019) discussed inner learning due to training of x-ray screeners, which makes them easily understand and analyze the appearance of threat objects. The understanding makes a trained x-ray screener capable of conducting informed searches of threat items because such trained x-ray screeners easily understand the procedures and methods of conducting searches. Thus, training is a morale booster and confidence builder for the guards (x-ray screeners). Security x-ray screeners with high confidence at work could perform great baggage searches at the universities. Training is essential for x-ray screeners' screening task performance

in that they would have better skills, the right knowledge, and the right attitude towards work as they conduct searches using an x-ray machine.

The easy understanding gained from training x-ray screeners on x-ray baggage screening could enable x-ray screeners to nurture x-ray screeners' cognitive ability of attention to recognize items well. This could mean that the x-ray screeners could handle all issues related to searches and decision-making with the training. Their easy understanding of the operations of the x-ray machine would lead to their good application and interpretation of threat items in all positions and effective use of the x-ray machine. The effective use of the gadget would mean that the security issues that require attention are attended to immediately, leading to enhanced security and safety in the universities.

It will be recalled that this study confirmed that training improves detection skills for x-ray screeners. In the study, 56.4% of the participants agreed that screening task training enables x-ray screeners to accomplish x-ray baggage screening tasks more quickly. With that improvement, there is an increase in knowledge and understanding of how the x-ray machine operates, hence increased effective and efficient search of threat items courtesy of training. As a result, training would make the x-ray screeners achieve the objective and goals of the workplace; thus, they become quick in their interpretation of objects passed through the x-ray machines.

A knowledgeable employee would not spend much time interpreting objects on the x-ray monitor's screen. Also, trained x-ray screeners would accomplish their screening task more quickly than untrained ones because, as established by this study, training increases the competence of workers. This could suggest that competent workers (screeners) know what to do at the right time. They would complete each screening task within the shortest time possible, increasing the frequencies of baggage searched within a given time frame. Training nurtures a good understanding of the

performance task purpose, which could be done with enhanced ability levels exhibited by trained x-ray screeners at work. Thus, training would make x-ray screeners not spend much time screening objects, resolve baggage queues, and perform quick screening tasks.

Previous research by Sterchi and Schwaninger (2015) on "A first simulation on optimizing Explosive Detection System for cabin baggage screening regarding throughput" showed that trained x-ray screeners (observers) were not only quicker and more exact to reduce false alarm rate but also had better cooperation to hasten task than untrained ones at detecting threat items in X-ray baggage screening. This could mean that trained x-ray screeners are easy to work with, hence cooperating better at work than untrained workers. As established in this study, trained workers would require less supervision to work with the accuracy required than untrained ones. The less supervision done to trained x-ray screeners could mean that they have better cooperation at work, quicker performance of task assigned, and more exact (accurate) screening tasks for threat items.

Also, in this study, 44.3% of the participants strongly agreed that screening task training enhances x-ray screeners' visual skills. It is a pre-employment standard requirement that security guards (screeners) are taken through some fitness test to confirm their eyesight condition before any successful recruitment. X-ray screeners majorly use eyesight to identify threat materials passed through the x-ray machines. Saavedra, Banerjee, and Mery (2020) wrote that x-ray screeners have their concentrations guided by their visual capacity to detect threat elements and have a few seconds to decide. Visual capacity is built to enhance as x-ray screeners utilize their visual capacity in monitoring different x-ray images. The x-ray images could be real and unreal. While x-ray screeners undergo thorough training to develop good visual skills, both unreal and real x-ray images of objects are used in training x-ray screeners' screening resilience.

According to Object Recognition Theory (ORT) (Biederman, 1987), humans account for the effective identification of objects using their visual capacity regardless of changes in their image positioning. The theory explains that objects identification involves visual perception and cognitive ability to receive such x-ray image data by first using visual stimuli. Training allows trained x-ray screeners to identify diverse threat materials by remembering them easily after seeing such materials through the x-ray machine. It is on this background to help X-ray screeners remember threat materials that training could enhance visual skills.

Past studies agreed that training enhances x-ray screeners' skills and knowledge to recognize threat items better and be conversant with their X-ray images through visual search (Michel, 2014). Sterchi, Hattenschwiler, Michel, and Schwaninger (2017) noted that x-ray screeners could develop their visual skills while using x-ray machines as both visual capacities to recognize objects, analyze them, and interpret the objects through the x-ray machine are preceded by their detection visually—for decision making—by x-ray screeners. If the visual skill is improved by x-ray baggage task training, threat items are detected too. This could mean that with training, x-ray screeners could be keen visual observers to recognize threat items through the X-ray screening machine.

In this study, 27% of the respondents strongly agreed that x-ray baggage screening task training depends on the level of computer literacy. This minimal response by the respondents could mean that the level of computer literacy of x-ray screeners does not necessarily determine how training could be conducted. An x-ray screener could have a high level of computer literacy, but their interpretation of threat items could challenge security and safety.

Moreover, this could mean interpretation, analysis, and understanding of threat materials as passed through x-ray screening machine just require very basic computer literacy level, which is enabled

by Computer Based Training (CBT) to security screeners). Chavaillaz, Schwaninger, Michel, and Sauer (2019) all agree that CBT reduces the negative effects of likely signals, increasing the search accuracy of threat materials. This study revealed that x-ray screening requires relevant training on basic computer literacy that does not depend on the level of education of x-ray screeners in terms of being highly computer literate. This could suggest that computer-based training Security guards must possess some minimum score of high school national exams qualification to be recruited by security firms. As established by this finding, there is only a requirement for x-ray screeners to go through relevant training and a need to have basic training on computer literacy. Mugisha (2018) studied "recruitment, selection and service delivery by private security guards" and observed that 79% of security guards were recruited with high school certificates. This could mean that security firms mostly recruit job seekers who have completed high school studies to be trained as security guards. For those that the security firms may assign duties as x-ray screeners, only basic computer literacy induction would be done to equip them with basic computer skills required in operating x-ray machines.

Having established that x-ray screeners required only basic computer literacy to conduct searches using the x-ray machine, the study sought to establish whether x-ray screeners were computer literate. The participants were asked to respond to a dichotomous question of 'Yes or No,' and the results are shown in Table 4.2:

Table 4.2: Response by Respondents on Having Basic Computer Literacy

Statement	**Yes**	**No**
X-Ray baggage scanner requires computer infrastructure; as a user, do you have basic computer literacy for x-ray screening tasks?	**95%**	**5%**

(Field Data, 2020)

The results indicate that 95% of the respondents interviewed agreed that they had some basic training to be computer literate to operate X-ray screening machines. In addition, one of the respondents reported that:

"*When I started this security job … I was taken through some basic computer literacy training here to understand even …and know what to look for when e' m searching bags through the machine. …. I can now say categorically that I am computer literate courtesy of training on the job for searches using X-ray machine*" (Respondent 11.11.2020).

While another one noted that:

"Yes, I am computer literate. When I was employed, I was already computer literate, but I needed specific training to operate an X-ray machines to identify threat items. My training did not take long, and I knew how to use the machine" (Respondent 20.11.2020).

As stated by the respondents on whether computer literacy is a requirement in the recruitment of guards (x-ray screeners), it was found that security firms recruit personnel who have high school certificates at the basic education level. Also, this basic high school requirement was corroborated in a study conducted by Mugisha (2018) on "recruitment, selection and service delivery by private security," which found that 79% of guard recruits had high school certificates. This could imply that for guards to be assigned x-ray screening tasks, basic training on computer literacy would be conducted by the security firms accordingly to use the x-ray machines in conducting searches.

Guards who are computer literate could perform x-ray screening tasks for threat materials. The basic training in computer literacy would also equip them with the right skills to operate the x-ray machine with ease. As indicated by the respondent, the training on the job for basic computer literacy skills is vital for the x-ray screener to know what is required of them. In that regard, the x-ray screener would know what threat materials are, be able to analyze them, interpret and make the decision accordingly.

The interview further sought respondents' opinions on whether the x-ray screeners undergo standard training in x-ray baggage screening. One respondent specified that:

"…yes, x-ray screeners require to go through standard training on operations of X-ray baggage scanner so that such a screener performs x-ray screening task of searches. There is standard training for guards to master all these x-ray screening tasks and know what items are of threat in nature, and which ones are not" (Respondent 29.10.2020), while another one noted that "*standard training is a must thing for every new x-ray screener posted to x-ray screening assignment, since this will confirm that the-ray screener has basic computer literacy… is well trained like the rest. I also passed through the standard training in X-ray screening task"* (Respondent 30.11.2020)

The interview data validate the study findings, consistent with past studies on training x-ray screeners (guards) for effective and efficient security and safety of facilities. The finding indicated that x-ray screeners' competence was occasioned by relevant and suitable, and continuous training in identifying threat items in x-ray images (Michel et al., 2014). Moreover, the study by Michel et al. (2014) established that such training was an essential requirement for guards (x-ray screeners) to be assigned x-ray tasks to enable x-ray screeners (guards) to identify items' images in diverse views.

Based on the descriptive results of this study, it appears training is very important to human interface with the x-ray baggage screening machine. The findings show that training enables x-ray screeners to cultivate appropriate and desired attitudes towards work. Also, it enhances and develops efficient and effective searches conducted by x-ray screeners using an x-ray machine. Training brings confidence, and that confidence by x-ray screeners leads to an increase in their job performance with little supervision or no supervision. However, the study cannot conclusively

conclude the interaction between training and x-ray baggage screening on the security and safety of universities. Therefore, there was a need to test the correlation.

4.5 Correlation Analysis between Training and X-ray Baggage Screening

A Pearson Correlation Coefficient was done to test the Correlation, and the result is presented below in Table 4.3. Correlation is used to assess the interaction between training and x-ray baggage screening and their relationship.

Table 4.3 Correlation Analysis between Training and X-ray Baggage Screening

		Training	X-ray baggage screening
Training	Pearson Correlation	1	0.567**
	Sig. (2-tailed)		.000
	N	218	198
X-ray baggage screening	Pearson Correlation	.567**	1
	Sig. (2-tailed)	.000	
	N	198	204
**. Correlation is significant at the 0.01 level (2-tailed).			

From table 4.3 above, there is a significant correlation between training and X-ray baggage screening (r=0.567, p=0.00); hence there is a significant positive correlation. This indicates that the training of guards (x-ray screeners) significantly interacts with the process of x-ray baggage screening, thus, confirming the positive role of the human factor, training. A positive relation could imply that if more training is conducted on the x-ray screeners, their task performance on x-ray screening for threat items increases. In that regard, the effectiveness of x-ray screening tasks for threat items is improved, which could enhance universities' security and safety. Also, this indicates that training enhances guards' ability (x-ray screeners) to use the x-ray machine effectively. Therefore, training affects the impact of x-ray baggage screening on the provision of security and safety of universities.

Training can increase guards' productivity by teaching them the right knowledge and skills to increase their interpretation competencies of thereat materials while using an x-ray machine. Training helps the guards (x-ray screeners) accomplish their x-ray screening tasks more quickly by equipping them with the right skills to identify, analyze, and interpret threat materials passed through the x-ray machines. Moreover, training enhances x-ray screeners' ability to adapt to long hours of work environment while conducting searches competently and efficiently using an x-ray machine. Thus, it nurtures a sense of increased security and safety of personnel and the workplace.

This study finding is consistent with a study by Blacker, Peltier, McKinley, and Biggs (2020) on "What Versus How in Visual Search: Effects of Object Recognition Training, Strategy Training, and Noninvasive Brain Stimulation on Satellite Image Search," whereby they investigated the difference between search tactic training and object recognition training. They found that tactic-based training could be as operational as perfect object recognition training. Further, the study revealed a significant rise in the performance of the X-ray screening detection task of threat materials in both training methods.

