FACTORS INFLUENCING LEVELS OF PROJECT MANAGEMENT INFORMATION SYSTEMS ADOPTION IN DISASTER MANAGEMENT PROJECTS IN FIRE STATIONS IN NAIROBI METROPOLIS, KENYA

BENARD ONYANGO LANGO

DOCTOR OF PHILOSOPHY

(Project Management)

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

2018

Factors Influencing Levels of Project Management Information Systems Adoption in Disaster Management Projects in Fire Stations in Nairobi Metropolis, Kenya

Benard Onyango Lango

A Thesis Submitted in Partial Fulfilment for the Degree of Doctor of Philosophy in Project Management in the Jomo Kenyatta University of Agriculture and Technology

2018

DECLARATION

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

Signature: ……………………………….……… Date: ……………..………………….

Benard Onyango Lango

This thesis has been submitted for examination with our approval as the University supervisors

Signature: ……………………………….……… Date: ……………..………………….

Prof. Henry Bwisa

JKUAT, Kenya

Signature: ……………………………….……… Date: ……………..………………….

Prof. George Orwa

JKUAT, Kenya

DEDICATION

To my beloved wife Carol and children Chloe and Clovis for their dedication, sacrifice and prayers during my studies

ACKNOWLEDGEMENT

My profound gratitude goes to Professor Henry Bwisa and Professor George Orwa of the College of Human Resource, Entrepreneurship and Development (COHRED) and the School of Mathematical Sciences respectively, Jomo Kenyatta University of Agriculture and Technology. Their guidance, constructive criticism, suggestions, comments, support and encouragement enabled the completion of this research work.

I am deeply grateful to the six metropolitan fire stations' management for allowing me to conduct my research. In particular, I thank Mr Samuel Kahura, the director fire services Kiambu County for coordinating the completion of the questionnaires. And also, the respondents for taking their valuable time to complete the questionnaires, responding to interviews and providing relevant documents for observation and analysis as was required.

A special gratitude goes to my brothers, sister and parents for their prayers and words of encouragement during the research process. I sincerely thank my wife for the support, patience, love and encouragement and my children Chloe and Clovis for enduring the commitment I had during the period of the research and subsequent analysis.

Above all, I thank the Almighty God for giving me long life, wisdom and strength during the entire period and may His name be blessed abundantly.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

ASP	Active Server Pages
CAV	Capacity Availability Variable
CBAM	Concerned-Based Adoption Model
CSF	Critical Success Factors
ERP	Enterprise Resource Planning
ICT	Information and Communication Technology
IEBC	Independent Electoral and Boundaries Commission
IFRC	International Federation of the Red Cross
ISDR	International Strategy for Disaster Reduction
K-R	Kuder – Richardson
KRA	Key Results Area
KTAI	Key Technology Adoption Indicators
KTI	Key Technology Indicators
NDOC	Kenya National Disaster Operation Center
PMBOK	Project Management Body of Knowledge
PMIS	Project Management Information System
SIV	Stakeholders Involvement Variables
SOC	Stages of Concern
SPSS	Statistical Package for Social Sciences
SBAT	Stakeholder Benefit Analysis Tool
TAM	Technology Acceptance Model
TMSV	Top Management Support Variable
TPV	Teamwork Policies Variables
UNDP	United Nations Development Programme
UTAUT	Universal Theory of Acceptance and Usage of Technology
WDR	World Disaster Report
WHO	World Health Organization

DEFINITION OF TERMS

Disaster Management Projects: Otieno *et al.* (2010) defines disaster management projects as the projects undertaken by the fire station that require the organization and management of resources and responsibilities for dealing with emergencies to ensure preparedness, response and recovery with the main objective being to lessen the impact of disasters

Nairobi Metropolis: This is the area defined by the Nairobi vision 2030 strategic plan to encompass not only the core of Nairobi but stretching to surrounding towns including Thika, Machakos, Tala-Kagundo, Limuru, Kiambu, Ol Kejuado, Masaku, Ruiru, Kikuyu, Mavoko and Nairobi itself (Nairobi-Metro 2010).

Metropolis: Nairobi-Metro (2010) a government policy review paper describes a metropolis as a large town or city which has a significant economic, political, and cultural influence for a country or the region within which it is located and at the same time act as an important hub for both regional and international connections, commerce and communications.

PMIS Adoption: This is the ability of fire stations to implement and learn Project Management Information System as a new technology and understand fully its incorporation in to their disaster management projects (Raymond & Bergeron, 2010).

Public Fire Station: This is a department within the national and county governments dedicated to providing fire safety service delivery to the members of the public within their defined jurisdiction (Malcom, 2010).

Perceived MIS Usefulness: This is the degree of the fire stations acceptance of technology which is dependent on the degree to which its top management believe that the system will enhance their work and the degree to which the system can be used without much effort (Venkatesh, 2007).

Key Staff Involvement: This is the direct participation of top management of the fire station employees in the adoption of PMIS in disaster management projects by applying their own ideas, expertise, and efforts towards making decisions on the level of PMIS adoption (Young & Jordan, 2008).

Communication: This is the sending and or receiving of internal information from the top management leadership of the fire station to the fire officers in relation to technology adoption in disaster management projects implemented at the station (Pan & Jang, 2008).

Knowledge and Skills: The definition takes the perspective pointed by Talukder (2011) that knowledge and skills are the facts and information acquired through experience or education and allows the fire station employees to use technology in their everyday tasks and managing disaster projects.

Innovativeness: This is the ability of the fire station personnel to translate technology acquired at the station to provide good service in managing disaster projects to provide value which translates into adoption levels experienced (Sahin & Thompson, 2007).

Sustainable Team: This is the ability of the fire station to be able to manage the financial, social and environmental risks, obligations, and opportunities related to its capacity in terms of technology adoption (Dewick & Miozzo, 2004).

Policy Availability: These are the fire stations with lower benefits or high costs and those with smaller and larger teams determining the policies that it can adhere to due to their accessibility for application (Kerr and Newell, 2001).

Policy Appropriateness: This is the policy being considered as a major factor in PMIS adoption in disaster management projects in fire stations contributing to major decisions taken by the top management in levels of technology adoption (Talukder, 2011).

Policy Responsiveness: Tripathi (2011) defines policy responsiveness that it is positive preferences that are derived from the fire stations' implementation of a policy through its action plan with the main aim towards improvement of the technology adoption levels.

Consultation: This is the process by which the fire stations involve the people who may be affected by its decisions on technology adoption and eventually influence the implementation of the same (Laplume, Karan, & Reginald, 2008).

Stakeholders' Participation: This is balancing the stakeholder's interests as a process of assessing, weighing, and addressing the competing claims of those who have a stake in the technology adoption directly and indirectly (Miles, 2011).

Stakeholders' Training: This is engaging all the stakeholders of technology adoption through a formal process to drive an understanding of knowledge and skills on the interests, perspectives, value dimensions, and the benefits of having a PMIS technology at the fire station (Mishra & Mishra, 2013).

High Levels PMIS Adoption: This is where the fire station has the highest degree of infusion of PMIS in its disaster management projects with a view to improving the overall success rates (Njoki, 2013).

No PMIS Adoption: This is where the fire station does not consider the PMIS technology as a considerable requirement in its implementation of disaster management projects thereby having no information technology in any form at the station for disaster projects management (Caniels *et al., 2011*).

Low Levels PMIS Adoption: This is where the lifecycle that describe technology adoption in disaster management projects at the fire station are considered negligible and only used in specific phases of the projects and contributes to moderate success rates as opposed to high level adoptions (Lee *et al.,* 2011).

ABSTRACT

The purpose of the study was to determine factors influencing the levels of adoption of PMIS in disaster management projects in fire stations considering top management support, capacity availabilities, teamwork policies, and stakeholders' involvement as the dimensions. The study aimed at providing intuition and a model that would enable fire stations have high performance and success rates in implementation of disaster projects. This was to be achieved by having specific factors of consideration that would reduce the general focus on the technology itself and look at the fire station as an environment of implementation. The study applied mixed method research employing both the qualitative and quantitative research approaches. The study used census survey method to the total population of 234 drawn from the 6 fire stations. The data used were both primary and secondary. The primary data was collected using self – administered questionnaires and observation guide while the secondary data was obtained from internal fire stations and KENFIBA annual reports and other studies. Data analysis was done using statistical computation for averages, percentages, correlations and regression analysis, and ANOVA. Regression models were fitted and hypothesis testing carried out using multiple regression analysis and standard F and student *t* tests. The analysed data were presented using tables, charts and graphs. The findings of this study from the multiple regression analysis indicated that levels of PMIS adoption was positively influenced by top management support, capacity availability, teamwork policies and stakeholder's involvement. Correlation analysis results indicated that capacity availability and top management support had a strong and positive influence on levels of PMIS adoption. However, the results of this study showed that teamwork policies and stakeholders involvement had a moderate positive influence on the levels PMIS adoption. The study recommends that fire stations should focus on the four factors to ensure high levels of adoption that ensures high rates of disaster projects completion within cost, time stipulated, and quality. The research also recommends that fire stations in Kenya should match their levels of technology adoption strategies with dynamic environment and develop practical solutions to achieve realistic outcomes and bottom-line successes. The study further recommends that theorists consider the research findings and contribution to levels of PMIS adoption in four dimensions which are: top management support; capacity availability; teamwork policies; and stakeholder's involvement. The study concluded that although the factors of levels of PMIS adoption were modelled using literature and theoretical context from the developed world countries, their items converged to fit to their respective dimensions and configurationally, the theory was applicable in the Kenyan context.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The global rise in disasters whether natural, human-induced and technological is high and continuing according to the World Disaster Report (2004:161) as reported by IFRC (2010). From 1994 to 1998 the reported major disasters averaged 428 per year and from the year 1999 to 2003, the figures rose up by two thirds to an average of 707 disasters per year and the biggest increase was in development countries like Kenya where the increase was reported at 142 per cent (IFRC, 2010). This increase has raised international concerns on the Fire Stations disaster preparedness and their abilities to quickly respond to disasters in order to limit their impact on the population.

Failure to adequately use technologies in disaster management departments in a timely manner may results in increased number of causalities (IFRC, 2010). According to US congressional investigation on Hurricane Katrina that hit the southern US coast in 2005, the federal, state and city agencies did not plan and allocate the resources using the available Project Management Information System (PMIS) adequately to ensure decisive response actions. It was also noted that many disaster management procedures and plans generated by the PMIS for disaster management were improperly implemented.

Despite the shortcomings, PMIS have gained much attention globally for their applications in resource allocation and are increasingly being utilized throughout the disaster management cycle as a tool to support decision making. PMIS tools have been recognized as a key support tool for disaster management (Mileti, 1999). The reporting capabilities of these systems have almost become synonymous with policy makers, disaster managers and the general public. PMBOK (2004) define PMIS as the coherent organization of the information required for an organization to execute projects successfully and is usually typically one or more software applications and

a methodological process for collecting and using project information to help plan, execute and close project management goals.
Mintzberg (1983) theorizes therefore that most of the emergent organization including fire stations, since the second world war are projects intensive and that the widespread use of projects in these fire stations demands an approach that can efficiently manage the temporary endeavours which are critical to the fire stations strategic objectives. In 1980s, the use of automated data processing and later new techniques were developed to influence better investment implementation (PMBOK, 2004). The concept of management of projects and management by projects clearly, according to Soderlund (2004), points to the requirement of PMIS as a candid tool and its adoption by fire stations would certainly determine the level of success of these projects.

Most countries in the Eastern Africa region are categorized by the United Nations Development Program (UNDP, 2013) as category of low human development. Although Kenya is best ranked among the East African countries at 145 out of 186 countries of which data is available, disaster emergencies will still erode the development gains. The East African region is prone to both natural and man-made disasters hence important considerations should be made on the preparedness of its fire stations in utilization of technologies like PMIS in managing disasters during the pre- and post- occurrence of these disasters.

According ISDR (2013) the disaster scenarios, across the region, ranges from civil strife, population movement, terror attacks, earth tremors, cyclones, flooding, droughts and epidemics with various countries exhibiting varying degrees of exposure. Of importance is fire related emergencies which makes up to 60% of disasters experienced in the region (Chatora, 2005). Disaster response to these situations in the region often becomes desperate due to the inadequate state of disaster management resources coupled with poor planning, allocation and lack of support within the governments to inadequate preparedness; insufficient contingencies; delays in emergency response; inadequate and uncoordinated information flow; poor institutional arrangements; and inadequate systems and procedures for emergency risk management (Chatora, 2005).

In Kenya lessons learnt from the fire disasters which includes Nakumatt fire on 28 January 2009 which had 29 fatalities with 47 reported missing, the Nairobi pipeline fire on 12 September 2011 with 100 fatalities and 116 other hospitalized with varying degrees of burns, and the most recent Jomo Kenya International Airport (JKIA) fire on August 2014 which had no fatalities but resulted in losses estimated at Kshs.300 million according to the Kenya Airport Authority status report (2014), have all shown the level of lack of preparedness and insufficient and ineffective application of technologies like PMIS in planning and allocation of emergency management resources (IFRC, 2014). As a result of the recent disasters there have been increased activities in contingency planning, provision of early warning systems to the fire stations and increased preparedness through hiring of more fire station service men and women however the impact was minimal according IFRC (2014) as it did not take into consideration the level of management information system (MIS) technologies role.

In light of all these, the establishment of Kenya National Disaster Operation Center (NDOC) was to ensure there is collaboration with other government ministries, United Nations Agencies, the Kenya Red Cross, Non-Governmental Organizations and International Humanitarian Organizations to put in place a plan that could be activated in times of disasters that require national coordination (NDOC, 2015). NDOC relies heavily on technology to relay disaster related information and service delivery. According to NDOC (2015) report the major hindrances to adoption and adoption of technologies in the various disaster management departments including fire stations across the country includes: lack of support from top management; lack of capacity within the departments; individualism instead of teamwork; and lack of stakeholder’s involvement. Considering these factors therefore, Njoki (2013) asserts that synchronization with other disaster management departments is difficult.

With the promulgation of the Kenyan Constitution in August 2010 came the 47 county governments. Every County Government is required by the establishment of County Government Act (2010) and the Independent Electoral Boundaries Commission (IEBC) (2012) to have an established county fire station to respond to local disasters mainly related to fires. Nairobi Metropolis which is the only metropolis in Kenya hosting the highest number of fire stations according IEBC (2012) formed the study's target population.

1.1.1 Overview of Disaster Management Project

This section provides a description of disaster management projects managed by fire stations in emerging economies like Kenya. It defines disaster management projects and further discusses the classifications of disaster management projects in general while highlighting the stages involved in disaster management operations that incorporate the application of technologies like PMIS.

1.1.2 Disaster Management Projects Definition

According to Malcolm (2010), a disaster management project is an emergency or non-emergency scenario that is complex and comprising of a set of activities and tasks that must be completed with a definite start time or date and also the completion time or date, and applies resources to achieve the specific objective which is usually disaster resilience. Additionally, the PMBOK (2008) indicates that the major components of a project are time, scope and resources. In essence according to PMBOK, a project must have a specified start time and end time, with a defined scope of activities to be undertaken and the resources to be utilized and generally unique as they usually are not routine operations. Therefore, disaster projects are generally defined by Malcolm (2010) as a process in which material, equipment and workforce are assembled to ensure permanent resilience in protection and safety. It therefore, according to Njoki (2013), encompasses technologies such as PMIS and includes emergency response, accident scene management, disaster management trainings, disaster relief support projects as well as standardization processes in disaster operation centres. Out of these categories, the categorisation based on scope seems to provide a candid classification of disaster management projects.

1.1.3 Classification of Disaster Management Projects

Emerging economies, according to Phillips (2005), view disaster management projects as geared towards dealing with and avoiding risks and involves preparing, supporting and rebuilding when manmade or natural disasters occur. Malcolm (2010) on the other hand argue that all projects despite their complexities, scope and use have certain features that must include goal, budget and timeframe, they differ in various ways. Disaster management projects can therefore be classified based on the type of hazard and according to Drabek and Hoetmer (1991) the disaster management project can either be man-made or naturally instigated projects. Malcolm (2010) on the other hand classifies disaster management projects according to size as either small, medium, large or mega. In dealing with location of occurrence of disasters, Drabek and Hoetmer (1991) suggest that disaster management projects be classified as either national or county government projects.

Inherently therefore, based on scope, a disaster management project is categorised as a response or mitigation project. Response projects includes: fires outbreaks; fuel or oil spills and leaks; climate change; and medical emergencies that occur at any moment without giving notice which therefore require quick and coordinated effort to respond. On the other hand, mitigation projects include disaster management capacity trainings, inspections, report generation, recruitment of response officers, donations support and community support projects (Malcolm, 2010; IFRC, 2008; Drabek & Hoetmer, 1991). Because of focus on reactive disaster management by developing countries, response projects are most popular type of disaster management projects especially by the county fire stations governments. Disaster management response or mitigation projects are carried out by the same fire stations with the mandate to protect and provide safety within their jurisdictions. This study therefore concentrated on the level of PMIS adoption in disaster management considering the response and mitigation projects that are eminent at the national and county government but with a specific focus to Nairobi Metropolis fire stations with a view to exploring the experience of the sub-county fire stations with regard to the level of PMIS adoption.

1.1.4 Disaster Management Project Phases

Disaster management projects are usually undertaken in a number of phases and each phase have specific activities to be undertaken to achieve a specific objective geared towards the overall disaster management (Phillips, 2005). Disaster management project life cycle therefore according to World Health Organization (WHO, 2002) illustrates the on-going process by which governments, businesses and civil societies plan for and reduce the impact of disasters and takes steps to recover after disasters occur. Significant numbers of studies in the field of disaster management have described the phases of disaster management projects to include prevention, mitigation, preparedness, response, reconstruction and rehabilitation (Malcolm, 2010). Phillips (2005) on the other hand provides the same in fewer stages to include mitigation, response and recovery.

According to PMBOK (2008) there are four phases to any project and this includes: conception; development; implementation; and termination. The phases as stated captures the activities that take place during disaster management projects. Figure 1.1 indicates the phases of disaster management projects as: project conception and planning; project response design; project response operations; and project recovery and report.

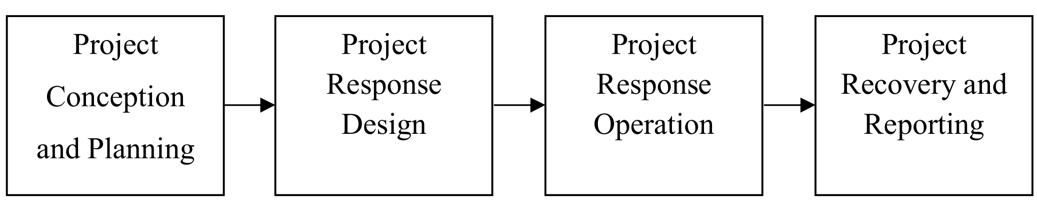


Figure 1.1: Disaster Management Projects Life Cycle: *Source (WHO, 2002)*

According to PMBOK (2008), project inception and planning refers to the disaster need recognition and the need to provide resilience and normalcy. The project response design on the hand translates the primary concept of disaster at hand into an expression of a spatial form which enables the response team involved draw the requirements in optimum and economic manner. The project response operations are the actual implementation of the project through elimination of the disaster in the shortest time possible and within the stipulated time limits set while the project recovery and reporting, which is the last phase, examines whether the response met the objective of resiliency. The study investigated the factors influencing the level of adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

1.1.5 Factors Influencing Level of Technology Adoption

Assessment of factors of technology adoption amongst fire stations as disaster management departments has assumed great importance the world over due the increasing sector ability to deliver social welfare services before, during and after disasters and at the same time the negative social and environmental impact created when these stations fails. With reference to developing countries factors influencing the level of adoption of technologies including Project Management Information System (PMIS), has been even more important due to its immense potential in addressing the problems of failure response, poor disaster resources allocation and inequitable support in distribution of these resources in different regions. However, as revealed in literature, determinants of adoption of technologies like PMIS has been identified based on the criteria of response time, resources costs and quality of service delivery (Malcolm, 2010; Njoki, 2013; Haddow, 2007; French, 1996; Rwelamila *et al.* 1996; Chatora, 2005). This traditional approach, commonly referred to as the “iron triangle” merely captures the economic factors of adoption of technologies in disaster management projects at the public fire stations and ignores the social and environmental aspects that define the level of the adoption (Rwelamila *et al*. 1996).

In the light of this shortcoming of traditional criteria, the Projects Management Body of Knowledge ([PMBOK], 2004) and the International Federation of Red Crescent ([IFRC], 2010) introduced the technology performance-based factors of disaster management projects based on efficiency, effectiveness, relevance, impact and sustainability. This criterion popularly known as the “five-pillars” of disaster management projects, (Rwelamila *et al*. 1996; Malcolm, 2010), as much as it seems to capture the social and economic aspects of factors influencing adoption of technology like PMIS in disaster management projects, does not adequately address the environmental aspects in which the technology is implemented that are considered quite important in these kind of emergency projects. Further the scholars have suggested hardly any objective measure upon which these five pillars that point to the major factors of technology adoption can be operationalized for verification.

Scholars have also opined that in order to overcome the limitations of the traditional approach in factors of technologies adoption that includes costs, time and quality have suggested the inclusion of additional factors as major considerations. One of the factors includes consideration of the disaster management project implementation site (Haslam *et al*. 2005; Ortega, 2000; Malcolm, 2010), technology conflicts (Njoki, 2013; Chatora, 2005), and customer and recipient satisfaction (Ali & Rhamat, 2010; Eriksson & Westerberge, 2011). This contribution can be seen to widen the scope of factors of technology adoption but are skewed towards either the societal or environmental aspects. None listed above provides a balanced set of Key Technology Adoption Indicators (KTAI) which would capture all the essential and unique features of technology application in disaster management projects in public fire stations. Additionally, the scholars in their studies seem to have not talked about the appropriate facilitating factors that enables disaster management project managers achieve success with the identified KTAIs. The enabling factors can also be described as the Critical Success Factors (CSFs) and are vital in ensuring the success of any disaster management project because it enables the project managers to commit resources on specific factors.

A survey of factors influencing the level of adoption of PMIS in disaster management project reveals that they are numerous in number and they influence the success and failure of the project to varying degrees, with certain factors according to Malcom (2010), being more critical to the level of adoption success than others. However, from the literature it is evident that some of the factors standout as the Critical Success Factors (CSFs) and these factors according to PMBOK (2004) includes: top management support; availability of capacity; stakeholders' involvement; and availability of teamwork policies.

Considering these factors therefore, to investigate the factors influencing the level of adoption of PMIS in disaster management project, the research design was shaped by both qualitative and quantitative orientation and the study applied a case study approach, an exploratory research questions, and inductive procedures while drawing from ethnographic and grounded theory research methods to analyse the experiences of fire stations based on these factors.

1.2 Statement of the Problem

In many countries, including Kenya, technologies play a greater role in disaster management, especially in the long- and short-term problems which may involve choosing on an almost minute-by-minute basis on appropriate resources under control (Phillip, 2014). To ensure efficiency and effectiveness, Project Management Information System (PMIS) has been recommended globally to disaster management departments (Drabek, 2005; Phillip, 2014; Granito, 2014). PMIS adoption in disaster management operations accrue benefits and according to Haddow *et al*. (2007) these includes improved quality of information used in the disaster management planning, control and reporting due to its candid features. Despite the implementation of PMIS in different forms at the national and county disaster management departments in Kenya and in particular, fire stations, studies by various authors showed that these departments have been frequently criticised by clients' and stakeholders for poor project performance (Otieno *et al*. 2010; Standard Newspaper report, 2009, 31 January).

According to Njoroge (2013) the Nairobi County Government fire department in 2013 was to build two new fire stations as its mega project to add to the current two existing. But the annual disaster management report from the fire station indicated that this was abandoned due to poor fire stations management performance (Njoroge, 2015; Otieno *et al*. 2010; Njoki, 2013). The performance of the fire stations is always replete with abandonment of projects; costs and time overruns; poor workmanship; financial deficiencies; poor planning; poor mechanization; and high frequency of litigation (Otieno *et al*. 2010; Njoroge, 2013; Kenya National Assembly, 2009; Njoroge, 2015; Wekesa, 2014). Ministry of Local Governments (2009) in its national fire safety draft policy document outlines the fire stations as the dominant disaster management departments. Otieno *et al*. (2010) therefore notes that PMIS offers great potential in enhancing effectiveness and efficiency and that its level of adoption should be reflected in disaster management activities of the fire station.