4.6 The level of Interaction between Experience and X-Ray Baggage Screening on Provision of Security and Safety of Universities within Nairobi City County

The second objective focused on the level of interaction between experience and x-ray baggage screening in the provision of security and safety, and the findings are presented in the following sections. The respondents were presented with five indicators to answer to measure the interaction between experience in x-ray baggage screening on provision of security and safety. Responses for every indicator were on a 5- point Likert Scale: (1 –Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree). Starting with quantitative data, which is corroborated with the qualitative data correspondingly, the findings are presented as follows:

Table 4.4 The Level of Interaction between Experience and X-Ray Baggage Screening On Provision of Security and Safety of Universities within Nairobi City County

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Effective mastery of x-ray screening skills depends on screeners' level of experience	4.9%	6.2%	11.9%	21.2%	55.8%
X-ray screening task experience improves screening job performance	7.5%	8.9%	10.7%	28.5%	44.4%

Your deployment for x-ray screening tasks depends on your level of experience with X-ray baggage screening	9.3%	8.0%	12.4%	27.6%	42.7%
Your x-ray screening task performance speed depends on your experience with X-ray baggage screening	8.4%	7.1%	11.5%	32.7%	40.3%
X-ray screeners' level of experience increases their skill and accuracy at a screening items	8.4%	10.2%	8.8%	19.0%	53.5%

Tables 4.4 demonstrates the scoring on the measures tested, whereby 55.8% of respondents strongly agreed that effective mastery of screening skills depends on screeners' level of experience, 44.4% strongly agreed that screening task experience improves screening job performance, 42.7% strongly agreed that deployment for screening tasks depends on the level of experience with x-ray baggage screening, 40.3% strongly agreed that screening task performance speed depends on experience with x-ray baggage screening. In comparison, 53.5% strongly agreed that screeners' level of experience increases their skill and accuracy at screening items. As reflected in the findings, experience is important in performance. Through experience, individuals master the skills that perfect their art of performance. Acompado (2019) defines experience as the interaction of organism and the surroundings and that it is dynamic, unified, historic, and socially oriented. Therefore, experience makes an organism conscious of its surroundings.

Further, the author writes that experience is dynamic since it continuously varies because there will constantly be a new interface between the organism and the surroundings.

Additionally, the historic meaning of experience could imply that experience is a total sum of both past and current periods of the organism's interaction with the environment. This could mean that an organism repeats a given activity at hand over some period to master a skill set of doing the activity. This good mastery of the skillset leads to experience, a state of an organism being conscious of its surroundings. Accordingly, no other experience is required in the workplace for better performance of tasks, but a relevant and good level of work experience. Employees who are considered to have a certain level of work experience could be assigned tasks relevant to their areas of expertise.

According to Renold and Oswald-Egg (2021), employees with a certain level of experience are in high demand in the labor market for their effective mastery of specific job roles. Such experienced employees could make employers incur fewer training costs in the future or employment. Swann, Popovic, Blackler, and Thompson (2020), in their study on "Airport Security Screener Problem-Solving Knowledge and Implications," classified security screeners with less than two years of x-ray screening experience as "less experienced," while security screeners with more than three years of x-ray screening experience were classified as "more-experienced." Relevant job experience comes with a significant period spent by an employee conducting specific roles. In this regard, workplaces could categorize employees as experienced, more experienced, less experienced, or inexperienced based on certain parameters set on given job tasks for expected targets.

This study found that 55.8% of the participants agreed that effective mastery of x-ray screening skills depends on screeners' experience level. The level of experience gained by an x-ray screener in x-ray screening is accumulated over some years of practice or training (Chavaillaz, Schwaninger, Michel & Sauer, 2019). An experienced x-ray screener possesses a good level of mastery of screening skills, courtesy of the repeated work conducted over time. This could mean

that the more an employee repeats a certain role for a duration, the more relevant job experience is refined, leading to effective mastery of the repeated role, which results in invaluable experience. Likewise, the effective mastery of the skillset by an experienced screener could lead to good task performance, which is depended upon the level of job experience so gathered. In the work place, a screener who is experienced at the task of operating an x-ray machine becomes competent to develop effective mastery of screening skills based on the level of experience gathered. Thus, x-ray screeners with experience yield better detection performance of threat items through x-ray machines than inexperienced or less experienced screeners.

One of the participants who were interviewed during the study corroborated that x-ray screeners with a high level of experience at x-ray screening tasks had been on the job for an applicable period and that they had a good mastery of the screening skill, and the respondent said that:

"*…experienced x-ray screeners do not necessarily miss their targets…they are very confident at screening duties than most of us who have less experience in x-ray screening. I think this is because they have witnessed and seen more threat items in bags than most of us, so they can reflect faster and make a decision within seconds*… (Respondent. 28.10.2020).

The quote shows that the experienced x-ray screeners do not miss their targets, which implies that they are alert while conducting x-ray screening tasks. Also, experience makes them improve their confidence while on duty. This could mean that whenever the experienced screeners see objects passed through the x-ray machine, they will relate the objects with others that they have captured with the help of the x-ray machine and make quick decisions as far as threat items are concerned. Such decisions are combined with confidence, hence the good mastery of screening skills needed for the security and safety of universities.

‘Targets’ are threat items that the screeners are supposed to be prevented from accessing workplaces. However, if screeners do not capture threat items despite using x-ray machines to conduct searches of bags, they are missing their targets. Inexperienced screeners could fail to identify threat items well, keeping missing their targets. X-ray screeners who miss their targets while conducting x-ray screening are a threat to their workplaces as they could allow items that could put the entire organization at risk. Therefore, frustrate the provision of security and safety of universities.

This study finding resonates well with a previous study by Chavaillaz, Schwaninger, Michel, and Sauer (2019) on “expertise, automation, and trust in x-ray screening of cabin baggage,” whereby they observed that when a Diagnostic Aid (DA) was installed an x-ray machine to help x-ray screeners effectively identify threat items for their decision making, experienced screeners only used the DA as a backup to endorse their decision based on their level of experience, while inexperienced screeners made the most use of the DA as a guide to base their decision making on threat items. Further, the study found that the DA was necessary for the inexperienced screeners, hence being a guide for them compared to experienced ones who only considered DA as a backup just in case they needed to confirm a threat item further. Experienced x-ray screeners would be self-self-assured and competent, highly influencing their decision-making. Therefore, they would possess an effective mastery of x-ray screening skills. This could suggest that the level of experience by screeners in x-ray screening corresponds to effective mastery of x-ray screening tasks. In addition, this could mean that a highly experienced x-ray screener would have the advantage of making decisions on threat items passed through the x-ray machines by utilizing his mastery skills based on the history of threat items that they have captured from accessing the universities. This differentiation of x-ray screeners’ effective mastery of skills because of their

level of experience could boost the security and safety of the universities, which the current study also established.

The study also found that 44.4% of the respondents strongly agreed that x-ray screening task experience improves job performance. An experienced screener would achieve better detection performance than an inexperienced screener (Chavaillaz et al., 2019). With experience, x-ray screeners at the universities would have less time pressure at screening tasks since they are skilled for the roles a relevant job desires. Skilled screeners have relevant experience, which will make them have improved job performance. Therefore, they could feel less tired with x-ray screening tasks; as a result, they prevent threat items from accessing the universities. It confirms that x-ray screening task experience improves the screeners' job performance, and this study finding underscored that as well. It is generally recognized that job performance hinges on a worker's skillset during the execution of tasks (Hussain, Xuetong & Hussain, 2020). This could specify that lack of a certain skill set for a task corresponds to a lack of experience, negatively impacting job performance. Besides, less experienced or unskilled x-

ray security screeners have less knowledge about screening tasks and could have poor detection skills for threat items; thus, their screening job performance could be reduced considerably. During the interview, one of the respondents verified that noted the following:

"*…guards gain experience by repeating a given task over some time, and this makes them remember the task so repeated…those guards who have experience in screening tasks perform better than those with no experience…x-ray screening experience plays a key role in improving x -ray screening tasks…* (Respondent. 28.10.2020).

Some workers learn activities very well since the same activities repeated over time stick to some part of their brain, which makes the tasks be remembered whenever they come across them. The experience gained by the repetition of tasks leads to performance improvement. This could

demonstrate that screeners who conduct x-ray screenings tasks repetitively for a substantial period become experienced at doing the very tasks, hence have improved task performance, which could guarantee the security and safety of the universities.

According to Zhan, Guo, Chen, and Yang (2018), stimuli learned by repetition will be recalled better and reserved by the brain for a longer period. Standard Consolidation Theory (SCT) advocates that repeated memories are likely to become independent of the hippocampus (part of the brain that plays a major role in memory and learning). So by the x-ray screeners doing x-ray screening tasks severally for an extended period, the very tasks could stick to their brains as they become experienced. This could mean that repetition of tasks, such as x-ray screening, provides task experience and results in x-ray screening task performance improvement by screeners. Having improved x-ray screening performance courtesy of experienced screeners could mean that they would use the x-ray machine to conduct searches well, promoting better security and safety in the universities. The current study confirmed that experience reinforces screeners' task performance. This could lead to better x-ray screening of threat items by screeners, which would intensify the security and safety of the universities.

Additionally, this study finding that x-ray screening task experience improves x-ray screening job performance concurs with Swann, Povovic, Blackler, and Thompson (2020), which investigated the effects of the "Airport security screener problem solving-knowledge and implications". The study results showed that more experienced security screeners proved situational x-ray screening knowledge better than less experienced security screeners and improved job performance. However, less-experienced screeners demonstrated insufficient x-ray screening knowledge. Moreover, situational knowledge (understanding gained from experience) facilitated effective

problem solving and decision-making activities, whereas less experienced screeners required assistance from their fellow screeners, hence delayed problem-solving. This could imply that if universities could utilize the services of inexperienced screeners who may have challenges interpreting threat items on x-ray screening, there could be insecurities in the universities as threat materials would infiltrate the learning organizations. As such, their little knowledge could hamper their decision-making skills and their x-ray screening job performance. Alternatively, if universities employed experienced screeners with relevant expertise on how threat items appear in x-ray machines, such screeners would prevent the threat materials from accessing the universities; thus, they would play a significant role in improving the security and safety of the universities.

In the study, 42.7% of the respondents who took part in the study strongly agreed that x-ray screeners' deployment for x-ray screening tasks depends on their experience with x-ray baggage screening. The current study finding is in line with a previous study by Skorupski and Uchronski (2015) on "a Human Being as a part of the Security Control System at the Airport", which found that after a period of consistent work with an X-ray machine, screeners do reach an optimal level of experience that may enable them to work independently on X-ray screening of baggage. Also, the researchers observed that after some consistent duration of work, Xray screeners would have a level of experience with operating parameters, which let them be qualify as fully experienced. Therefore, X-ray screeners are assigned to areas that fit best, depending n several factors. These factors include but are not limited to job experience, training, and produc vity. The screeners who can work independently are competent due to their experience, hence their deployment for X-ray screening duties in the areas they understand better. This could suggest that their independence at work would make them efficient and effective on X-ray screening duties; hence their

deployment to various locations for x-ray screening tasks will depend on their level of experience. As a result, there would be enhanced security and safety in the universities.