Njoki (2013) in her study of adoption of PMIS in construction projects reports that there is a general lack of understanding of the factors that influence the level of adoption of PMIS in not only construction projects but also disaster management response projects. Nairobi Metro 2030 (2010) on its review document titled *a world class African metropolis,* notes that there is a potential benefit in PMIS adoption in disaster management projects and concludes that no attempts have been made to ascertain reasons for the observed levels of adoption and therefore notes of inadequacies in strategies to promote PMIS technology in disaster management projects at the fire stations in Nairobi Metropolis. The status of PMIS adoption suggests that there is a need to carryout internal survey on the adoption of PMIS in fire stations. Therefore, there is need to establish the factors that influence the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

1.3. Objectives of the Study

1.3.1 General Objective

To investigate the factors that influences the levels of PMIS adoption in disaster management projects in fire stations in Nairobi metropolis, Kenya.

1.3.2 Specific Objectives

1. To determine the influence of top management support on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.
2. To examine the influence of capacity availability on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.
3. To analyse the influence of teamwork policy on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.
4. To examine the influence of stakeholders' involvement on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

1.4 Research Questions

1. What is the influence of top management support on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya?
2. What is the influence of capacity availability on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya?
3. What is the influence of teamwork policies on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya?
4. What is the influence of stakeholders' involvement on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya?

1.5 Hypotheses of the Study

The following hypotheses are tested:

1. **H_0**: There is no significant influence of top management support on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

   H_1: There is a significant influence of top of management support on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

2. **H_0**: There is no significant influence of capacity availability on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

   H_1: There is a significant influence of capacity availability on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

3. **H_0**: There is no significant influence of teamwork policies on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

   H_1: There is a significant influence of teamwork policies on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

4. **H_0**: There is no significant influence of stakeholder involvement on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

H_1: There is a significant influence of stakeholder involvement on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

1.6 Significance of the Study

A seamless fire station knowing the levels of PMIS adoption in both its resource allocations and response service is able to reduce the loss of lives and protect properties which in turn will benefit the disaster management sector by turning around the performance levels of the players in the industry (Malcolm, 2010). This study therefore, provides an intuition and a model that should enable fire stations levels of adoptions of PMIS in the application of disaster management projects be more achievable and the extension to the larger disaster management industry employing adoption factors that could enable in increasing the levels of adoption of PMIS with the changing fire station environments (Otieno et al., 2007).

Challenges of public fire stations have increased with the increasing trends in disaster management coupled with the complexities of the same. Thus, these fire stations despite the fact that they contribute to the general well-being in provision of social services, they still lack a theoretically grounded model that explains the levels of PMIS adoption in disaster management projects that eventually leads to a failed or successful project (Ahmad, Kyratsis & Holmes, 2012) which this particular study provides. The Kenyan national and county governments, in the face of many disasters rising steadily in current years, views a strong fire station as an absolute necessity for the nation to participate as a full partner in the worlds fast changing disaster management strategies for the attainment of the Kenya vision 2030. To these governments therefore, this study presents an independent status report on the factors influencing their uptake of technology in disaster projects management and suggests for improvement. To the specific institutions that were surveyed this study helps in informing their future debate, decisions, and strategies in implementing technologies such as PMIS with a special focus on top management support, capacity availability, teamwork policies, and stakeholders' involvement which were the core factors of considerations.

The study provides intuition on how the factors influencing levels of PMIS adoption in disaster management projects can be applied in fire stations to gain higher performance and high levels of uptake. The national and county government on their part could gain in its policy formulation ensuring that policies formulated for technology adoption are geared towards ensuring that the uptake levels are high and that the fire stations contribution to disaster management projects implementation is optimum. The study aimed at making empirical contribution and attempts to bring understanding on the factors that influence the levels of PMIS adoption in disaster management projects in fire stations through top management support, capacity availabilities, teamwork policies, and stakeholders' involvements (DeMarco & Lister, 2013). This study therefore serves as a good ground for further modelling both development and testing in the areas of PMIS adoption, and a basis for further future research in the same or related field.

1.7 Scope of the Study

The study was done covering all public fire stations within Nairobi Metropolis, Kenya. However, only six stations were purposively selected for the study as they had implemented PMIS in some form according to Kenya Fire Brigade Association (KENFIBA, 2014). The study was therefore done in Nairobi, Thika, Kiambu, Kikuyu, Machakos, and Limuru where the study was able to get the relevant officers. This included the station directors, commanders, heads of departments, ambulance attendants, first aiders, and lead firemen. The study was limited to PMIS adoption focusing on top management support; capacity availabilities; teamwork policies; and stakeholders' involvement. The research did not include the influence of PMIS adoption of other sectors of the economy.

1.8 Limitations of the Study

PMIS has been implemented in nearly all fire stations at the national and county government either through simple technologies like Microsoft Excel and Microsoft Access or more complex systems like Node wave PMIS; all these were generalised under the term PMIS. Disaster management projects at the fire station uses PMIS and the factors that influence its adoption within the station are diverse. This study therefore evaluated whether top management, capacity availability, teamwork policies, and stakeholders' involvement influences the level of adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis. Employees at the fire stations located within the Nairobi Metropolis formed the population from which a census was conducted. The employees of the fire station were limited to the directors; the heads of departments; the fire station commanders; the first aiders; the ambulance responders; and the lead firemen.

This research considered top management support (TMS) as a possible factor influencing the level of PMIS adoption and Young and Jordan (2008) in the context of disaster project management, defines TMS as devoting time to the project in proportion to its cost and potential, reviewing plans, following up on results and facilitating the management problems involved with integrating PMIS with the management process of the station. According to PMBOK (2004) availability of capacity in the context of the study only involved establishing the available capacity, whether resources are allocated appropriately, the monitoring and evaluation of current and future demands of PMIS adoption, and finally determining the corrective actions to ensure appropriate capacity is available while at the same time balancing costs against resources available. Availability of teamwork policies on the other hand spanned to include the interdependent components of performance required to effectively coordinate the performance of multiple individuals through individual-level task-work (PMI, 2009). Finally, stakeholders' involvement referred to individuals, groups or organizations that may be affected by the decisions regarding implementation of PMIS in disaster management projects at the fire stations and particularly for the Nairobi Metropolis included the disaster management project sponsors.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides an insight into the theoretical and empirical environment in which the field of disaster management operates and especially in fire stations. Disaster management literature is more episodic and while it gives much insight in certain areas, it is limited in terms of scientific studies, analyses and overall scrutiny to raise the knowledge findings in disaster management to the same level of other social development studies. The overall objective of this inquiry therefore was to understand the factors that influences adoption of PMIS in disaster management through experiences of fire stations in their everyday response to disasters.

To achieve this objective, this study incorporated the complexity of fire stations in disaster management to embrace PMIS technology through obtaining critical and insightful representation of this multi-faced social phenomenon through the experience and eyes of the fire station. To inform this study and position it within a conceptual framework, a critical review of literature was undertaken in the fields where it is anticipated that the findings had the greatest potential in contributing to the relevant discussions. This study therefore was positioned as lying at the intersection of four broad conceptual fields: emergency management; mindfulness, resource-based value, and institutional theories.

This chapter therefore attempts to relate information technology, project management information systems, disaster management and the supporting theories in order to provide theoretical and conceptual frameworks that be source of foundation for factors that influence the level of adoption of PMIS in disaster management industry the world over. The study provides an overview of related literature on the past studies on the area of PMIS and disaster management and identifies the gaps that are inherent in disaster management and the factors that influence the level of adoption of project management information systems.

2.2 Theoretical Framework

Bwisa (2015) defines framework as the logical structure of meaning that guides the development of a study providing the shape and support while theoretical framework as a group of ideas providing guidance to a research project as it interrelates theories involved in the research question. Further Bwisa asserts that the ideas are important in making sense of the evidence and use of such evidence to test, extend or revise existing knowledge or facts. Theory comprises of laws and relationships among concepts and while laws are universal generalizations about facts, the facts on the other hand are observed reality that have been seen, felt, heard or experienced Laplume *et al*. (2008).

Theoretical framework guides the research, determines the variables the research measured and what statistical relationships exists (Charmaz, 2008). Kothari (2004) on the other hand notes that theoretical framework is a collection of interrelated concepts while Drabek (2005) argue that the theoretical framework guides the research in determining what to be measured and what statistical relationship the study looked for. This study therefore reviews relevant theories on top management support, capacity availability, teamwork policies and stakeholders' involvement.

2.2.1 Emergency Management Theory

Formulated by Drabek (2005) emergency management theory provides impetus to the study of factors of adoption of technology such as PMIS in disaster management projects. According to Drabek, the theory of emergency management focuses on the top management support as the core centre of operations in an institution or organization involved in disaster projects like fire stations. Scholars in the field of disaster management contend that emergency management theory well explains the role top management play in the success of a project and further asserts that the success of disaster management projects depend on the top management of the fire station which is essentially outlined by the topology of the fire station (Granito, 2014; Philip, 2014; Drabek, 2005; Raymond & Bergeron, 2008). This topology according to the scholars includes the site-specific disaster project arrangements, the crisis involved, the station's response patterns, and finally the fire stations improvisation in disaster management projects. Emergency management theory, therefore according to Drabek (2005) relates to how people create, interact and cope with hazards, risks, vulnerabilities and management support with relation to implementation.

Further Drabek (2005) notes that in order to support technology adoption in disaster management projects in fire stations, the focus should be on four structural components which are the domains, tasks, resources and the activities of the project. The domains are a function of a well-organized response while the tasks are how the domain is accomplished and the resources are the fire stations capacity availability which includes the resources like PMIS with their modern capabilities, commodities and equipment. Activities on the other hand are the teamwork policies which are interdependent actions of fire station stakeholders in the allocation of the available resources. In order for this relationship to be bridged Njoki (2013) states that PMIS is essential in ensuring success of the disaster management project. This theory in essence provides understandings of the factors that are of great importance when studying the level of adoption of PMIS in disaster management projects in fire stations.

Barney (1991) and Bissell (2005) on the other hand, contend that emergency management theory focuses on the resources and capacity availability at the fire station with respect to disaster management projects. This perspective therefore advocates that fire stations' resources and capacity availability should be consistent with other aspects of the station which can only be managed by a technology-based system like PMIS. This aspect of the theory is further proved by a number of studies such as Philip (2014) studying efficient allocation of fire department resources in California and Granito (2014) studying evolution and planning of public fire protection. Technology based innovation PMIS therefore is a necessary component in the management of disaster projects and specific to every fire station.

The major criticism of this theory as suggested by McEntire (2004) is the shared nature of the subject matters with other disciplines. In essence, this theory over generalises disaster management projects as part of other projects at the fire station. In attempting to focus on four structural components of domain, tasks, resources and the activities in supporting technology adoption, the theory assumes that the relationship between technology adoption and these components is linear and non-problematic. McEntire further contends that part of the weaknesses of this theory is the failure to provide a coherent system that merges the welter of the components in PMIS adoption that also plays a bigger role in disaster management projects at the fire stations. Top management support, capacity availability, teamwork policies and stakeholder involvement associated with these functional components of disaster management projects also plays a bigger role but the theory fails to take this into account. Kapuci and Van Wart (2006) also agrees with the deficiencies in the theory stating that it is limited by the impossibility of modelling all contingent variables considered in adoption of technology like PMIS hence the difficulties in showing how the factors which are the components influences the level of adoption of technology adoption like PMIS. Kapucu (2009) brings to attention that a theoretical model should incorporate the role played by the other varying factors to simultaneously promote a general fit in level of PMIS adoption in disaster management projects and cope with future projects.

2.2.2 Technology Acceptance Model (TAM)

Davis (1989) in an effort to establish availability of capacity in various organizations advanced the theory of technology acceptance model (TAM) and suggests that an individual's perception of a technology adoption affects the level of use of that technology. In this theory therefore according to Davis there are only two factors considered relevant and these are the perceived usefulness and the perceived ease of use as the major factors that contribute to the level of technology adoption. Davis defines perceived usefulness as the prospective user's subjective probability that using a specific application system like PMIS enhances their work during a disaster management project implementation. According to this theory therefore, the perceived ease of use and perceived usefulness are the most important determinant of the level of adoption of a system. However, this theory has been modified by various studies over time to include other variables that directly incorporates perceived ease of use and perceived usefulness (Agarwal and Prasad, 1998; Lim, 2000).

Agarwal and Prasad (1998) for example notes that technology acceptance model (TAM) variables are influenced by external forces. Kapucu (2009) notes that these external forces include top management support, capacity availability, teamwork policies and stakeholder involvement in the technology adoption process. Venkatesh (2007) opined that the determinants of perceived ease of use and perceived usefulness are primarily individual perception. Venkatesh further groups the individual perceptions into three categories as control beliefs; intrinsic motivation; and emotions. Kapucu (2009) notes that the three categories are directly related to fire stations top management support as it defines the perceptions on top management beliefs, their intrinsic motivation and emotions towards technology adoption that further defines the level of the adoption of the same. This fact is supported by Sanchez-Franco and Roldan (2005) who suggests that the relationship between perceived usefulness and top management behavioural intention was strong among goal directed users of the information systems which can be directly compared to PMIS use in disaster management projects.

For fire stations to succeed in its disaster management projects which are usually planned studies in the field argue that it is the factors that are perceived to come to play within the fire station that will ensure whether a project succeeds or not (Malerba, 2004 and Armstrong, 2009). The fire stations, therefore according to Lango (2014), takes considerations on human and technological factors which are mainly geared towards achieving the capacity availability and technological incorporation within the projects. The technological invention like PMIS is incorporated to perform roles relating to administrative, service delivery, inventory management and standardization as performance factors that will increase the likelihood of disaster management project success (Lango, 2014). The underlying factors for consideration by TAM proponents in the level of adoption of technological invention like PMIS lies in considering the perception of the fire station resources and capabilities, disaster management project strategies and sustained disaster management as the end product of the project and finally a technology like PMIS aiding these factors in their considerations (Grant, 2008). This factors as presented in figure 2.1 below summarizes the school of thought as professed by Davis (1989) in analysing the external factors that eventually results to levels of system adoption in any organization.

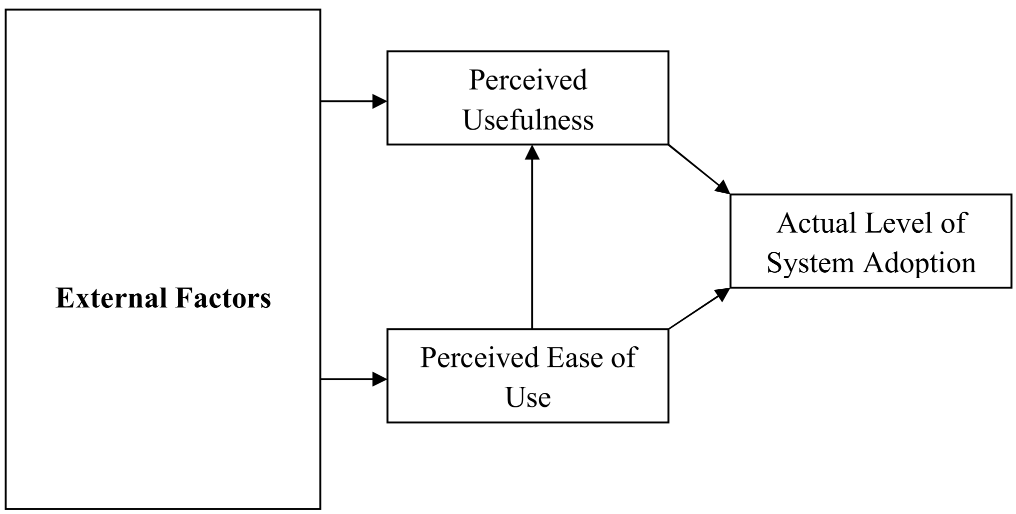


Figure 2.1: Relationship between external variables and level of system adoption.
Source: Davis (1989).

TAM's view in technological adoption enables a fire station to identify the perceived factors of influence by the stakeholders as it improves on the SWOT and stakeholder's analysis by examining a variety of different factors and the resource capabilities that the fire station possesses and thereafter evaluating the degree to which they become a basis for sustainable disaster management project (Perce and Robinson, 2007). IFRC report (2010) notes that a public fire station is an administrative organ of the country governments in most instances and Kenya included. Therefore in order to consider factors influence resources adoption within the fire station, the perception of top management support must be taken into consideration. Purcell (2004) indicates that sustained disaster management project is achieved through employing technological innovations like PMIS in the roles of the fire stations and ensuring that these roles are as lean as possible and distinctive so as to avoid public spit on the performance of the stations. Theoretical view in TAM therefore indicates that there are perceived external factors which directly relates to the perceived ease of use and perceived usefulness and intently influence the level of adoption of technologies like PMIS (Purcell, 2004; Peerce & Robinson, 2007; Philip, 2014).

All said and done on TAM, critics of the theory argue that the theory has limited explanatory and predictive power, trivial and lacks in practical value (Holland & Light, 1999). Furthermore, Benbasat and Barki (2007) argue that the independent attempts by various studies to expand TAM in order to adapt it to the changing disaster management project scenarios and technology in general has led to a state of theoretical chaos and confusion. In general TAM focuses on the individual users of the technology and gauges their support if they are in top management, their team effort based on the team policies, their numbers for capacity availability and their role in stakeholder involvement. The focus on individual user of the technology vis-viz ignoring the social aspects of the organization does not cover the social factor that includes teamwork and stakeholder involvement.

2.2.3 Concerns-Based Adoption Model (CBAM)

In order to review teamwork policy theories, the study reviews two theoretical models which are the Concerns-Based Adoption Model (CBAM) and the Universal Theory of Acceptance and Usage of Technology (UTAUT).

While citing Hall, George, and Rutherford (1979), Bwisa (2015) introduces the Concerns-Based Adoption Model (CBAM) as a model for consideration in level of technology adoption. Bwisa asserts that CBAM approaches the adoption of technology through the eyes of the adoptees who are the fire station personnel themselves and the fire station in general. CBAM has been generally accepted in educational research work as it maintains a participant-based focus that enables in understanding the factors that influences technology adoption and more specifically in relation to individuals' attitudes, perceptions, thoughts and considerations towards using a new innovation system like PMIS (Gershner & Snider, 2001; Lienert, Sherrill, & Myers, 2001; Adams, 2002). CBAM was therefore developed based on various explicit assumptions which are listed by Birnbaum (1988) as: change is a process and not an event; change is accomplished by individuals and organizations cannot change until individuals change within it; change in itself is a personal experience; and finally, change involves developmental growth and is best understood in operational terms. The focus of facilitation therefore according to proponents of this theory should be on the individuals, innovations and the context in which these are applied.

Proponents of CBAM argue that the fire stations individual role expectations in a disaster project management are influenced by both their personal attributes and the context in which they exist thus suggesting that the factors that influence adoption of technology like PMIS will be a function of both the individual and the fire station (Coser, 1975; Oeser & Harary, 1964; Callero, Howard & Piliavin, 1987). The most recognised contribution of CBAM to factors influencing technology adoption is the ability to give directional view on how to avoid measurement errors in factor analysis tools (Gerhart, Minkhoff, & Olsen, 1995). This results to an organization only considering factors that are defined by the organization like fire station as related to technology adoption which in itself may exhibit deficiency errors. A number of individual characteristics one may take at the fire station are limitless and this conceptualises that there are multiple factors at play. Furthermore, CBAM model provides a standard to examine the various factors of concern related to technology adoption through what it calls the *stages of concern (SOC)* (Hall, George & Rutherford, 1979). They suggest that the SOC typically defines the technology adopters concerns in relation to the top management, the policies, the station capabilities and involvement of various stakeholders. A number of literatures reviewed on SOC reveal that the level of technology adoption has been underpinned with the SOC to provide the studies in each case with a relation to the individual perception of the factors of technology adoption.

The strengths of CBAM therefore are in its application of cognitive concerns through the context of its environment. By addressing the concerns of the fire station responders including the commanders from a disaster management project development perspective, CBAM can provide administrators with an idea of how the fire station responders will adapt to change and further provides a framework to anticipate future needs (Hall, 1979). While a few studies examine the role of contextual variables' relationship with the intensity of higher user technology concerns, several studies have considered factors such as prior experience and professional development that are considered to contribute to higher levels of user concerns (Todd, 1993; Adams, 2002; Casey, 2000). While it can be construed that the CBAM model has identified the factors leading to full adoption of technology like PMIS as prior experience and training with the tasks and the impacts, it is limited on the methodology as most of the findings are generalised and are from a smaller sample sizes (Todd, 1993). CBAM is also limited in methodology due to the fact that most research undertaken were carried through convenience sampling (Adams, 2002) and self-selecting sampling as suggested by Casey (2000). Additionally, studies of CBAM model relied primarily on descriptive statistics and correlations to examine the relationship between selected variables on user concerns and not to add that this model is biased towards an educational environment setting.

In conclusion therefore, while CBAM model takes into consideration the technology user concerns, there may be gaps in understanding how certain variables selected individually or collectively influences the adoption of the particular technology and particularly a management information system like PMIS. Limited research exists that evaluates the combination top management, fire station capacities, teams, and stakeholders on their concerns on adoption of PMIS in disaster management projects and taking into consideration the fire station in its entirety.

2.2.4 Universal Theory of Acceptance and Usage of Technology

This theory was developed by Venkatesh *et al.* (2007) and is based on a review of extant literature to provide completely synthesised factors for consideration in technology acceptance. The key contributing constructs in this theory are touted as performance expectancy, effort expectancy, social influence and facilitating conditions. Venkatesh and others notes that these constructs influence the behavioural intentions to use technology. Gupta, Dasgupta and Gupta (2008) notes in their study of adoption of ICT in government organizations in developing countries that the factors that relates to performance expectance are those that provide some degree of benefits to the users in performing certain activities while effort expectancy factors are those that are associated with the degree of ease of use of the technology. Social influence factors relate to the level to which the users of the technology perceive the importance of family and friends believe of their use of the technology while the facilitating conditional factors are those that refer the perception of the fire station users of the resources and the accompanying support availed to perform a behaviour (Venkatesh *et al*. 2007; Hong, Thong & Tam, 2006; Igbaria *et al*., 1997). According to UTAUT model therefore, performance expectancy, effort expectancy and social are theorized to influence behavioural intention to use technology like PMIS. Behavioural intention and the facilitating factors, therefore, determine the level of technology adoption in every sector, disaster management included. These relationships, according to Venkatesh *et al*. (2007) are then moderated by individual variables which includes age, gender, voluntariness, and experience.

Notwithstanding the empirical applicability of the UTAUT model, additional efforts are needed to validate the existing research results (Gillivan-Murphy & Miller, 2011) and especially with specific reference to technology adoption in disaster management. Gillivan-Murphy & Miller argue that UTAUT model considers generic factors in explaining complex organizational technology adoption decisions and further observes that generic adoption models like UTAUT model relies on voluntary adoption decisions by individuals hence may be less suitable in their applications. Peansupap and Walker (2005) suggest that where technology is mandated it is important to consider non-generic factors such as top senior management, capacity, team, and stakeholders. Further successful technology adoption according to Young and Jordan (2008) requires the varied factors at play and more importantly the support of the top management, fire station responders and the stakeholders. Further generic factors are considered by studies of technology adoption as having ability to devote time to the technology in proportion to its costs and potential as well as review plans, monitor results and facilitate the management of problems involved in integrating the technology with the disaster management projects (Njoki, 2013; Young and Jordan, 2008; Venkatesh *et al*., 2007; Gallivan, 2000). Gallivan (2000) adds that generic adoption variables are better placed to influence positive user perception and improves the overall technology adoption.

It must be mooted that the emergency management model has been included as a key predictor in much of fire station behaviour in many research (Malcolm, 2010). Complementing this perspective from motivation theory is intrinsic motivation which according to Young and Jordan (2008) has been regarded as one of the contributing factors to technology adoption. It can also be observed from literature reviewed that from the perspective of effort expectancy in UTAUT model in an organizational setting, employees assess time and effort in forming views about the overall factors or efforts associated with acceptance and use of technologies like PMIS (Venkatesh *et al*., 2003). Studies of UTAUT and related models focus on intentionality as the key factor of theoretical realism that drives behaviour change towards technology adoption (Venkatesh *et al*., 2007; Gupta, Dasgupta and Gupta, 2008; Gallivan-Murphy & Miller, 2011). Several studies in this field including the critics of the theory according to Dodd’s *et al*. (1991) argue that it is necessary to include additional theoretical mechanism that drives behaviour. Further, in using the model, the initial acceptance shows that the context of teamwork as evident in the users of technology is a critical factor in predicting the levels of adoption of any technology within an organization. It is therefore paramount that other theoretical mechanisms like top management, teamwork, fire station capacity and the stakeholders play a lot of significance in factors influencing technology adoption apart from the ones theorised by UTAUT model.