During the interview, one of the respondents emphasized that their x-ray screening experience determines their deployment. She said the following:

"*…we are assigned duties to various assignments depending on our skills, abilities, and experience to offer our services. There is normally a checklist indicating where each security screener is deployed to work. Sometimes x-ray screeners are assigned duties at the main entrances of workplaces or various buildings' entrances…highly experienced x-ray screeners are deployed at the main entrances while less experienced ones are assigned at the doors of various buildings…* (Respondent. 28.10.2020).

As corroborated in the quote, deployment is guided by the level of experience of x-ray screeners. Indeed, security overseers assign x-ray screeners to locations depending on their understanding, abilities, and skillset for x-ray screening tasks. This could suggest that highly experienced x-ray screeners would be assigned at the main entrances of organizations because they are deemed to have more capacity to identify threat items than the less experienced ones. Accordingly, the main entrances are normally the first layers of security and safety, which require highly skilled security personnel for access control tasks. In general, the less experienced x-ray screeners would be deployed to the interior organizations and assigned x-ray screening duties at the doors of the buildings, but not the main entrances. The rationale is that the main entrances have many personnel and baggage, hence a need to deploy highly experienced screeners who would handle a high volume of work. Therefore, they could capture threat items at the main entrances before the threat items access the universities. This deployment principle could mean that threat items would be prevented from entering the organizations at the first points (main entrance). They play a role as the first layer of security and safety in organizations. Certainly, the security and safety of the

workplace depend a lot on the ability of x-ray screeners to identify threat items courtesy of their skills and level of experience as these fundamentals let them perform their duties freely as they make decisions (Fruhen et al. 2014).

In the study, 40.3% of respondents strongly agreed that x-ray screening task performance speed depends on the level of experience with x-ray baggage screening. In comparison, 53.5% of the respondents in the study strongly agreed that x-ray screeners' level of experience increases their skill and accuracy at x-ray screening of threat items. According to Mitroff, Ericson, and Sharpe (2018), speed means an x-ray screener's response time and the decision made on target. They defined accuracy as the presence of a target hit rate compared to the absence of a false alarm rate. Concerning the x-ray screening tasks, speed means how faster an x-ray screener does x-ray screening activities during a given job performance, while accuracy is how exact an x-ray screener hits the target of threat items passed through the x-ray machine. Therefore, the more the target hit rates are correct since the false alarm rate of threat items is minimized, the higher the accuracy level of searches of threat items by screeners (Saavedra, Banerjee & Mery, 2020). This could imply that x-ray screeners who perform their screening task faster and with the accuracy required can handle a large workload, whereby they will minimize the probabilities of threat items passing through the x-ray machine as well.

The study finding concurs with a study conducted by Mitroff, Ericson, and Sharpe (2018) on "Predicting Airport Screening Officers' Visual Search Competency with a Rapid Assessment, which examined the relationship between "speed versus accuracy and screening task performance" and established that good x-ray screening task performance is directly interrelated to a specific mixture of speed, accuracy to produce relevant experience by a screener. Further, the study

observed that any best job performers in x-ray screening tasks should be fast and accurate to manage the flow of bags passed through the x-ray machine. Screeners with experience could have increased task performance speed since they feel valued and satisfied. Thus, they would nurture a good attitude at work to reduce x-ray screening faults. Therefore, this study has confirmed that job performance experience increases x-ray screening speed and accuracy courtesy of improved skills, which results in enhanced security and safety of universities.

4.7 Pearson Correlation test between Experience and X-ray baggage screening on the provision of security and safety of universities within Nairobi City County

A Pearson Correlation Coefficient was done to test the Correlation, and the result is presented below in Table 4.5.

Table 4.5 Pearson Correlation test between Experience and X-ray baggage screening on the provision of security and safety of universities within Nairobi City County

Correlations			
		Experience	X-ray baggage screening
Experience	Pearson Correlation	1	.668**
	Sig. (2-tailed)		0.00
	N	225	203
X-ray baggage screening	Pearson Correlation	.668**	1
	Sig. (2-tailed)	0.00	
	N	203	204
**. Correlation is significant at the 0.01 level (2-tailed).			

From table 4.5 above, there is a significant correlation between experience and x-ray baggage screening (r=0.668, p=0.00); hence, there is a significant positive correlation. This implies that x-ray screeners' experience and x-ray screening tasks interact significantly. A positive relation could mean that an increase in experience results in better x-ray screening tasks, which could heighten the security and safety of universities that have employed x-ray machines to conduct searches of threat items. Moreover, it suggests that experience leads to a better understanding of x-ray

screening tasks and operations of x-ray machines by x-ray security screeners. Therefore, experience influences x-ray baggage screening to impact the security and safety of universities.

Indeed, experienced x-ray screeners have developed their screening skills over time. This makes them appreciated at the workplace for their increased task knowledge that recruits can tap. Experience gives screeners the abilities and skills to conduct searches well and perform daily activities well. With experience, screeners' search of threat items will be accurate and quick since they are focused on their work. Accuracy and speed are important requirements for security and safety service providers, and x-ray screeners must always practice them. Security work hinges upon correct reports made at the right time for further action. X-ray screeners who would make false reports would mislead any review on such reports. This could have a serious impediment to the security and safety of organizations at large. False reports of interpretation of threat items as captured by x-ray machines could also cause false alarms or injuries to personnel. In addition, speed would make x-ray screeners control baggage jams at the entrances, and personnel would be served in good time. The implication is that threat item are identified appropriately and with a lot of precision to save time for serving personnel. As such, the x-ray screening will be driven by competency brought by experience, which could mean that universities' security and safety will be enhanced.

This study finding is consistent with Skorupskia and Uchronski (2016) study, which examined the influence of "a human being as a part of the security control system at the airport" and found that inexperienced x-ray screeners commit several mistakes while screening threat items. Still, the mistakes decrease in time as x-ray screeners' experience increases. This could indicate that the x-ray screeners will have the ability to withstand long hours of work without wavering their minds

on screening tasks; thus, they would be motivated and remain vigilant during searches, strengthening the security and safety of the universities.

4.8 The Level of Interaction between Supervision and X-ray baggage screening on Provision of Security and Safety of Universities within Nairobi City County

The third objective focused on the level of interaction between supervision of x-ray screeners and x-ray baggage screening on the provision of security and safety of universities within Nairobi City County, Kenya. To measure the interaction between supervision of guards (x-ray screeners) in x-ray screening on provision of security and safety, the respondents were presented with 5 indicators to answer. Responses for every indicator were on a 5- point Likert Scale: (1 –Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree). Starting with quantitative data, which is corroborated with the qualitative data correspondingly, the findings are presented as follows:

Table 4.6 The Level of Interaction between Supervision and X-Ray Baggage Screening On Provision of Security and Safety of Universities within Nairobi City County

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Supervision increases x-ray screeners' level of x-ray screening professionalism	4.4%	10.6%	16.4%	27.9%	40.7%
Supervision improves x-ray screeners' effectiveness in x-ray screening task	5.9%	10.4%	16.7%	36.2%	30.8%
Supervision makes x-ray screeners accomplish x-ray screening of threat items quickly	10.4%	9.5%	21.3%	27.1%	31.7%
Supervision enhances professional work development of screeners	9.8%	10.7%	18.8%	29.9%	30.8%

Supervision gives support and promotes easy learning by x-ray screeners on x-ray screening accuracy	10.2%	11.5%	12.8%	24.3%	41.2%

Tables 4.6 demonstrates the scoring on the measures tested, whereby 68.6% of respondents both agreed and strongly agreed that supervision increases x-ray screeners' level of x-ray screening professionalism, 67% both agreed and strongly agreed that supervision improves x-ray screeners' effectiveness in x-ray screening tasks, 58.8% both agreed and strongly agreed that supervision makes x-ray screeners accomplish x-ray screening of threat items quickly, 60.7% both agreed and strongly agreed that Supervision enhances professional work development of x-ray screeners. In comparison, 65.5% agreed and strongly agreed that Supervision gives support and promotes easy learning by x-ray screeners on x-ray screening accuracy.

Supervision is a control mechanism meant to rectify a person's activities or personnel to ensure that they perform duties as required (Opoku, Apenteng & Boakye, 2021).). Employers require that any person employed should do responsibilities bestowed on them accordingly. Instances may arise that some person might decide to do the responsibilities contrary to their job description or standard operating procedures (SOPs). As a result, they might fail to perform their duties well. Supervision will step in to help reverse failures by such personnel at work. According to Lee and Kusumah (2020), supervision is the relationship between senior and junior workers in an organization that assesses the quality of services done by junior workers and that is extended over time serve to improve the abilities of the junior workers in performing tasks and observes the quality of services offered by the junior workers. Supervisors are overseers who evaluate how a task is performed by subordinates so that an organization meets its goals. An employee is deemed

to be supervised when they get instructional tips, which can make them improve on their job responsibilities.

From table 4.6, 68.6% of respondents agreed and strongly agreed that supervision increases x-ray screeners' professionalism level of x-ray screening professionalism. This study finding resonates well with a study conducted by Baeriswyl, Krause, and Schwaninger (2016) on "Emotional Exhaustion and Job Satisfaction in Airport Security Officers…". The study examined the influence of supervision on x-ray screeners' professionalism at work and established that good supervision was significant for x-ray security screeners' job satisfaction. Indeed, security x-ray screeners who are satisfied are also emotionally stable and flexible to utilize their professional decision-making skills to be productive at work. In addition, supervision remains a good predictor of the screeners' job fulfillment, thus their professionalism. This could mean that supervision plays a role in moderating the levels of professionalism by x-ray security screeners. If the x-ray security screeners perceive that they receive good supervision from particular supervisors, they would have positive emotional, social and physical well-being to perform their work professionally. Good supervision of x-ray security screeners could contribute to their feeling of having job security, which in turn could increase their level of job professionalism, enhancing the universities' security and safety.

This study finding is corroborated by one of the respondents interviewed, who noted that:

"…I have worked under different supervisors while conducting x-ray screening duties. I can tell you that some of the supervisors are unfriendly and too strict with us... they verbally abuse us even when we make small mistakes, which can be corrected without much drama… We do fear them instead of respecting them, and this makes some of us fail to concentrate on x-ray screening duties…but some supervisors are just professionals who teach, motivate and inspire us to work

hard…those good supervisors have good supervision that make us like our work…" (Respondent. 20.9.2020).

As reported in the quote, poor supervision coupled with stringent measures and verbal abuse lead to the discouragement of the x-ray screeners. At the same time, a good supervisor is not only friendly but also an instructor who gives direction on how x-ray screening work should be done. This implies that professionalism is passed on to the x-ray screeners by how the supervisors conduct their supervision. This could suggest that good supervision raises the x-ray screeners' concentration level in searches while using the x-ray machine, increasing the universities' security and safety.

From table 4.6, 67% both agreed and strongly agreed that supervision improves x-ray screeners' effectiveness in x-ray screening tasks. This study finding is supported by a study conducted by Wu and Yu (2015) on "working alone or in the presence of others- exploring social facilitation in baggage x-ray security screening task", which examined the contribution of evaluative audience or co-performers in x-ray screening duties, and established that x-ray screeners' task performance effectiveness improved considerably. This implies that x-ray screeners will relook at how they work and adjust their effort because they are being supervised. The presence of others or supervisors contributes to such adjustment of their roles. This could mean that supervision significantly increases x-ray screeners' effectiveness in screening tasks, which could tighten the universities' security and safety. In addition, drive theory advances that individuals' performance of the task is induced by the inspiration of being aware of the presence of other individuals, that is, social facilitation (Zajonc Drive Theory, 1965). This implies that workers tend to work well when being watched by other personnel or supervisors, whose presence triggers the workers' cognitive perception.