Prior research on technology adoption and levels of adoption have introduced four distinct constructs, which are the basis of this study, to UTAUT namely top management support, organization capacity, teamwork policies, and stakeholder involvement (Njoki, 2013; Young & Jordan, 2008; Dodd's *et al*., 1991; Bagozzi, 2007). Top management support as conceptualised by Young and Jordan in their study titled *top management support: mantra or necessity?* reflects on the fact that top management support should be one of the central focus to the level of technology adoption. Kim, Chan and Gupta (2007) on the other hand suggests that with increasing experience in technology use, behaviour become automatic and is therefore guided more the associated factors that relates to the technology use. Further Kim, Chan and Gupta eludes that studies in psychology have found out that experience in behaviour moderates the effects of behavioural intention in the future hence as a factor of consideration would be greatly affected where the moderation has occurred. Therefore Njoki (2013) and Malcolm (2010) notes that the UTAUT model is a significant consideration in factors of technology but since it is touted from several literatures reviewed it does not capture the full context of PMIS technology in disaster management projects hence the need for consideration for other factors that are in direct relation to disaster management projects context.

2.2.5 Stakeholder Theory

The study utilized the stakeholder theories in order to understand factors of influence on the level of PMIS adoption in disaster management projects in fire stations. The stakeholder theories for consideration include the stakeholder theory and the constructionism and grounded theory.

According to Evan and Freeman (1993) stakeholder theory addresses three interconnected problems relating to PMIS in disaster management projects which include value creation, problem of ethics of capitalism, and the managerial mind-set. Stakeholder theory suggests that PMIS be adopted as a unit of analysis in disaster management projects to include the groups and individuals who can be affected or are affected by it to ensure a better chance of adoption with three problems listed herein (Evan & Freeman, 1993; Evan, 1984, Clarkson, 1998). From the stakeholder theory perspective, Clarkson (1998) notes that a disaster management project can be understood as a set of relationships among groups that have a stake in the phases that makeup the project. It is thus how they interact to jointly create value. To understand PMIS adoption level in disaster management project therefore, it is paramount to know how these relationships work and change over time (Evan & Freeman, 1984; Bailur, 2007). Bailur (2007) further asserts that it is the fire station that must manage and shape these relationships to create as much value as possible for stakeholders and to manage the distribution of that value.

PMIS adoption in disaster management can results in interest conflicts and the fire station management must find a way to rethink the adoption process so that the needs of the broad group of stakeholders are addressed (Njoki, 2013) and to the level this is done more value will be created for each of the involved stakeholders. Although effective management of stakeholder relationships helps projects get through their logical conclusion and successes, it is also a moral endeavour because it concerns questions of values, choice and potential harms and benefits to groups and individuals (Evan and Freeman, 1993). Bailur (2007) further notes that a management that focuses its attention on the creation, maintenance and alignment of stakeholder relationships better equips the capacity to create value and avoid moral failures. Further secondary stakeholders have no formal claim on the station projects and the station management has no special duties pertaining to them, nevertheless, the firm may have regular moral duties to achieve different purposes and what makes one a stakeholder one fire station may vary (Freeman, 1984).

2.2.6 Constructionism and Grounded Theory

Proponents of construction theory argue that it addresses the factors of technology adoption related to what people in an organization like fire station perceive to be the factors and how these factors are brought about (Gubrium & Holstein, 1997). In their methodological treatise, *the new language of qualitative methods,* Gubrium &

Holstein proposes that the naturalistic qualitative studies in construction theory could address factors of technology adoption relating to the why questions by considering a set of contingent relations between what brings these factors and how they are brought about in the social life of the fire station. But according to Charmaz (2008), the construction theory does not address the why of the factors identified and indicates that most qualitative research applying this theory has not addressed the same. In the same breath and in contrast, literature reviewed in grounded theory illustrates that it has a long history of gauging the factors of technology adoption identifying them to define the what construct; relates how they come about to define the how construct; and finally define why the factors are the ones that are significant to define the why construct (Corbin & strauss, 1990; Glaser & Strauss, 1967; Strauss & Corbin, 1994; Charmaz, 2008; Henwood & Pidgeon, 2003). Critics grounded theory however argue that in as much as it looks into the why questions and the what and how questions, it assumes that an organization where the technology adoption is being studying is not complex (Strauss and Corbin, 1994). It is for this reason that Charmaz (2008) proposes the social constructionist approach to grounded theory.

According to Charmaz (2008) therefore, social construction and grounded theory approach allows in addressing why the variables top management, capacity availability, teamwork policies and stakeholder involvement factors were selected and at the same time it enables the preserving of complexity of social life within the fire stations of study in its implementation of disaster management projects. Henwood and Pidgeon (2003) while studying grounded theory in psychological research notes that it is not only a method for understanding research participants' social constructs but also is a method that studies construct throughout the inquiry. Therefore, Charmaz (2008) notes that the social constructionist and grounded theory model takes into consideration multiple actors contributing multiple factors of technology adoption and their environmental realities. This perspective therefore considers factors influencing technology adoption as the central point of the study and applies the identified multiple factors that includes top management, station capacity, teamwork policies, and the stakeholder management. In addition, Burr (1995) and Leeds-Hurwitz (2009) argue that the constructionist maintains that there is no objective truth and that the truth results from social interaction with multiple realities of the external environmental. Therefore, the factors contributing to technology adoption are not discovered, but are constructed from the experience of the fire station social setting with the users of the technology with reference to the various contributing factors mentioned (Leeds-Hurwitz, 2009). Taking into consideration the factors of technology adoption in a disaster management projects as articulated by studies in the area (Malcolm, 2010; Njoki, 2013; Drabek, 2005), social construction and grounded theory provided an opportunity for the studies to engage a set of interpretative activities which aim at understanding the meanings that the participants to the study attach to the factors when making sense of level of PMIS technology adoption. This therefore allows studies to explore raw data in its natural form hence allows for emergence of ideas and explanations in relation to factors contributing to PMIS adoption in disaster management project in fire stations.

Critics of social construction and grounded theory argue that it brings with it the constructionist sensitivity to factors of technology adoption that may lead to changes generating new perception in relation to the adoption process (Gergen, 1978; McNamee, 1994). In addition, they suggest that this model alternative has ethical implications in that it looks at the social factors grounded on some theory moving away from expertise-based, rational, hierarchical, and result-focused models to edging towards more participatory, co-creativity, and process-cantered factors of technology adoption.

2.3 Conceptual Framework

Conceptual framework is an intermediate theory in a diagram form that attempts to connect variables under study. According to Patricia and Rangarian (2013) in their play book for research methods, conceptual framework is a map that gives coherence to empirical enquiry and a representation of relationships of the various factors (independent variables) that influences the level of PMIS adoption (dependent variables) in disaster management projects in fire stations in Nairobi

Metropolis. Figure 2.2 below therefore portrays the conceptualized framework that operationalizes the study.

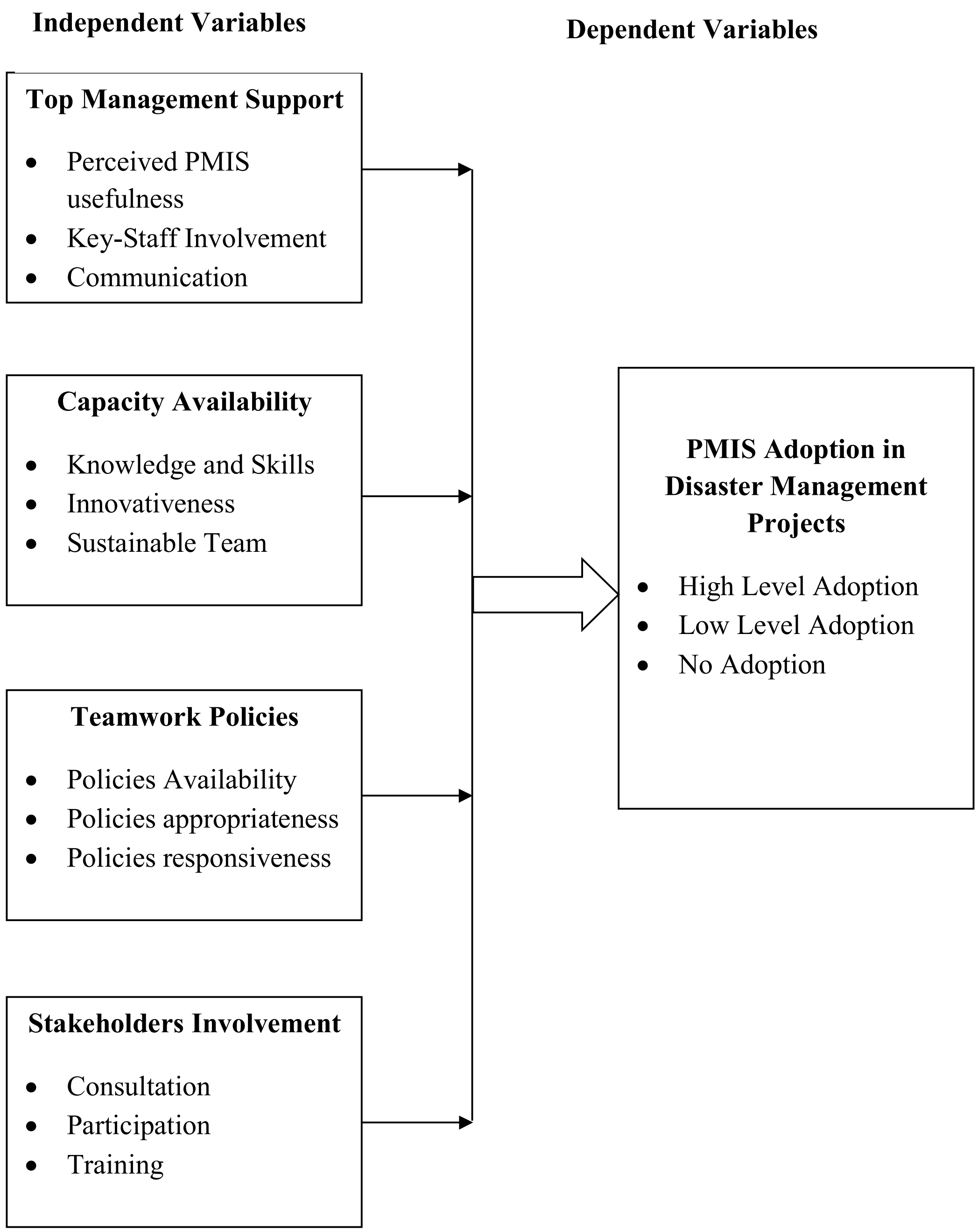


Figure 2.2: Conceptual Framework on Factors of Influence and Levels of PMIS Adoption

(Adapted from Charmaz, 2008; Gubrium & Holstein, 1997; Henwood & Pidgeon, 2003)

The conceptual framework of this study was based on top management support, capacity availability, teamwork policies and stakeholder's involvement. This was the study's interpretations of how the variable relate. The figure implies that there exist an influence and relationship between the independent variables and the dependent variable.

2.4 Review of Related Theoretical Literature

This section reviews related theoretical literature on the adoption of PMIS in disaster management projects and gives a review on studies on the factors of PMIS adoption considering top management, capacity availability, teamwork policies, and stakeholder involvement.

2.4.1 Adoption of PMIS in Disaster Management Projects

According to Bernard and Goodyear (2014) adoption of technology like PMIS in organizational activities and projects create procedure and constitute the building of knowledge and skills throughout the project's life cycle hence the need to determine the critical factors of influence. PMIS is a relatively new paradigm in management of disaster related projects and applications in fire station activities and hinged mainly on the need to create resilience on the understanding that the most critical of the resources are allocated to the immediate needs. Malcom (2010) described the adoption of PMIS in emergency management organizations in terms of transformation from the emergency station itself since it is responsible for coordinating other factors of technology adoption to enhance the levels of adoption.