Supervision is a process whereby a senior influences juniors as far as certain tasks are concerned. This implies that a supervisor's watchfulness of an x-ray screener's work would make them control and influence power over their juniors. Zhang and Liao (2015) posit that supervisory assessments of screening tasks create an effective and possible means for improving x-ray screening inspection by screeners. Lee and Kumasuh (2020) discuss that adequate supervision positively affects workers' morale. Indeed, good supervisors encourage and assist personnel under them in their tasks, thus, enhancing their effectiveness because of the positive work relationship between them. This could increase the effectiveness of x-ray screening duties for good security and safety of the universities. During the interview, a respondent reacted as follows:

"…*many times, if we get from our bosses the type of supervision with clarity of how we should work, we will screen customers' bags very thoroughly…" (*Respondent. 20.8.2020).

This quote confirms that x-ray screeners need to be checked well so that the quality of their screening task will depend on the type of supervision, which would make them do or fail to do a thorough search of threat items. A study conducted by Huegli corroborates this finding, Merks and Schwaninger (2020) on "Automation reliability, human-machine system performance, and operator compliance…for cabin baggage screening", which observed that screeners should receive clear instructions for effective screening task performance. This could mean that enhancement in effectiveness by x-ray screeners depends on a type of supervisor who gives instructions on task requirements to facilitate efficiency in task performance, which could promote security and safety in the universities.

From table 4.6, 58.8% agreed and strongly agreed that supervision makes x-ray screeners accomplish x-ray screening of threat items quickly. This study finding is consistent with a study Conducted by Sterchi, Hattenschwiler, Michel, and Schwaninger (2017) on "Relevance of visual inspection strategy and knowledge about everyday objects for X-ray baggage screening". The study investigated instruction guidance on the time response of x-ray threat items. The results indicated that the abundant instruction communication for visual inspection of X-ray images increased alarm hit and false rate. This could imply that the noted adjustment in alarm hit and false rates was due to the instructions (supervision) issued to the x-ray screeners. Further, Lee and Kusumah (2020) believe that supervision denotes the capacity of superiors to control the conduct of juniors in carrying out certain job roles, which could add value to the x-ray screeners in performing their tasks quickly without hesitating or creating queues of the baggage being searched. Therefore, there would be an increase in the number of alarm hit and false, which is indicative that the x-ray screeners would be accomplishing their x-ray searches quickly to record such high alarm rates.

X-ray screeners who are well supervised and issued with up-to-date instructions on their responsibilities would have deliberate strength to do their best. In this regard, they would be knowledgeable about what could be expected from them; thus, they would possess the right attitude towards x-ray screening task performance and could complete screening inspections quickly. For this reason, they could handle a large volume of work. The task performance being accomplished quickly would lead to satisfied customers and secure and safe universities for academic work.

In the study, 60.7% agreed and strongly agreed that supervision enhances the professional work development of x-ray screeners. The study finding is validated by Yu, Yang, and Wu (2017) on "Risk factors and visual fatigue of baggage X-ray security screeners…", which examined supervision's relationship to professional work improvement. The study observed that both supervisors and co-workers should extend strong support to workers in the security x-ray screening points. This implies that such support from the supervisors and co-workers would be important in developing skills that would be adequate for authority and discretion by the x-ray screeners. In addition, supervision is associated with increased professional productivity and job commitment, which embraces professional moral upkeep by building an inclusive work environment that develops juniors' task performance. (Mwasawa & Wainaina, 2021). This could mean that skillset-enabled x-ray screeners could have substantial work ethics in x-ray screening of threat materials, which require high integrity. A well morally supported x-ray screener would perform tasks beyond reproach, strengthening the universities' security and safety.

From table 4.6, 65.5% of respondents agreed and strongly agreed that supervision gives support and promotes easy learning by x-ray screeners on x-ray screening accuracy. This study finding is in line with a study by Liu and Yu (2019) on the "social facilitation effect in search and decision-making components of visual inspection", which established that the overseer (audience) presence increased the response time of x-ray screening for decision-making. The social facilitation intensity in the search component was stronger than that in the decision-making component. This implies that when x-ray screeners are supervised or if they work feeling that some audience is watching them, their brain is arousal to a greater extent; thus, they learn to conduct x-ray security duties. In addition, Social Exchange Theory (George Homans, 1958) posits that social affiliation consists of a psychological contract between workers and supervisors, which assists in the

motivation of the workers in task performance. This could mean that the social agreement of that relationship benefits x-ray screeners positively in harnessing their behaviors. This good behavior could increase easy learning for accuracy by x-ray screeners as far as searches as concerned. Thus, supervision leads to a beneficial social agreement between the superiors and the juniors working under them. Workers who are socially attached to their supervisors become active and feel empowered courtesy of the assistance they get from the supervisors. This could help in heightening the security and safety of the universities. One of the respondents asserted that:

"…*we are social beings and supervisors are not any better without the juniors. For this reason, they need to support us so that we pull from the same direction for a common goal, security, and safety of workplace. If the supervisors ensure that, then x-ray screening work would be easy to learn since we learn from others*..." (Respondent. 20.8.2020).

As indicated in the quote, both the supervisors and the workers are one thing that should understand one another since, without any of them, x-ray screening task performance would be at stake. The screeners do take directions from the supervisors as they learn their work to perform well. Another study by Hannang, Salju, and Qamaruddin (2020) on "The Effect of Supervision Levels on Employees' Performance Levels", established that supervisors increase employees' morale and team interrelation. This could imply that supervisors provide direction to personnel under them as they offer psychological, social, and administrative guardianship support to the subordinates. Indeed, supervision offers remedial measures to remove lapses, which may be triggered by the inadequacy of skills in junior employees. Certainly, supervisors play an essential role in controlling workers' psychological well-being. Cognitively well-nourished workers have clear minds directed to their work. Therefore, they would concentrate on x-ray screening tasks. This could mean that

the supervisory efforts influence the positivity of task performance by x-ray screeners; thus, it fosters screening accuracy by x-ray screeners to better the security and safety of the universities.

4.5.1 Pearson Correlation Test between Supervision and X-Ray Baggage Screening On Provision of Security and Safety of Universities within Nairobi City County

A Pearson Correlation Coefficient was done to test the correlation, and the result is presented below in Table 4.7. Correlation is used to assess the interaction between supervision and x-ray baggage screening and their relationship.

Table 4.7 Pearson Correlation Test between Supervision and X-Ray Baggage Screening On Provision of Security and Safety of Universities within Nairobi City County

		Supervision	X-ray baggage screening
Supervision	Pearson Correlation	1	.642**
	Sig. (2-tailed)		.000
	N	219	199
X-ray baggage screening	Pearson Correlation	.642**	1
	Sig. (2-tailed)	.000	
	N	199	204
**. Correlation is significant at the 0.01 level (2-tailed).			

From table 4.7 above, there is a significant correlation between supervision and x-ray baggage screening (r=0.642, p=0.00); hence, there is a significant positive correlation. This implies that x-ray screeners' supervision and x-ray screening tasks interact significantly. A positive relation could mean that an increase in supervision results in better x-ray screening tasks, which could intensify the universities' security and safety. It is indicative that supervision of the junior employees by their seniors makes them gather skills necessary for the tasks facing them. As a result, they increase their learning to conduct accurate searches. This could mean that x-ray security screeners, under

good supervision, could perform their work with competence created by a good relationship between them and their seniors. Furthermore, the learning of tasks aspects by the junior x-ray screeners could motivate them and equip them with the right practical skills geared towards producing outstanding task performance, which could promote the security and safety of the universities.

This study is consistent with Lee and Kusumah (2020), which examined the influence of "supervision on employee performance with work motivation as an intervening variable", and found supervision had direct positive control on work motivation. Further, the study revealed that rational understanding of supervisors on workers resulted in high productivity. This could show that the x-ray screeners who have good relations and understanding of tasks requirements are motivated while at work, which would reinforce the universities' security and safety.

4.9 Specific Challenges Faced by X-Ray Security Screeners in X-Ray Baggage Screening Task on Provision of Security and Safety for Policy Recommendations

The study's fourth objective sought to identify the specific challenges x-ray security screeners face in x-ray baggage screening tasks on providing security and safety for policy recommendations. The respondents were asked to indicate their level of agreement with the indicators presented to answer. Responses for every indicator were on a 5- point Likert Scale: (1 –Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree). Starting with quantitative data, which is corroborated with the qualitative data correspondingly, the findings are presented as follows:

Table 4.8 Specific Challenges Faced by X-Ray Security Screeners in X-Ray Baggage Screening Task on Provision of Security and Safety for Policy Recommendations

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Improper computer infrastructure network	55.0%	37.5%	1.4%	3.4%	2.7%
Insufficient electric power supply	61.9%	29.6%	1.2%	1.9%	5.4%
Insufficient continuous serviceability of the X-ray baggage scanner	0.8%	0.1%	0.6%	35.1%	63.4%
Insufficient budget for repair and service maintenance	3.1%	3.2%	7.4%	25.1%	61.2%
Irregular conveyor belt's movement speed level	3.7%	3.7%	4.3%	34.0%	54.3%
The invisibility of items' images	57.7%	31.7%	2.7%	4.6%	3.5%

From table 4.8 above, 55.0% of the respondents strongly disagreed that improper computer infrastructure network, while 61.9% of them strongly disagreed that insufficient electric power supply was among the specific challenges faced by the x-ray screeners in the x-ray baggage screening task on the provision of security and safety in the universities within Nairobi City County, Kenya. This could mean that the universities are well connected as far as computer infrastructure networks and electric power supply are concerned. Therefore, there is an adequate electric power supply and computer network to connect the x-ray machines to search for threat items in the universities.

However, 63.4% of the respondents strongly agreed that the x-ray baggage scanners were insufficient for continuous serviceability. In comparison, 61.2% strongly agreed that there was an insufficient budget for repair and service maintenance of the x-ray machines. This could show that the universities do not allocate enough funds to cover the x-ray machines' maintenance and service. Therefore, the maintenance and service of the x-ray machines are not done as required; hence the x-ray machines would not function optimally. Thus, this is a challenge to the users who are x-rayed and security screeners. In addition, it could mean that the x-ray machines might fail the x-ray security screeners in their pursuit to conduct thorough searches of threat items. This could compromise the security and safety of the universities.

In addition, 54.3% of the respondents strongly agreed that there was an irregular conveyor belt's movement speed level. This could mean that if the x-ray machines are not properly maintained to be serviceable, their internal functionality would be hampered. This could result in some of the components, for example, conveyor belts, becoming faulty. Consequently, affecting the X-ray machines' speed. This could result in x-ray screeners experiencing long queues of personnel's bags waiting to be checked. An x-ray machine with a low speed would not make x-ray screeners offer good services to a huge university community. A challenge could demoralize the x-ray screeners conducting the searches using the x-ray machines and contribute to the universities' poor security and safety measures.

Also, from table 4.8, 57.5% of respondents strongly disagreed that items' images were invisible as displayed in the x-ray machine. Citing this by the x-ray screeners could show that several threat materials are captured well by the x-ray machine since their images are clear to the x-ray screeners. For this reason, the x-ray screeners have good abilities to identify the threat materials and stop

them from accessing the universities. This could mean that the x-ray machines serve the purposes for which the universities install them. Further, it confirms that the display of images by the x-ray machines is not a challenge to the x-ray screeners, hence the guaranteed security and safety of the universities. These study findings were corroborated by Key Informants who participated in the study.