By engaging PMIS, the public fire stations in developing countries like Kenya, according to Njoki (2013) intend to put in place important building blocks for efficient and effective disaster management project with the aim of delivering information. Malcolm (2010) notes that PMIS has changed over time from the simplistic application in scheduling to complex information systems that cover a wide range of disaster processes while at the same time addresses the multitude of stakeholders. This is also viewed as a tool that enable fire station in achieving their project goals and objectives while in the same process considers the need to optimise the project constrains of time, budget, quality and scope as well as allocating and integrating the inputs needed to meet the pre-determined objectives of the station while mitigating recurring risks.

Raymond *et al*. (2008) notes that PMIS is a system that comprehensively supports the entire lifecycle of a project which includes the project activities, design, implementation and execution and reporting and Malcolm (2010) indicates that such systems can fire station management in their planning, organizing, control, reporting and decision-making tasks while evaluating and performing reporting at the same time. PMIS therefore to the fire station is considered advantageous as it is an enabler to timely decisions and the success of the project (Soderland, 2004; Chatora, 2005). The big question therefore is the level of PMIS adoption in disaster management projects in fire stations. Raymond and Bergeron (2008) while studying PMIS impact on project managers and their success notes that the success of projects including disaster management projects depend on time and budget and at the same time meet the specifications while managing the project risks. Furthermore, while large amount of fire station resources is usually dedicated to selecting and designing projects to respond to, it is of great importance that the stations' projects be managed adequately if they are to achieve their performance objectives.

To strengthen the assertions of Raymond and Bergeron (2008), Otieno *et al*. (2010) while quoting Gartner Research estimates that 75% of disaster management projects managed with the support of PMIS based technology will succeed, while 75% of the same projects without support will fail. Using PMIS at the fire stations therefore to ensure disaster management project success has become some sort of necessity. Njoki (2013) observes that PMIS software has been development for various projects in various sectors of the economy and especially targeting the developing countries like Kenya where projects failures are estimated at 65% of the total number of projects responded to by fire stations nationally (Gairson, 2013). Most fire stations in developing countries have applied technology based PMIS in their operations majorly to support activities in planning, organization, control, reporting and decision-making tasks during a disaster management project target (Raymond and Bergeron, 2008). The level of PMIS adoption in disaster management projects as presented in Figure 2 below is mainly characterised by the need to achieve the project goals and implementation of disaster management strategies (Gairson, 2013).

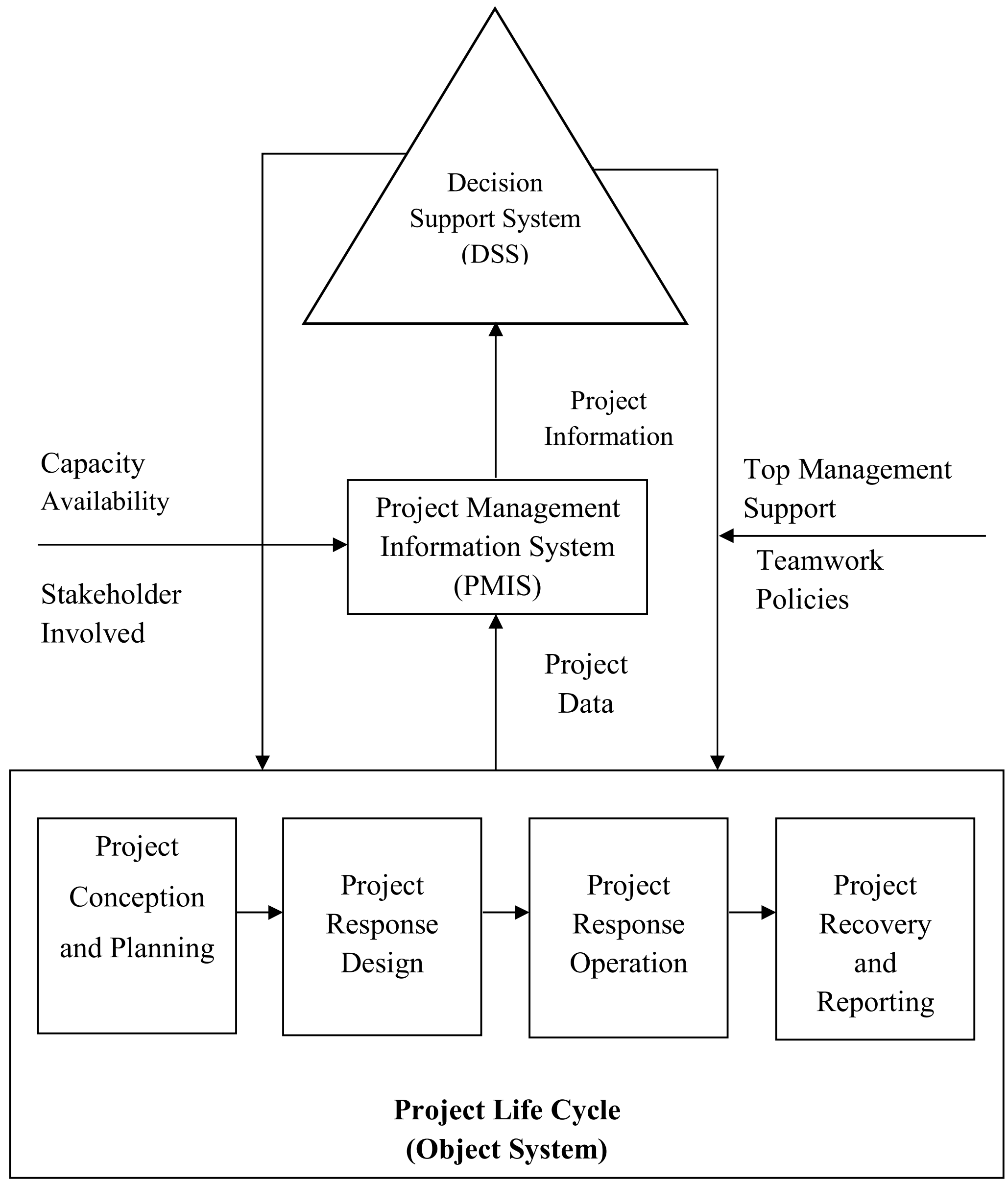


Figure 2.3: PMIS within Disaster Management Project Lifecycle
(Adapted from Raymond & Bergeron, 2008)

While PMIS is increasingly being used by disaster managers in managing emergencies, the factors that are considered in the level to which technology adopted remains the big impact. Several studies (Malcom, 2010; Otieno *et al*., 2010; Eriksson & Westerberg, 2011; Njoki, 2013) all agree that the factors that influences adoption of PMIS must include stakeholder involvement, top management support, teamwork policies and capacity availability. Fire stations aim at responding to disasters at the most opportune time and as they pursue their objectives of free safety service delivery, they seek to ensure that quality is maintained to satisfy the members of the public to which project outcome are intended. But Otieno *et al*. (2010) notes that this is not always the case and this has propelled the project implementing agencies in disaster management in public sectors to seriously outline the factors that influence the adoption of technology-based innovation like PMIS in disaster management projects and this particular study therefore reviews the theories behind PMIS level of adoption.

2.4.2 Factors of PMIS Adoption

This section reviews various literatures on the factors of PMIS adoption with relevance to top management support, capacity availabilities, teamwork policies and finally the stakeholder involvement.

2.4.2.1 Top Management Support

Technology adoption is a result of a decision by top management to accept a given innovation and Feder, Just and Zilberman (1985) citing work done by Roger (1962) define technology adoption and level of adoption as the top management mental process of accepting the technology from the first hearing about it to the final utilization. From this definition it is then believed that the top management interest in technology adoption and adoption falls into two categories: rate of adoption, and the intensity of adoption. Feder, Just and Zilberman define rate of adoption as the relative speed with which fire stations adoption PMIS innovation and taking into consideration the element of time. On the other hand, intensity of adoption refers the level of use of PMIS technology in any given time.

Top management, according to Young and Jordan (2008), can influence the implementation and use of new technologies like PMIS by devoting their time to the technology in proportion to its costs and the potential, additionally reviewing plans, monitoring results and facilitating the management of problems that are arising during the integration of the technology to the disaster management project life cycle. Feder and Slade (1984) cited by Njoki (2013) notes that the top management support encourages technology usage, better performance, positive user perception influence, and improvement in the overall technology adoption. Top management team in any fire station therefore determines the technological implementation success or failure. Furthermore, Dong *et al*. (2009) argue that effective top management support is one of the strongest enablers of PMIS implementation in fire stations as it is view as a clear commitment and allocation of sufficient resources to the PMIS and involvement in managing change that comes with the technology adoption. The UTAUT model which has been touted as the model for technology adoption does not specifically measure top management support in its constructs. Neufield *et al*. (2007) additionally points out that the top management support as a factor in technology adoption has not been sufficiently integrated into existing user adoption theories and neither does it have literature that is specific to top management behaviours that are associated with the success in technology implementation.

Other authors have also concluded in their findings that perceived usefulness of technology has a bearing on the level of its adoption. Lewis, Agarwal & Sambamurthy (2003) examined the simultaneous effects of influences that emanated from the individual, institutional and social context in which they interacted with information technology. Their findings suggested that beliefs about technology usefulness can be influenced by top management commitment to the new technology and the individual factors of personal innovativeness and self-efficacy further stating that social influences from multiple sources did not exhibit any significant effects. Davis, Bagozzi and Warshaw (1989) in their longitudinal study of 107 technology users concluded that perceived usefulness of technology by the top management had the possibility of guiding managerial interventions aimed at ensuring there is full adoption of technology.

A comparative study in construction industries in Nigerian however indicated that the successful completion of these projects was dependent on technological changes in project management which includes the adoption of PMIS noting that a low adoption leads to lower number of projects completed (Karodia, Cowden & Magaba, 2014). A benchmarking framework by Ahuja, Yang and Shankar (2010) revealed also that ICT including PMIS adoption by small and medium fire stations must take into consideration understanding of processes, project success indicators and measures in order to achieve high turnover in completed projects. Similarly, Barki and Huff (2005) concludes that the success in the number of disaster management projects completed relies heavily on the level and level of adoption of the technology in the project itself and indicates that the higher the level of adoption, the higher the number of projects completed as enabled by the technology.

Other authors are however of the opinion that the greatest role in adoption of technology like PMIS is in top management communication in support of the technology itself. Pan and Jang (2008) in their study of 99 firms in Taiwan's communication industry developed the technology-organization-environment (TOE) framework and concluded that communication leaning towards top management support of the technology being adopted were found to be of great importance. For a technology to succeed in its adoption, the top management must have a system of communicating directly with the fire stations involved and Premkumar and Roberts (2009) while analysis data collected from 78 organizations concluded that top management communication on technology adoption is vital and the form of communication used by managers includes telephone, e-mail, and meetings. Oliveira and Martins (2011) on the other hand view technology as a universally accepted essential tool in enhancing competitiveness of the fire station and notes that a consensus must be created on the type of communication to be made by the top management in support of the technology being adopted. Further they note that the type of communication chosen by the top management is to enable in the diffusion of the PMIS in disaster project management at the fire station level.

2.4.2.2 Capacity Availability

According to Majharul (2012) studies in technology adoption contend that capacity availability in any organization is the most important determinant of adoption and is driven by their social environment. Majharul opined that social influence is the level to which members of a social group influence one another's behaviour in adoption. According to this perspective therefore, employees may adopt an innovation not because of its usefulness but because of perceived social pressure. Neufield *et al*. (2007) notes that capacity availability may be due to pressure perceived to be coming from individuals whose beliefs and opinions are important and this may include peers and people who are in the social networks. There are conflicting opinions in capacity availability with regards to whether men use innovation more than women thereby influencing levels of technology adoption and studies by Quazi and Talukder (2011) points to the direction that demographic factors affect individual's adoption of technological innovation. Quazi and Talukder further notes that it is important to examine the adoption of technology innovations through capacity availability of employees because if there is no acceptance among employees, the desired benefits cannot be realised and the fire station may eventually abandon the innovation. Fire station employees like any other employees will resist change brought about by technologies like PMIS and this as a result may lead to compromising capacity availability for the station. While advances in hardware and software capabilities has been noted by Caniels *et al*. (2011) to continue at extraordinary pace, if the fire stations' capacity availability is limited the problem of underutilized systems remains.

Sargent *et al*. (2012) argues that capacity availability for an organization like fire station on technology adoption will depend on the individual staff dispositional inclination to resist change and predict reactions to specify the particular change. In this sense therefore, capacity availability for a fire station technology adoption and adoption is very important factor because resistance by the employees would mean there is no capacity (Venkatesh *et al*., 2003). UTAUT model proponents (Venkatesh *et al*., 2007) argue that capacity availability for any station would be dependent on theory surrounding inclination of why some employees are more to technology adoption than others. The theory related to resistance to change uses broad range of measures to assess the fire stations individual employees to assess their level acceptance to a technology being adopted and with finality gives the level of capacity availability in relevance to the specific technology being adopted and, in this case, the PMIS at the fire station (Sargent *et al*., 2012). But Oreg *et al*. (2009) has a different opinion and opines that capacity availability is based on the fire stations' employees four personality-based aspects which includes routine seeking, emotional reaction to change, short-term focus and cognitive rigidity. Oreg *et al*. notes that capacity for technology adoption can be available due to the fact that employees are routine seekers who enjoy and seek out stable and lasting routines at the fire station. Emotional reactors to change are how the individuals respond to imposed changes while an employ who has short term focus focuses on short-term hassles. Cognitive rigidity refers to individual's tendency to maintain one's view. The combinations of the four dimensions capture a variety of elements that predispose individuals to resist and avoid change thereby contributing to capacity availability (Oreg *et al*., 2009).

Sahin and Thompson (2007) notes that technology is an integral part daily life of an organization and in order for technology like PMIS to be adopted successfully there must be significant knowledge and skills and fire stations should be aided to learn these skills from instructional courseware, online sources, and collegial interaction. In conclusion Sahin and Thompson findings state that knowledge and skills play an integral role in technology adoption. These assertions are further supported by an empirical study of E-commerce adoption in Thailand on small and medium enterprises which found out that entrepreneurs with knowledge and skills in information technology were able to adopt the technology faster than those without hence categorised them into adopters, prospectors, and laggards (Lertwongsatien & Wongpinunwatana, 2003). Similarly, Bassellier and Benbasat (2004) notes that technology adoption like PMIS in disaster management project should focus on areas that are information technology related and opines that the knowledge and skills should comprise of organization-specific knowledge, the interpersonal, and management knowledge. Bassellier and Benbasat further concludes that the core of technology adoption and success lies in the integration of knowledge and skills related to the technology itself. Therefore, to ensure success of PMIS adoption in disaster management projects in fire stations, PMIS knowledge is integral.

Blayse and Manley (2004) on the other hand identified the main factors driving innovative adoption of technology that includes the adoption of PMIS in disaster management projects and concludes that the PMIS clients and developers, the structure of development, relationship between individuals within the station and external parties, the technology procurement systems and the nature of quality of the fire station resources will define how innovative a station is in the adoption of technology like PMIS. Further they conclude that for effective technology adoption there must be pre-requisite knowledge in the technology being adopted by the personnel and in this case the fire station personnel. Straub (2009) while contributing to Roger's innovation diffusion theory and focusing specifically on adoption theory outside of a formal organization and its implications, notes that individuals construct unique yet malleable perceptions of technology that influences their adoption decisions. Further the pre-requisite knowledge in the same can propel the individual interest in ensuring their full adoption. This is also supported by Lewis, Agarwal and Sambamurthy (2003) who opined that beliefs about technology use can be influenced by top management commitment to the new technology and an individual factor which includes personal innovativeness and self-efficacy to ensure the adoption levels is a success.

Sustainability of technology has also been considered as a major factor in ensuring success in adoption levels and Dewick and Miozzo (2004) opines that adoption of sustainable technologies is fundamentally dependent on the participation of the stakeholders involved in the implementation process and integration of the team roles with the technology. Also, that it is important to militate against the achievement of policy aims to promote the use of sustainable technology within fire stations. This is further supported by Choudhary, Thakur, and Suri (2013) who studied the adoption of integrated nutrient management (INM) technology in the irrigated ecosystem of Balh valley India and concluded that effective adoption of INM technology must have dedicated personnel and that users are empowered to make autonomous reporting from the system. In Zimbabwe Mazvimavi *et al.* (2008) concluded that it was difficult to measure technology adoption levels via spontaneous adoption of the technology over time and this instead be done by looking at the sustainability of the technology over a period. In addition, Mazvimavi *et al.* concludes that the sustainability of a system like PMIS system in disaster management projects should be pegged on a mentorship programmed within the organization in order to ascertain continuity and full adoption.

Wennekers *et al.* (2005) hypothesizes a U-shaped relationship between a country's rate of entrepreneurial dynamics and its level of economic development and regresses global entrepreneurship data for nascent entrepreneurs in 36 countries using an index for innovative capacity as one of the measurements. This finding found support for a U – Shaped relationship and the regression results indicated that innovative capacity of the entrepreneurs influenced 63.0% of technology adoption by the nascent entrepreneurs. This is further supported by Riddel and Schwer (2003) who used the endogenous growth model to identify the factors that influence technology adoption in the US. Their findings concluded that the stock of human capital and the number of high-tech employees influenced 35.0% influenced technology adoption. del Carmen Haro-Domínguez *et al.* (2007) summarizes these by concluding that capacity availability to a large level influences the absorptive capacity of technology positively both external and internal acquisition types of technologies. Rothaermel and Alexandre (2009) in their study involving technology capacity availability and firm performance generated at *t* –statistic of greater value than zero which indicated there was a significant relationship. However, the findings of Pokharel (2005) gave a statistical test of -4.5 ($P<0.05$) indicating that there was a significance difference between capacity availability and the adoption of technology.

2.4.2.3 Teamwork Policies

Studies in technology adoption agree that there is a correlation between technology adoption and development team size and posit that large teams tend to adhere to more structural policies and procedures while smaller ones tend to be more relaxed about applying policies and procedures therefore teamwork policies have a direct impact on technology or methodology of adoption (Sargent *et al*., 2012; Oreg *et al*., 2009; Quazi & Talukder, 2011). This assertion is further supported by Kerr and Newell (2001) in their study of policy-induced technology adoption where they found out that organization like fire stations both public and private will gradually adopt technology as its costs fall and increased policy regulation and stringency increases. Therefore, firms with lower benefits or higher costs will adopt technology more slowly while those with low costs related to policy implementation will adopt faster. Kerr and Newell also argue that organizations with low cost policies induced adoption usually have greater incentives for cost-saving technology adoption within a trading regime while the relatively high cost policy-induced technology adoption will have decreased adoption incentives under the permit system.

It can then be understood that policies within the fire station can be considered as a major factor in PMIS adoption in disaster projects management as the national and county government tradable permit system provides incentives for more efficient adoption in line with the policies set as it can lower adoption incentives for some fire stations with high compliance costs. Talukder (2011) notes that this flexibility does not exist for the various fire stations under the non-tradable performance standards and teamwork policies is defined within the context of each and every fire station. Therefore, a fire station face individually binding adoption and teamwork policies must play a greater role in ensuring that regardless of cost, technology adoption process is within the agreeable policies frameworks within the station.

Studies by various authors have shown that fire stations are divided into various teams for effective operation and implementation of projects; and these teams includes the fire response, the first aid team, the emergency medical technicians, interns, station managers, and the technical support group (Malcolm, 2010; Caniels *et al*., 2011; Philip, 2014; Raymond & Bergeron, 2008; Drabek, 2004). According to Sargent *et al*. (2011) quoting the Harvard centre for green buildings and cities, these teams must be aligned as per policies relating to the fire station laws, regulation and enforcement mechanisms for them to be able to adopt technology and drive its diffusion among its members. Similarly, behaviourally information relating to teamwork policies such as choice of the technology, default rules, norms, simplification, and information are critical to shaping technology adoption and diffusion among the team members in a fire station (Kerr & Newell, 2001).

Mark and Poltrock (2004) on the other hand propose a different view on teamwork policies and technology adoption. They propose that technology adoption in an organization, fire station included, should consider the organization as consisting of various teams that comprises of different social worlds with different working spheres. These social worlds within the organization according to Mark and Poltrock, can either be collocated groups or distributed teams and the fire station teams can belong to multiple social worlds at the station. Tripathi (2011) concurs with these assertions and confirms that technology diffuses as individuals introduce it into their social worlds thus the teamwork policies that defines the boundary of work practice influences the adoption of technology as opposed to approaches that use an organization, a physically collocated work unit, or individual as the locus of impact. The teamwork policies should have common properties cutting across the boundary of adoption, therefore Mark and Poltrok (2004) are of the opinion that rather viewing technology adoption on a single adoption unit of policies, it should be viewed as occurring due to multiple teamwork policies in multiple social worlds with different working spheres.

Using social world theory, Fitzpatric, Kaplan, and Masfield (1996), explained how people tend to structure the interfaces of a prototype virtual work environment system. According to them teamwork policies within a fire station are usually influenced by its individual members, the collective group, the work environment, and the task to which technology is required. Further they note that teamwork policies are influenced by the individual members through their experiences, values and knowledge within the station; hence individuals' members who are technology savvy would help their colleagues develop more trust in policies directed at technology adoption and are more positively persuaded in the implementation of the technology. However, it must be noted that the studies in the areas of teamwork policies and technology adoption have only concentrated on a single tier system of relation but a close view indicates that it is not only teamwork or policies that influences technology adoption.

Similarly, Kerr and Newell (2003) suggests that economic instruments which includes policy availability in organizations such as fire stations can provide a more efficient technology adoption incentives than regulatory standards. As such the authors conclude that the organization policies should be readily available to support adoption of technology. This is further asserted by Del Aguila-Obra and Padilla-Melendez (2006) who in their exploration of the factors that affect implementation of internet technology adoption, concluded that managerial policy availabilities is important in the level of adoption of technologies within organization like fire stations. However, Jain and McLean (2003) notes that the fire stations may have teams but these teams are not dedicated specifically to PMIS use in disaster management projects. Further various authors confirm that policies may be made available in fire stations (Mathew, 2005; Chan *et al.,* 2004). Mathew (2005) but concludes that policies on PMIS use is dependent on three factors which includes disaster preparedness, emergency relief and the management of disasters hence the use of modern information technology systems like PMIS in disaster management projects is paramount. Stephens and Ruth (2005) observes that even though the forest fire policy of US federal agencies have evolved over a period of time from small patrols to diverse policy initiatives and institutional arrangements, given the current challenges the existing policies are warranted and shows non-commitment by the authorities concerned. A voice that is also echoed by Herawati and Santoso (2011) who concludes their review of fire nature, policy and institutions in Indonesia by stating that the current fire management practices by Indonesian authorities were susceptible to more fires. Further Lindell, Prater and Perry (2006) agrees that fire station policies should be ones that are responsive and appropriate for technology absorption and supports the continuous use of the same technology within the station in its current structure and even when the organizational structure is reviewed.

Oh, Ahn and Kim (2003) with a regression analysis results of 0.404 on the perceived technology teamwork policies and the level of adoption confirms that in the adoption of broadband technologies it is an important contributing factor. Further the authors conclude that it is important to expand the teamwork policies to ensure compatibility base of broadband internet in order to facilitate their adoption level. Similarly, He, Cao, and Li (2007) confirms the influence of teamwork policies with a regression coefficient of 0.345. A study by Richardson (2009) on diffusion of technology adoption in Cambodia revealed in its ANOVA results that seven out of eight teamwork policy characteristics impacted on the level of adoption of technology like PMIS. This was further confirmed by Lee and Brown (2008) and Lu and Hsu (2007) whose ANOVA results indicated that teamwork policies related to platform competition, broadband speed, information and communication technology, and content contribute to global broadband technology adoption. Further concluding that teamwork policies perceptions on the potential user and adopters is significantly important for any form of technology including PMIS to be adopted.

2.4.2.4 Stakeholder Involvement

From the proponents of stakeholder theory, Laplume, Karan, and Reginald (2008) notes that to balance stakeholder interest within and out of the fire station, vital resources like PMIS technology must be distributed among those with claims on the station through a process known in stakeholder literature as balancing stakeholder interests. Studies in this field argue that the fire station have relationships with many constituent groups and that it can engender and maintain the support of these groups by considering and balancing their relevant interests during technology adoption and more so in disaster management projects which are considered volatile (Evan and Freeman, 1993; Clarkson, 1998; Jones and Wicks, 1999; Mansell, 2013). Miles (2011) defines balancing stakeholder interests as a process of assessing, weighing and addressing the competing claims of those who have a stake in the organization like fire station and notes that the desire to balance stakeholder interests as the driving force behind stakeholder strategies. When technology adoption like PMIS is involved, the factors considered in the balancing process may be cognitive at the individual level or administrative at the organization level but they must be factors that directly or indirectly influence the level of adoption of technology like PMIS (Mansell, 2013).