During the interview, the Key Informants (KIs) were asked to indicate some of the specific challenges x-ray security screeners face in x-ray baggage screening tasks on providing security and safety for policy recommendations. The following were responses from them:

"Abuse from suspected possessors of forbidden items… Long hours of standing while screening esp. in busy places. Attacks/injuries from those who possess weapons unlawfully. Defaults that may end up giving wrong results…" (Respondent 20.8.2020)

Another respondent indicated that:

"*…arguments from the clients create congestion when students come many at a time, some students refuse to screen their bags, the reason they have food, at times it is difficult to know … some items are small in sizes…"* (Respondent 20.8.2020).

Another Key Informant noted:

Breakdown of x-ray screening machines, congestion or long queues where one screening machine is relied on by the university…. Security screener strains by overworking in front of the computer. There is electricity power failure when there is no electric power backup generator." (Respondent 20.8.2020).

Another respondent indicated that:

"During rush hours x-ray scanners create a human traffic jam of bags as luggage pass through faster and fall … some people have had their items misplaced in the mix-up of bags that takes long

to sort hence creates jam…. Machine breakdown/malfunction sometimes… One becomes bored as a result of sitting in one position for a long. Risk of health complication due to the infrared rays emitted by the scanner…" (Respondent 20.8.2020).

One of the respondents added that:

"Harsh and rude customers not ready to answer questions on suspected items captured… power failure at times… challenges of differentiating colors to some screeners. Bulky baggage that can't go through the machines…" (Respondent 20.8.2020).

Another one said that:

"…Lack of enough money to support the project. Bad payment…Lack of spares parts for repairs. Poor supervision…" (Respondent 20.8.2020).

One of the Key Informant note that:

"…Most the screeners report eye problems due to scanners' light… some fail to identify exact weapons being transported to the organization… many x-ray baggage scanners normally fail/faulty or mechanical issues…" (Respondent 20.8.2020).

Another one said:

"Some people want to be forced to scan their luggage; some items don't show well whether they are harmful or not…sometimes there is no electricity to run the machine… the service maintenance of baggage scanner is insufficient…" (Respondent 20.8.2020).

Another one replied:

"X-ray machine has radiation; hence, it can affect the screener physiological functions of the body... The monitor connected to x-ray baggage screening can affect the eye-sight. Some people are stubborn they don't want to place items on the x-ray. When there is a power problem, the screener has a lot of work to search the luggage manually…" (Respondent 20.8.2020).

As seen in the quotes above, there are seven main themes regarding the specific challenges x-ray security screeners face in the x-ray baggage screening tasks on the provision of security and safety tasks. According to the respondents, intimidation was evident from the customers being screened, whereby some of them refused their bags to be searched by the x-ray machine. As a result, they tended to be rude and harsh to the x-ray security screeners; hence the time taken in the queue occasioned congestion and baggage traffic jam. Therefore, this could cause a serious lapse as the customers' argument with the guards could distract them from their work, hampering universities' security and safety.

In addition, the second theme cited long hours of work that could create boredom. X-ray screeners who are bored would have reduced morale and concentration for searches. According to the responses, security work is common with extended work hours. This becomes a challenge as it results in monotony; thus, it could result in poor x-ray screening task performance by the screeners, thereby thwarting the essence of security and safety in the universities. The third theme identified the breakdown of the x-ray machine as one of the specific challenges faced by x-ray screeners. The x-ray machine's proper functionality lies in its regular maintenance and services. The responses showed insufficient funds set aside by the universities to take care of such maintenance issues; thus, this would occasion the fourth theme, which cited the lack of spares to be used in repairs sorting of mechanical issues the x-ray machines could pose.

Further, the fifth theme indicated that x-ray screeners reported fears of developing eye problems due to the bright x-ray lights emitted by the x-ray machine. The respondents reported that the machines produce radiation that could pose health risks to the x-ray screeners using the x-ray machine for searches of threat materials. In this regard, x-ray screeners could be discouraged from

conducting thorough searches for fears that the x-ray machine would cause them both physiological and psychological health issues.

Additionally, the sixth theme identified some electric power failures in a situation where backup generators would be lacking. In addition, the seventh theme specified that bulky luggage would not pass through the x-ray machine. If electricity and bulky luggage were a challenge, the x-ray screeners would be forced to revert to manual searches. X-ray screeners used to conduct machine-aided searches could decrease task performance, making hidden threat material pass through the universities to defeat security and safety measures.

4.9.1 Chapter Summary

Chapter four summarizes the results obtained from 227 questionnaires and interviews conducted with 19 Key Informants (KIs) who volunteered to participate in the study. Moreover, the chapter contains an in-depth explanation of findings per research objective that facilitated answering the research questions.Also, the chapter presents clarification of how the specific objectives satisfied the general objective of the study, which was to evaluate the level of interaction beween human factor (training, experience, and supervision) and X-ray screening on the provision ofsecurity an d safety of selected universities within Nairobi City County, Kenya.

4.5.2 Regression Model

The regression model consists of the model summary, the Analysis of Variance (ANOVA) table, and the table of Coefficients. The presentation begins with the first table containing the model summary showing the R-Square, the adjusted R-square (the coefficient of determination), and the standard error of the estimate. R-square depicts how scattered the dotted points appear around the fitted regression line. The model summary seeks to determine whether the correlation coefficient is significant at a 5% significance level and the extent that which human factor (training,

experience, and supervision), which is an independent variable, interacts with x-ray baggage screening to explain the provision of security and safety (a dependent variable) through the coefficient of determination**.**

Table 4.9: Linear Regression Analysis between Human Factor (Training, Experience, and Supervision) and X-Ray Baggage Screening

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	0.415[a]	0.173	-0.018	1.69135		
a. Predictors: (Constant), Training						
ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.753	3	2.584	.903	0.006[b]
	Residual	37.189	13	2.861		
	Total	44.941	16			
a. Dependent Variable: Security and Safety						
b. Predictors: (Constant), Supervision, Training, Experience						
Coefficients						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	10.224	3.200		3.195	.007
	Training	0.325	.748	-.110	-.434	.005
	Experience	0.416	.486	-.356	-.857	.001
	Supervision	0.826	.561	.613	1.474	.000
a. Dependent Variable: Security and Safety						

From table 4.9 above, R-Square is found to be 0.173. This means the data can explain 17.3%. Thus, an indication that training, experience, and supervision only affect 17.3% of the X-Ray Baggage Screening on the provision of security and safety. This could mean that other factors positively affect the unexplained 82.7% of the X-Ray Baggage Screening. This study shows that

the model is fit in predicting that the independent variable human factor (training, experience, and supervision) variation has a statistically significant proportion of variation on the dependent variable (provision of security and safety).

As such, ANOVA is tested to demonstrate whether the model has a confidence level of 95%, where the P-value was 5% or 0.05 since the data finds P-value= 0.000, which is less than 0.05 significance level. In addition, the ANOVA results for the linear regression analysis shows that the relationship between human factor (training, experience, and supervision) and x-ray baggage screening is significantly linear.

The results from the coefficients table indicate that increasing training by one unit, X-Ray Baggage Screening significantly improves by 0.325 units, increasing experience by one unit, X-Ray Baggage Screening significantly improves by 0.416 units, and increasing supervision by one unit, X-Ray Baggage Screening significantly improves by 0.826 units hence all the independent variables (Training, Experience, and Supervision) enhance the provision of security and safety of the universities. Therefore, the linear model explaining the interaction between independent variables and X-Ray Baggage Screening is **Y= 10.224+0.325X1+0.416X2+0.826X3.**

Therefore, this study finding is consistent with a study by Sterchi, Hattenschwiler, Michel, and Schwaninger (2017) on "Relevance of visual inspection strategy and knowledge about everyday objects for X-ray baggage screening," which established that X-ray screeners with more experience had increased hit rates for threat materials known through relevant training they have undergone because such x-ray screeners may well know about everyday objects and threat materials introduced to them in training. The study further found that good knowledge coupled with good decision strategies (supervision) is valuable for better job performance by the x-ray

screeners; thus, training, experience, and supervision are human factors that, when increased, there would be an enhanced provision of security and safety of universities.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

The chapter summarizes the study findings, conclusion, and recommendations of the study, which assessed the interaction between human factors (training, experience, and supervision) and x-ray baggage screening in providing security and safety of selected universities within Nairobi City County, Kenya. Therefore, the chapter begins with a discussion, the conclusions, recommendations from the research findings, and final suggestions for further research areas. The respondents were security guards (screeners), guard supervisors, and security managers drawn from the selected universities. A stratified sampling technique was used to sample the respondents while the qualified universities were purposively sampled. The study employed qualitative and quantitative data analysis, analyzed by the SPSS tool and presented in graphs, tables, percentages, and pie charts.

5.2 Summary of the Research Findings

The following section summarizes the study findings that sought to evaluate the interaction between human factors (training, experience, and supervision) and x-ray baggage screening in providing security and safety of selected universities within Nairobi City County, Kenya.

The demographics revealed that 35% of the respondents were female while 65% were male and that 61% of the respondents were of age 21-30 years, which represented a bulk of the x-ray security screeners in the study. The study revealed that 83% of the respondents agreed that the x-ray machine was an effective and efficient tool in searches for threat materials; hence it was an essential machine that promotes the security and safety of the universities. Moreover, the finding indicated that they needed basic computer knowledge for the x-ray security screeners to work well

with the x-ray machine. The study found that 95% of the respondents possessed basic computer skills and that 50% of the x-ray security screeners had worked with an x-ray machine for 1 to 4 years.

In the study objectives, the first objective examined the interaction between training and x-ray baggage screening in the provision of security and safety of the universities within Nairobi City County, Kenya. After the study, it was established that there is an interaction between training and x-ray baggage screening, where P- value=0.567.

The second objective evaluated the interaction between experience and x-ray baggage screening on the provision of security and safety of the universities within Nairobi City County, Kenya. It established interaction between experience and x-rays baggage screening and that the P-Value=0.668.

The third objective measured the interaction between supervision and x-ray baggage screening on the provision of security and safety of the universities within Nairobi City County, Kenya. It found that there is an interaction between supervision and x-ray baggage screening. The study found the P-Value =0.642.

The study reveals that the above P-values are greater than the significance level of P=0.05. Therefore, there is a significant correlation between training and x-ray baggage screening, a significant correlation between experience and x-ray baggage screening, and a significant correlation between supervision and x-rays baggage screening; hence, there is a positive relationship between human factors (training, experience, and supervision) and x-ray baggage screening, and that an increase by one unit of each will improve x-ray baggage screening by 0.325 units, 0.416 units, and 0.826 units respectively in a linear model:

Y=10.224+0.325X1+0.416X2+0.826X3.

Objective four of the study sought to identify the specific challenges x-ray security screeners face in x-ray baggage screening tasks on providing security and safety for policy recommendations. The study revealed that 63.4% of the respondents strongly agreed that there was insufficient continuous serviceability of the x-ray baggage scanners. In comparison, 61.2% of the respondents strongly agreed that there was an insufficient budget for repair and service maintenance of the x-ray machines, and 54.3% of the respondents strongly agreed that there was an irregular conveyor belt's movement speed level. In addition, the respondents reported that they were being intimidated by some customers who did not want their bags to be checked by the x-ray machines. They engaged guards in verbal abuse when they insisted on doing the searches. Other challenges included long working hours experienced by guards, hence bringing boredom and long queues of bags. Moreover, some guards reported that they feared the x-ray machine's radiation and brightness from the x-ray machine for both physiological, psychological, and eyes well-being. The study also found that sometimes there was electricity failure with no generator power backups and x-ray machine's mechanical breakdown, which could force the guards to use manual searches.

This significant correlation confirms an essential and positive role of the human factors (training, experience, and supervision) in x-ray screening tasks on the security and safety of the universities since their P=values are greater than the significance level of 0.05.

5.3 Conclusion

Based on the specified findings, the following conclusions were reached: the human factor plays a crucial role in using x-ray baggage machines in providing security and safety for the universities. The study showed that human factors (training, experience, and supervision) interrelate and react positively with x-ray machine functionality as far as searches of threat materials are concerned.

The findings revealed that security x-ray screeners (guards) who have undergone relevant training are experienced and supervised on x-ray screening activities have improved x-ray screening task performance by 17.3% in security and safety of the universities. Most guards had between 1and 4 years of experience in x-ray screening, which enhances their decision-making skills to work independently. In addition, the study reveals that guards require good supervision to offer psycho-social support, which boosts their morale for job satisfaction in x-ray screening tasks. It can be concluded that good experience contributes to effectiveness and accuracy in threat detection skills by x-ray screeners.

On the other hand, the study concludes that x-ray security screeners encounter challenges during their x-ray screening tasks. Still, the universities could mitigate these challenges by sensitizing the community on the importance of x-ray screening for searches. In addition, having backup power generators for consistent operations of x-ray machines when electric power fails, having well-trained and experienced x-ray screeners to differentiate threat items, and preventing the same from accessing the universities would promote security and safety of the universities.

The study explored the importance of human factors, the study variables being (training, experience, and supervision), and their impacts on x-ray screening task performances for security and safety in the universities. Moreover, the study adopted the following theories: The technology

Acceptance Model (TAM) by (Fred Davis (1989) and the Perceived User Resource Model (PURM) by Mathieson (2001). The study determined that these theories are useful to x-ray screeners whose perception of usefulness and ease of use of the technology (x-ray machine) inspires them to conduct searches to promote the security and safety of the universities.

The study confirmed that both the theories supplement one another, whereby PURN deals with human attributes: user skill, user training, user educational level, time available to learn the technology, support from others (supervision), and system attributes (technology user-friendliness and technology cost). The study's conceptual framework similarly summarises these human attributes and system attributes

5.4 Recommendations

This study revealed that the human factor interacts with x-ray screening for effective and efficient searches of threat items, which enhances the security and safety of the universalities. Therefore, the recommendations are presented as follows:

1. Since the x-ray machine was found to be useful by the security x-ray screeners/guards for searches, the universities administrators should acquire the equipment for their respective schools and campuses.
2. Since the effectiveness and efficiency of x-ray screeners have been proven to be dependent on human factors (training, experience, and supervision), universities security managers should continue to incorporate the human factors for quality provision of security and safety in the universities.
3. There should be objective supervision strategies of guards (security x-ray screeners) by universities' security managers/ guard supervisors to encourage guards' better x-ray

screening task performance geared towards improving security and safety in the universities.

4. The universities should implement standby backup power generators to ensure the x-ray machine's unswerving functionality if electric power failures occur.
5. The universities management should sensitize university communities on the essence of x-ray machine searches to encourage everyone to volunteer and embrace searches.
6. The universities administrators should set aside enough financial allocations to care for x-ray machines' preventive repairs and service maintenance during their budget periods.

5.5 Recommendations for Further Research

The study offers invaluable information on the human factor and how it interacts positively with x-ray screening to enhance the security and safety of universities. However, the scope of the study was in Nairobi City County, Kenya. While there are other universities in rural and sub-urban areas in Kenya, further research is required to sample universities across Kenya to examine the interaction between human factors and x-ray baggage screening on security and safety and establish if there is a variation in results.

5.6 Chapter Summary

The chapter summarizes the study findings, which address the research gap. Also, it provides conclusions drawn from the study findings and outlines study recommendations for the university's policymaking. In addition, it provides suggestions for further research.

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APPENDIX 1: INTRODUCTORY LETTER TO THE RESPONDENTS /INFORMED CONSENT FORM

I am Edwin Oluoch Wachie, a post-graduate student undertaking a Master of Arts Degree in Security Management and Police Studies at Kenyatta University. I am conducting a study on ***Human Factor and X-ray Baggage Screening on Provision of Security and Safety of Universities within Nairobi City County***, **Kenya**. Therefore, I request that you provide information regarding the interaction between human factors (supervision, experience, and training) and X-ray baggage screening on the security and safety of your university.

Confidentiality/Voluntary/Reward

Participation in the study is voluntary, and your name will not be documented on the questionnaire. Also, there will be no payment reward to participants. The data that you will provide in this study will be treated with utmost confidentiality and will be used only for academic purposes.

Benefit

If you agree to participate in the study, you will help the researcher interrogate the subject matter, and gauge the importance that the gadget plays in security and safety of universities. Having fully understood the explanation given above, I hereby agree to participate:

Name……. sign…….. ……..Date……..

Contact Information

Should you have any question(s) as far as the study is concerned, please call the researcher on **0736191609/0721539009** or the Supervisor, Dr. Merecia Sirera on 0715457405. But if you have questions on your rights, you may contact: Kenyatta University Ethical Review Committee Secretariat on chairman.kuerc@ku.ac.ke, secretary.kuerc@ku.ac.ke

Investigator's Statement

As the researcher, I have explained to the participant in the study about what the process and their voluntary participation entail in a language the volunteer understands.

Name of the interviewer: **Edwin Oluoch Wachie** Date: …….

APPENDIX II

QUESTIONNAIRE TO THE SECURITY GUARDS/SCREENERS:

Please respond to the questions below by ticking (√) against your preferred response for questions with options. For questions that require suggestions or comments, please use the provided space. and answer them honestly. The information will be used strictly for the study and will be treated with utmost confidentiality.

SECTION A: GENERAL INFORMATION

1. Indicate your age is in the range:

☐ 18-30 years

☐ 31-40 years

☐ 41-50 years

☐ Above 50years

2. Indicate your gender: Male ☐ Female ☐

3. As a security guard, what period have you worked with an X-ray baggage scanner as a tool in screening of items?

☐ Less than a year

☐ 1- 4 years

☐ 5- 9 years

☐ Over 9 years

4. What period have you worked as a security officer?

☐ Less than 1 year

☐ 1-4 years

☐ 5-9 years

☐ Above 10 years

5. a). In your opinion, does X-ray baggage screening promote security and safety of the university? Yes ☐ No ☐

b). Explain your answer …….

6. a) In your opinion, does X-ray baggage screening have a role on effective security and safety of the university? Yes ☐ No ☐

   b) Kindly explain your answer above……..

   ……

In a scale to 1-5 whereby, Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1, to what extent do you agree or disagree with the following statement.

Part 1:						
The Level of Interaction between training guards/screeners in X-ray baggage screening for searches on provision of security and safety in universities within Nairobi City County						
No	Statement	5	4	3	2	1
1.	Screening task training makes X-ray baggage screening easier to understand					
2.	Screening task training enables screeners to accomplish X-ray baggage screening tasks more quickly					
3.	Screening task training improves screeners' detection skill of threat items					
4.	Screening task training enhances screeners' visual skills					
5.	X-ray baggage screening task training depends on the level of education					
Part 2						
The Level of Interaction between screeners' experience in X-ray baggage screening on the provision of security and safety in universities within Nairobi City County						
1.	Effective mastery of screening interface s depend on screeners' level of experience					
2.	Screening task experience improves screening job performance					
3.	Your deployment for screening tasks depends on your level of experience with X-ray baggage screening					

4.	Your screening task performance speed depends on your experience with X-ray baggage screening					
5.	Screeners' level of experience increases their skill and accuracy at screening of items					
Part 3						
The Level of Interaction between screeners' supervision in X-ray baggage screening on provision of security and safety in universities within Nairobi City County						
1.	Supervision increases screeners' level of screening professionalism					
2.	Supervision improves screeners' effectiveness in X-ray baggage screening					
3.	Supervision makes screeners accomplish screening of threat items quickly					
4.	Supervision enhances the professional work development of screeners					
5.	Supervision gives support and promotes easy learning by screeners on screening accuracy					
Part 4						
In your opinion, what specific challenges do screeners face while using X-ray Baggage screening for security and safety in the university? ***Please List five (5) of the challenges.***						
1.						
2.						
3.						
4.						
5.						

APPENDIX III: KIIs GUIDE

Please respond to the questions below by ticking (√) against your preferred response for questions with options. For questions that require suggestions or comments, please use the provided space, and answer them honestly. The information will be used strictly for the study and will be treated with strict confidence.

Interview Guide

1. In your opinion do security guards/screeners undergo standard training in X-ray baggage screening?
2. How would you rate the level of experience gained by guards/screeners in X-ray baggage screening for security and safety of universities?
3. What strategies would be effective in security guards/screeners' supervision in X-ray baggage screening?
4. What is your personal opinion on human-machine interface in X-ray baggage screening on security and safety of universities?
5. What kind of threat items have your security team captured with the help of X-ray baggage screener for security and safety of the universities?
6. What are threats outside human elements that may impact on the effective X-ray baggage screening for security and safety of universities? (Please tick against them).
    i. Insufficient electric power supply.
    ii. Insufficient continuous serviceability of the X-ray baggage scanner.
    iii. Conveyor belt's movement speed level.
    iv. Invisibility of images of items.
    v. Insufficient budget for repair and service maintenance.

vi. Improper computer infrastructure network.

7. X- Ray baggage scanner requires computer infrastructure, as a user, are you computer literate? Yes ☐

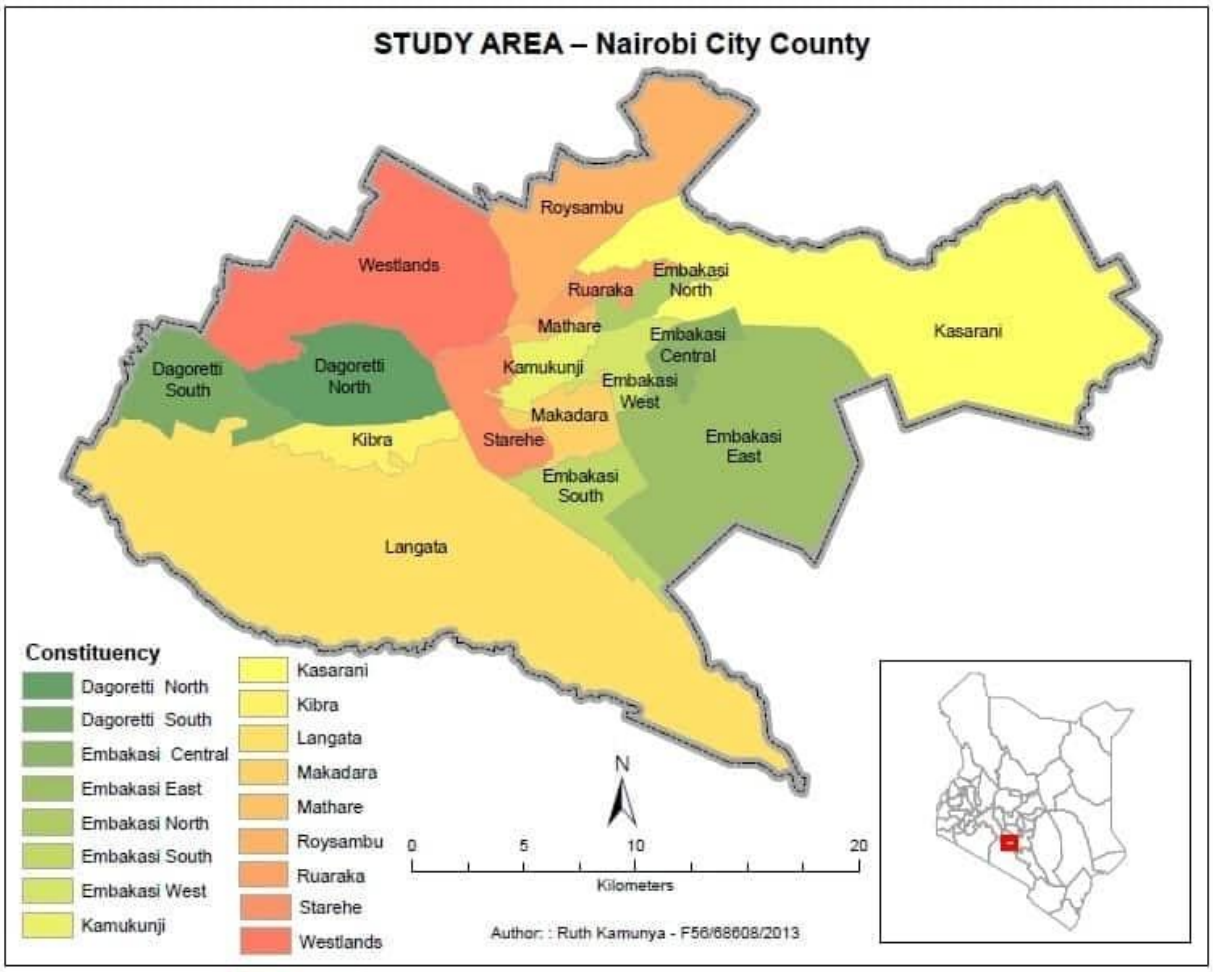
No ☐

If yes please explain…….....

8. Please comment on any other security and safety issues that you may have as far as X-ray baggage screening is concerned for security and safty of universities within Nairobi City County, Kenya.

Appendix VI: Area of the Study

Fig 4.7: Map of Nairobi City County



Source: https://www.tuko.co.ke/285791-list-nairobi-county-wards.html

Appendix VII: Research Proposal Authorization from the Graduate School

Fig: 4.8: Research Proposal Authorization from the Graduate School

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 4150

Internal Memo

FROM: Dean, Graduate School

DATE: 14th October, 2020

TO: Edwin Oluoch Wachie
C/o Security & Correction Science Dept.

REF: C159/PT/CTY/38459/2016

SUBJECT: APPROVAL OF RESEARCH PROJECT PROPOSAL

We acknowledge receipt of your revised Project Proposal as per our recommendations raised by the Graduate School Board at its meeting of 11th September, 2020, Entitled, "Human Factor and X-Ray Baggage Screening on Provision of Security and Safety of Universities within Nairobi City County, Kenya".

You may now proceed with your Data Collection, Subject to Clearance with Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School webpage downloads.

Thank you.

ELIJAH MUTUA
FOR: DEAN, GRADUATE SCHOOL

C.c. Chairman, Department of Security and Correction Science
Supervisors:

1. Dr. Merecia Sirera
   C/o Sociology, Gender & Development Studies Dept.
   Kenyatta University

Appendix VIII: Research Project Introductory Letter from the Graduate School

Fig: 4.9: Research Project Introductory Letter from the Graduate School

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke

Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

Our Ref: C159/PT/CTY/38459/2016

DATE: 14th October, 2020

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR EDWIN OLUOCH WACHIE REG. NO. C159/PT/CTY/38459/2016

I write to introduce Mr. Edwin Oluoch Wachie who is a Postgraduate Student of this University. He is registered for M.A degree programme in the Department of Security and Correction Science.

Mr. Wachie intends to conduct research for a M.A Project Proposal entitled, "Human Factor and X-Ray Baggage Screening on Provision of Security and Safety of Universities within Nairobi City County, Kenya".

Any assistance given will be highly appreciated.

Yours faithfully,

PROF. ELISHIBA KIMANI
DEAN, GRADUATE SCHOOL

EK/nn

Appendix IX: Correction of the Project Proposal Title from the Graduate School

Fig: 5.0: Correction of the Research Project Proposal Title from the Graduate School

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
kubps@yahoo.com
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Dean, Graduate School

DATE: 29th September, 2020

TO: **Mr. Edwin Oluoch Wachie**
C/o International Relations, Conflict & Strategic Studies

REF: C159/PT/CTY/38459/16

SUBJECT: **CORRECTION OF PROJECT PROPOSAL TITLE**

This is to inform you that Graduate School Board, at its meeting on **11th September, 2020**, approved your Research Proposal for the M.A. Degree **subject to adding "Nairobi City County, Kenya.**

Please ensure that you forward a copy of the amended title through the Chairman of your Department before you get the research authorization so that you can proceed to the field.

Thank you.

EDWIN OBUNGU
FOR: DEAN, GRADUATE SCHOOL

CC. Chairman, Department of Security & Correction Science

Supervisor:

1. Dr. Merecia Sirera
C/o Department of Security & Correction Science
Kenyatta University

Appendix X: Research Project Approval from the Directorate of Ethical Review Committee

Fig: 5.1: Research Project Approval from the Directorate of Ethical Review Committee

KENYATTA UNIVERSITY
DIRECTORATE OF ETHICS REVIEW COMMITTEE

Fax: 8711242/8711575
Email: chairman.kuerc@ku.ac.ke **P. O. Box 43844,**
Nairobi, 00100

Website: www.ku.ac.ke Tel: 8710901/12
Our Ref: **KU/ERC/APPROVAL/VOL.1**

Date: 24th November, 2020

Edwin Oluoch Wachie
P.0 Box 43844-00100
NAIROBI

Dear Mr. Wachie,

RE: APPLICATION NUMBER: PKU/2168/I1312 HUMAN FACTOR AND X-RAY BAGGAGE SCREENING ON PROVISION OF SECURITY AND SAFETY OF UNIVERSITIES WITHIN NAIROBI CITY COUNTY, KENYA

This is to inform you that ***KENYATTA UNIVERSITY DIRECTORATE OF ETHICS REVIEW COMMITTEE*** has approved version 4 of the study protocol together with the attached consent forms dated 12.09.2020. Your application approval number is **PKU/2168/I1312**. The approval period is ***24th November, 2020 TO 24th November, 2021.***
This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***KENYATTA UNIVERSITY DIRCTORATE OF ETHICS REVIEW COMMITTEE.***
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***KENYATTA UNIVERSITYDIRECTORATE OF ETHICS REVIEW COMMITTEE*** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***KENYATTA UNIVERSITY DIRECTORATE OF ETHICS REVIEW COMMITTEE*** within 72 hours

v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to ***KENYATTA UNIVERSITY DIRECTORATE OF ETHICS REVIEW COMMITTEE***.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely

Prof. Judith Kimiywe

DIRECTOR- KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE.

Appendix XI: Research Project Approval Permit from NACOSTI

Fig: 5.2: Research Project Approval Permit from NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **447889**

Date of Issue: **23/October/2020**

RESEARCH LICENSE

This is to Certify that Mr.. Edwin Oluoch Wachie of Kenyatta University, has been licensed to conduct research in Nairobi on the topic: HUMAN FACTOR AND X-RAY BAGGAGE SCREENING ON PROVISION OF SECURITY AND SAFETY OF UNIVERSITIES WITHIN NAIROBI CITY COUNTY, KENYA for the period ending : 23/October/2021.

License No: **NACOSTI/P/20/7337**

447889

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is Guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014

CONDITIONS

1. The License is valid for the proposed research, location and specified period
2. The License any rights thereunder are non-transferable
3. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research
4. Excavation, filming and collection of specimens are subject to further necessary clearence from relevant Government Agencies
5. The License does not give authority to tranfer research materials
6. NACOSTI may monitor and evaluate the licensed research project
7. The Licensee shall submit one hard copy and upload a soft copy of their final report (thesis) within one year of completion of the research
8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice

National Commission for Science, Technology and Innovation
off Waiyaki Way, Upper Kabete,
P. O. Box 30623, 00100 Nairobi, KENYA
Land line: 020 4007000, 020 2241349, 020 3310571, 020 8001077
Mobile: 0713 788 787 / 0735 404 245
E-mail: dg@nacosti.go.ke / registry@nacosti.go.ke
Website: www.nacosti.go.ke

Appendix XII: Request for Research Project Approval Review by KUERC

Fig: 5.3: Request for Research Project Approval Review by KUERC

Edwin Oluoch Wachie,
P.O Box 14634-00800,
Nairobi, Kenya.
Cell: 0721539009/0736191609
Email:edwinwachie@gmail.com

24th October, 2020

Chairman,
Kenyatta University Ethics Review Committee,
P.O. Box 43844-00100,
Nairobi University Main Campus,
Moi Library 1st Floor, Room 25.

Dear Prof.,

REQUEST FOR MASTERS RESEARCH PROJECT REVIEW BY KENYATTA UNIVERSITY (K.U) REVIEW COMMITTE

I am a post graduate student undertaking a Master of Arts Degree in Security Management and Police Studies at Kenyatta University. As a partial fulfilment of the requirements for an award of the master degree, I am conducting a study on ***Human Factor and X-Ray Baggage Screening on Provision of Security and Safety of Universities within Nairobi City County***. Kenyatta University main campus and city campus are among the selected universities within the Nairobi City County, Kenya, by purposive sample for the study.

The sample will comprise a total of 248 respondents who are screeners/guards who will be drawn from the qualified universities within Nairobi City County that adopt X-ray baggage screening of bags at the entrances. The security guards are selected by stratified sampling technique.

The study will be guided by ethical regulations for research. I will observe utmost ethical standards in conducting the research. The data that will be obtained from the security team of the selected universities in this study will be treated with utmost confidentiality, and will be used only for academic purposes.

The purpose of this letter is to seek your guidance or advice whether the study is applicable for ethical review by KUERC, and if so, the remaining requirement(s) that I need to fulfil for the same before I seek authority to collect data from the selected universities, Kenyatta University main campus and City campus included. I have attached a soft copy of the approved research project proposal, K.U approval letter of the masters research project proposal, my research License from NACOSTI and KU-ERC/FORM/1 for your perusal and/or advice. I look forward to receiving a positive reply.

Yours faithfully,
Edwin Oluoch Wachie,

Appendix XIII: Request for Data Collection Approval by the V.C, KU

Fig: 5.4: Request for Data Collection Approval at KU by the V.C, KU

Edwin Oluoch Wachie,
P.O Box 14634-00800,
Nairobi.
Cell: 0721539009/0736191609
Email: edwinwachie@gmail.com
23rd October, 2020

The Vice Chancellor,
Kenyatta University,
P.O. Box 43844-00100,
Nairobi, Kenya

Through,

Deputy Vice-Chancellor,
Research, Innovation & Outreach,
Kenyatta University,
P. O. Box 43844 -00100,
Nairobi, Kenya.

Dear Prof.,

REQUEST FOR PERMISSION TO COLLECT DATA FROM THE SECURITY GUARDS AT KENYATTA UNIVERSITY (K.U) MAIN CAMPUS AND K.U CITY CAMPUS

I am a post graduate student undertaking a Master of Arts Degree in Security Management and Police Studies at Kenyatta University. As a partial fulfilment of the requirements for an award of the master degree, I am conducting a study on ***Human Factor and X-Ray Baggage Screening on Provision of Security and Safety of Universities within Nairobi City County***. Kenyatta University main campus and city campus were selected by purposive sample. Therefore, it is my humble request that you grant me permission to collect data for the research.

The study will be guided by ethical regulations for research. I will observe utmost ethical standards in conducting the research. The data that will be obtained from the university security team in this study will be treated with strict confidentiality, and will be used only for academic purpose. I look forward to receiving a positive reply.

Yours faithfully,

Edwin Oluoch Wachie,

Student Admission No.: C159/PT/CTY/38459/2016

Appendix XIV: Request for Data Collection Approval at CUEA

Fig: 5.5: Request for Data Collection Approval at CUEA

Edwin Oluoch Wachie,
P.O Box 14634-00800,
Nairobi, Kenya.
Cell: 0721539009/0736191609
Email: edwinwachie@gmail.com

24th October, 2020

Directorate of Research, Innovation & Graduate Training,
The Catholic University of Eastern Africa,
P O Box 62157 - 00200,
Nairobi, Kenya.
Email: research@cuea.edu

Dear Sir/Madam,

REQUEST FOR PERMISSION TO COLLECT DATA FROM THE SECURITY GUARDS AT THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

I am a post graduate student undertaking a Master of Arts Degree in Security Management and Police Studies at Kenyatta University. As a partial fulfilment of the requirements for an award of the master degree, I am conducting a study on ***Human Factor and X-Ray Baggage Screening on Provision of Security and Safety of Universities within Nairobi City County, Kenya***. The Catholic University of Eastern Africa, Main campus, was selected by purposive sample being among the universities within Nairobi City County, which uses/has used X-ray baggage scanner(s) for security and safety screening purpose.

Therefore, it is my humble request that you grant me permission to collect data for the academic research. I have attached a copy of approved research project proposal letter from Kenyatta University, Graduate School, a soft copy of the research instrument to be used for data collection, and a copy of research license/permit from NACOSTI for your reference and/or advice.

The study will be guided by ethical regulations for research. I will observe utmost ethical standards in conducting the research. The data that will be obtained from the university security team in this study will be treated with strict confidentiality, and will be used only for academic purpose. I look forward to receiving a positive reply.

Yours faithfully,

Edwin Oluoch Wachie,

Kenyatta University Student Admission No.: C159/PT/CTY/38459/2016

Appendix XV: Request for Data Collection Approval at USIU-A

Fig: 5.6: Request for Data Collection Approval at USIU-A

Edwin Oluoch Wachie,
P.O Box 14634-00800,
Nairobi- Kenya.
Cell: 0721539009/0736191609
Email: edwinwachie@gmail.com
23rd Oct., 2020

The Dean, School of Graduate Studies, Research & Extension,
United States International University-Africa (USIU-A),
P.O. Box 14634-00800,
Nairobi- Kenya

Dear Prof.,

REQUEST FOR PERMISSION TO CONDUCT AN ACADEMIC RESEARCH

I am a post graduate student undertaking a Master of Arts Degree in Security Management and Police Studies at Kenyatta University. As a partial fulfilment of the requirements for an award of the master degree, I am conducting a study on ***Human Factor and X-Ray Baggage Screening on Provision of Security and Safety of Universities within Nairobi City County***. USIU-A was selected by purposive sample being among the universities within Nairobi City County, which installed X-ray baggage scanners for security screening at the entrances.

Therefore, it is my humble request that you grant me permission to collect data for the research. I have attached a copy of approved research project proposal letter from Kenyatta University, Graduate School, a soft copy of the approved research project proposal and a copy of permit from NACOSTI for your reference

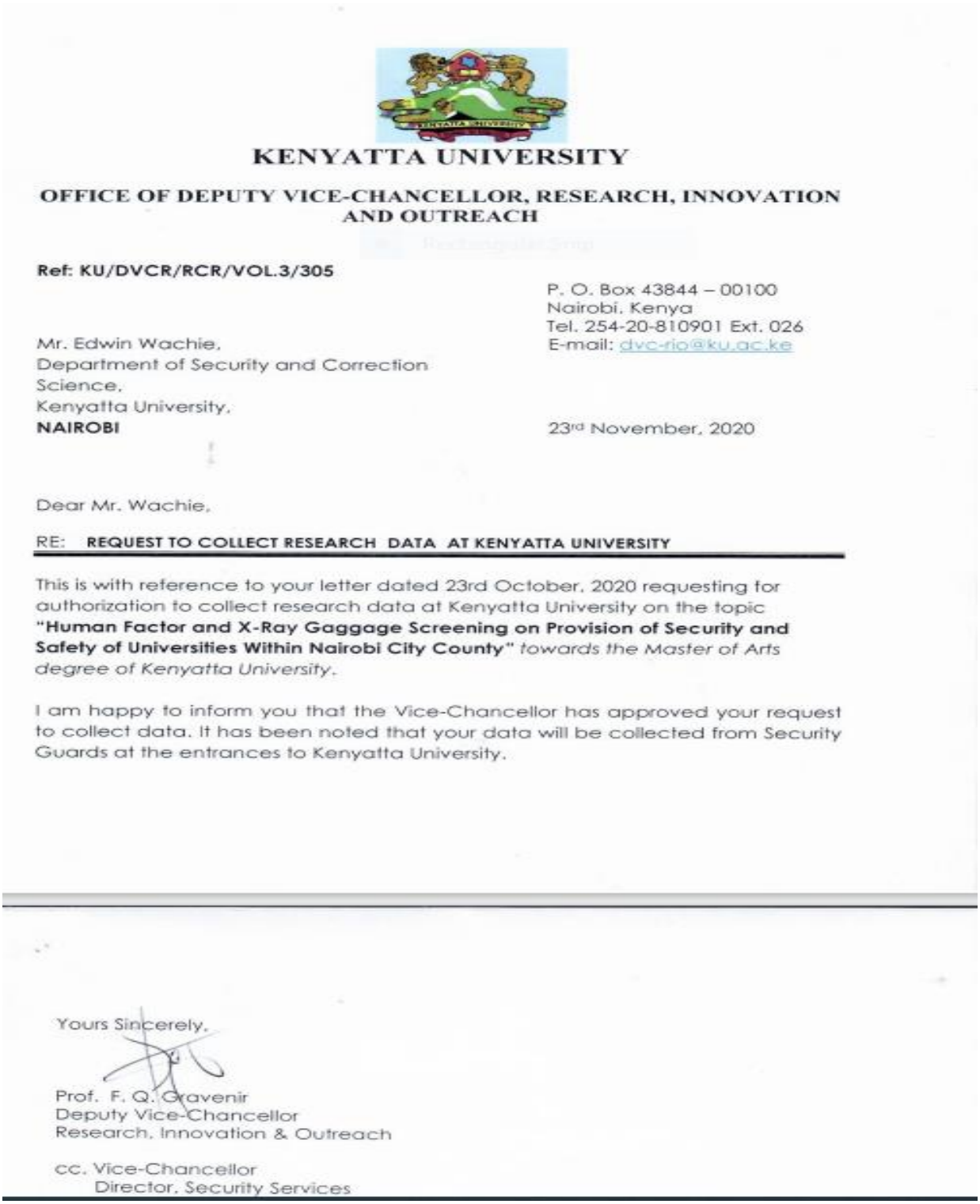
The study will be guided by ethical regulations for research. I will observe utmost ethical standards in conducting the research. The data that will be obtained from the university security team in this study will be treated with strict confidentiality, and will be used only for academic purpose. I look forward to receiving a positive reply.

Yours faithfully,

Edwin Oluoch Wachie,

Appendix XVI: Research Project Approval for Data Collection at KU

Fig: 5.7: Research Project Approval for Data Collection at KU



KENYATTA UNIVERSITY

OFFICE OF DEPUTY VICE-CHANCELLOR, RESEARCH, INNOVATION AND OUTREACH

Ref: KU/DVCR/RCR/VOL.3/305

P. O. Box 43844 – 00100
Nairobi, Kenya
Tel. 254-20-810901 Ext. 026
E-mail: dvc-rio@ku.ac.ke

Mr. Edwin Wachie,
Department of Security and Correction Science,
Kenyatta University,
NAIROBI

23rd November, 2020

Dear Mr. Wachie,

RE: **REQUEST TO COLLECT RESEARCH DATA AT KENYATTA UNIVERSITY**

This is with reference to your letter dated 23rd October, 2020 requesting for authorization to collect research data at Kenyatta University on the topic **"Human Factor and X-Ray Gaggage Screening on Provision of Security and Safety of Universities Within Nairobi City County"** *towards the Master of Arts degree of Kenyatta University.*

I am happy to inform you that the Vice-Chancellor has approved your request to collect data. It has been noted that your data will be collected from Security Guards at the entrances to Kenyatta University.

Yours Sincerely,

Prof. F. Q. Gravenir
Deputy Vice-Chancellor
Research, Innovation & Outreach

cc. Vice-Chancellor
Director, Security Services

Appendix XVII: Research Project Approval for Data Collection at CUEA

Fig: 5.8: Research Project Approval for Data Collection at CUEA

THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

Office of the Deputy Vice Chancellor
ACADEMIC AFFAIRS & RESEARCH

Our Ref: DVC/AA&R/RG/esm/087/2020

11 November 2020

Edwin Oluoch Wachie
United States International University Africa (USIU-A)
P.O. Box 14634-00800
Nairobi, Kenya.
Tel. No. 0721 539009

Dear Edwin,

RE: Permission to Conduct Research at The Catholic University of Eastern Africa (CUEA)

Greetings in the Mighty Name of our Lord and Savior Jesus Christ.

I am glad to inform you that your request to conduct research for a Masters, thesis entitled; ***"Human Factor and X-Ray Baggage Screening on Provision of Security and Safety of Universities within Nairobi City County, Kenya"*** has been granted. You are therefore authorized to collect data from the security guards at The Catholic University of Eastern Africa. You are expected to strictly observe the normal ethical cautions and discretions while conducting the research.

I wish you well with your study and I look forward to you sharing your findings with the Directorate of Research and Innovation of the The Catholic University of Eastern Africa.

Sincere regards

Mrs. Prof. Rachel K. Gesami, PhD, MBS
Deputy Vice Chancellor/Academic Affairs & Research

THE CATHOLIC UNIVERSITY OF EASTERN AFRICA ★ OFFICE OF THE DEPUTY VICE CHANCELLOR ACADEMIC AFFAIRS & RESEARCH ★ 11 NOV 2020 ★ P.O. Box 62157 - 00200, NAIROBI

CC *Vice Chancellor*
Directorate of Research & Innovation
Dean of Students

Appendix XVIII: Research Project Approval for Data Collection at USIU-A

Fig: 5.9: Research Project Approval for Data Collection at USIU-A

United States International University-Africa

Edwin Oluoch Wachie
26th October, 2020

Dear Edwin,

REF: PERMISSION TO CONDUCT RESEARCH AT USIU-AFRICA

Following your request to conduct research at USIU-Africa on the topic **"Human Factor and X-Ray Baggage Screening on Provision of Security and Safety of Universities within Nairobi City County."** the university's Research Office has authorized you to collect data from the respondents in the Institution.

However, the university imposes the following conditions:

1. No personal information will be asked of the respondents.
2. You will share the preliminary report findings with us prior to completion.
3. You will provide a copy of the completed research to us.
4. Under no circumstances will the information obtained from USIU-Africa be re-used or disclosed for other purposes.

Your research period expires on 26th January 2021. Kindly contact the undersigned to confirm your acceptance to the condition stated above.

Sincerely,

UNITED STATES INTERNATIONAL UNIVERSITY AFRICA RESEARCH OFFICE

Prof. Amos Njuguna,
Dean- School of Graduate Studies, Research and Extension.
Tel: 0730116442
Email: amnjuguna@usiu.ac.ke