Contrary to stakeholder literature in strategic management, most references to stakeholder involvement in technology adoption refer primarily to individuals or groups within the fire stations (Pouloudi, 1999, as cited by Zhang, Dawes and Sarkis, 2005). Early studies in stakeholder involvement contribution to information technology like PMIS argue that the involvement of technology project beneficiary who are usually the end-users of PMIS is very important towards the successful adoption of a management information system (Mumford, 1979; Zhang, Dawes and Sarkis, 2005; Chung, Chen and Reid, 2009). Mishra and Mishra (2013) citing Pouloudi (1999) notes that there is confusion in information systems research about the notion of stakeholders and the factors they contribute to the adoption of technology in an organization. Checkland (1981) and Checkland and Scholes (1990) for instance provides a soft system methodology as basis for factors to consider during technology adoption and lists the factor elements as CATWOE elements to include customers, actors, transformation process, world view, owner and finally environmental constrains. Mishra and Mishra (2013) notes that this approach has the advantage that it can be used to provide holistic factors to consider in information systems like PMIS level of adoption. Benjamin and Levinson (1993) on the other hand proposes a 7-step stakeholder analysis to come up with the factors that will enable adoption of information systems like PMIS and concentrates on the feasibility of adoption and how the information system modifies the organization strategy for better results.

Rowley (2010) while studying the area of E-government opined that successful implementation of technology requires considerations that engages all stakeholders and as a preliminary factor to that engagement there must be a shared understanding on the interests, perspectives, value dimensions, and benefits sought from e-government by the various stakeholders. Rowley further proposed topological factors that includes stakeholder roles, benefits and embedded these in the stakeholder benefits analysis tools (SBAT). This is a clear indication that factors to be considered in any technology adoption must consider the stakeholders of the disaster management project and by extension the fire station as the implementing agency of the project. The factors must present the holistic way to integrate the most critical tasks of PMIS and employ case-based reasoning (CBR) technique that are applied in formulating strategies for the implementation of the PMIS and at the same time support stakeholder's management strategy model that determines the levels of PMIS adoption at the fire stations (Lim, Ahn & Lee, 2005). Stakeholder involvement therefore provides the benefit of determining which factors are key in a project and how they can be managed. Analysis of these factors can be undertaken using categorization that is very subjective as it matters to define which factors are primary and which are secondary (Bailur, 2007). In addition, the factors contributing to technology adoption changes over time and this may be as results of changes in stakeholders who are involved in the project and Freeman (1984) explained this through what he termed as *snail darter fallacy.*

Since stakeholders are usually more broadly and emotionally involved during technology adoption and level of adoption, Smith and Hasnas (1999) cited by Mishra and Mishra (2013) suggests that the fire station managers should balance the factors of interests without violating the rights of any stakeholders but maintaining the high levels of adoption of PMIS in disaster management projects. These factors must be made in full consideration to the fact of the various stakeholder groups which Chua *et al.* (2005) argues that includes four groups and outlines them to include investors, suppliers, regulators and the indirect stakeholders who directly and indirectly contribute to factors influencing PMIS adoption in disaster management projects in fire stations. Therefore, it was interesting to study the factors contributing to the level of PMIS adoption in different fire stations. From the literature review, stakeholder involvement proposes the consideration of stakeholder concept as a major factor in technology adoption in organizations and mentions the factors as needs and interests of the organization and its stakeholders. However, the literature review reveals that much of the analysis on stakeholder involvement applications to level of technology adoption are related to E-government, E-commerce, and information systems domains that do not include PMIS.

In Characterizing eParticipation, Sanford and Rose (2007) note that stakeholder consultation in public projects like disaster management projects should be instrumental to include all stakeholders in order to encourage adoption of technology. Further the authors note that most stakeholders are usually not involved in technology adoption yet are required to use the same technology in its operational stages. This is also confirmed by Ahmad, Kyratsis and Holmes (2012) who asserts that most organizations like fire stations involve stakeholders at the initial phase but minimally ignoring the range of innovations considered, technologies selected, and successful implementation of technology is fully dependent on stakeholder involvement. Pinkse and Dommisse (2009) while building on a case study of four Dutch building contractors opines that contractors that regularly consult its stakeholders besides the external stakeholders is bound to succeed in technology adoption but at the same time notes that most contractors do not consult their stakeholders hence the slow pace of adoption of technology being witnessed at the construction industry.

In an attempt to determine the influence of stakeholder training Sarkis, Gonzalez-Torre and Adenso-Diaz (2010) investigated the relationship between stakeholder training and adoption of environmental technology practices and posit that the level of adoption of technology is directly dependent on the level of training of the station members in the same. This fact is also supported by Rogers (2000) initial study which examined the barriers to technology adoption and confirmed that training plays a very important role in clarifying internal and external obstacles and server as a pre-service to the use and successful infusion of new insights to the adoption of the new technology. Further it has been noted by Poon *et al.* (2006) that despite the growing interest in technology adoption taking health information technology as a sample to improve safety and quality; there adoption remains limited due to limited stakeholder training. While analyzing stakeholder involvement as an institutional and non-institutional influencing factor of information and communication technology adoption, Zorn, Flanagin and Shoham (2011) concludes that stakeholder involvement influences the adoption of technology with a regression coefficient of 0.57. This assertion is further supported by Karki and Bauer (2004, October) who with a regression coefficient of 0.422 confirmed that stakeholder involvement has a direct influence on the adoption of technology in an organization. Further ANOVA results by Choudrie and Dwivedi (2006) suggests that the stakeholder involvement offers a significant contribution to the adoption of technology including in disaster management projects in fire stations, a finding that is also acclaimed by Bajwa *et al.* (2005) who concluded that at significance levels of 1% stakeholders influenced the process.

2.5 Empirical Review of Literature

This is a review of past studies work by means of direct observation or experiment to answer a question or hypothesis (Njoki, 2010). Empirical review enables studies to put forward different perspectives and views of constructionist and positivist for comparison or argument (Mugenda & Mugenda, 2003). Globally, PMBOK (2008) notes that disaster and crises are by nature accompanied by uncertainty and the list of reconstruction priorities may be longer than one person can handle. Further, leadership and ability to adopt new solutions are essential to managing projects of these types and more soundly the practicing of established principles of project management in order to achieve successful outcome. It is for this reason that the Project Management Institute (PMI) developed the Project Management Information System (PMIS) aimed at proactive and reactive disaster management projects (PMBOK, 2008). PMBOK which is a global authority in projects management notes that PMIS, worldwide, has created a new paradigm shift in managing disaster management projects in fire stations as it constitutes the building of strategies to aid in decision making towards projects and operations within the station. PMIS adoption in disaster management project therefore, according to Armstrong (2008) should be a shared approach which ensures that there are joint strategies, shared outcomes and shared targets in disaster management projects and it should be implemented at all levels and phases of the project.

Njoki (2013) in her study of role played by PMIS in construction projects notes that in Africa PMIS play an important building blocks for efficient and effective project management and over time have changed considerably from the known scheduling applications to complex information systems to cover a wide range of project processes while at the same time addressing the multitude of stakeholders in massive development projects currently concentrated in Africa. In the same breath, Caniels *et al*. (2011) notes that PMIS have become more comprehensive system that support the entire life cycle of projects, their programs and their portfolios. Raymond and Bergeron (2008) on the other hand notes that PMIS in any organization when implemented comprehensively can support fire station managers in their projects planning, organization, control, reporting and decision-making tasks while evaluating and reporting at the same time. Caniels *et al*. (2011) asserts that modern fire stations that have fully adopted information technology have a separate Management Information System (MIS) department which are involved in maintaining records, performing transactions, report generations and consolidation of the important project details which are then supplied to the various levels of disaster management project life cycle. PMIS therefore interact with internal and external environment to provide corrective mechanisms within projects so that information change needs are taken into consideration (Njoki, 2013). Further Raymond and Bergeron (2008) adds that successful adoption of PMIS will have an impact within the fire station in terms of top management supporting the PMIS needs, satisfied workers, existence of favourable policies to build teamwork and stakeholder support. Njoki (2013) on the other hand notes that the factor that facilitates successful adoption of PMIS includes the PMIS software or system, information generated and finally the use of the generated information.

Lee *et al*. (2011, cited in Njoki, 2013) seems to think differently on the forces of level of PMIS adoption. Lee *et al*. argue that the level of PMIS adoption in any organization activities such as disaster management project will depend on the

PMIS's quality of information generated, its ability to provide the station with appropriate levels of details in relation to the project needs, the ease with which the information generated can be used and finally, the ease with which this information can be shared within the project team members. The level to which PMIS is adopted therefore depends on how the features are incorporated to ensure that it is about improving effectiveness and efficiency in managerial tasks of the fire station which majorly includes planning, scheduling, monitoring and controlling, as well as taking into consideration the timeliness of the information for decision making.

There is need for a theoretical link on the adoption of PMIS and the level of adoption of PMIS in disaster management project. According to Lee *et al*. (2011) level of technology like PMIS adoption is usually enhanced by the social factors that support the practices of the fire station that support each other and have a mutually reinforcing effect on the level of adoption. There is a symbiotic relationship between level of PMIS adoption and the factors of technology adoption in the construction industry (Njoki, 2013). However, this relationship cannot be generalised conclusively to the disaster management industry due to fragility of disaster projects.

Caniels *et al*. (2011) even further suggest that PMIS adoption in disaster management projects must take into consideration the requirement for risks management tools which includes risk impact assessment, risk classification and risk ranking. This is to ensure that the PMIS have high quality since they support and ameliorate better decisions making (Njoki, 2013). Lee *et al.* (2011) notes that for a system to be considered full integrated into the system, its qualities of consideration should include convenience, simplicity, accuracy, reliability, speed, availability, stability, compatibility and accessibility of the PMIS. Njoki (2013) further add that a PMIS should be one that is flexible for it to be able to meet the varying responsibilities in different phases of the disaster management projects which in essence vary from one project to the other. Lee *et al*. (2011) concludes that the level of PMIS adoption determines the quality of disaster management projects themselves and further insisting that the most critical factors that determine the level of adoption are the level of accuracy and timeliness of the information generated by PMIS.

2.6 Critique of Existing Literature Relevant to the Study

While it is paramount that many studies have been done on the factors influencing the level of adoption of PMIS on projects, most of them have been done in the construction projects which make it impossible to generalize in disaster management projects, for example, a study by Kim and Joo (2009) found a positive relationship when considering two dimensions in the factors influencing PMIS adoption in the construction management as system configuration (which included in-house developed, ERP/ASP, groupware, professional software) and construction project functions (which included design, estimating, costs, time) for firms in South Korea. This clearly may have minimal relationship with disaster management projects due to the nature of these projects which have volatile tasks involved in both. And at the same time as indicated by Njoki (2013), there are national differences on what constitute technology like PMIS adoption success, therefore what may be success factors in South Korea may not be so in Kenya.

It is also difficult to demonstrate the link between factors of technology adoption and the level of adoption in disaster management projects. It is difficult to accept that the UTAUT model reflects reality because what works well in one organization is not necessarily certain that it will work well in another. The factors considered may not fit the top management support, capacity availability, teamwork policies or stakeholders' involvement. What count as a factor of importance should consider the levels of PMIS adoption while considering the environment under the adoption process and factors to be considered to determine the level of the process (Gergen, 1978; McNamee, 1994). Njoki (2013) studied the factors influencing adoption of PMIS in projects and narrowed it down to construction projects in Nairobi Kenya which is the capital but did not look at other projects in other fields like disaster management which would have formed a bigger picture.

Davis (1989) and Draker (2004) noted that the key factor that influences level of technology adoption is the perception of success by the individual actors and this is a narrow conclusion since there are a number of factors which influence the level of technology adoption and perception in itself cannot be the only candid factor. A study by Raymond and Bergeron (2008) on PMIS empirical study of their impact on project managers and project success, only narrowed down to a model composed of five constructs namely: PMIS quality; PMIS information output; PMIS use; PMIS individual impacts; and PMIS impact on project success. These constructs focused on the PMIS contributing factors at the expense of organizational contributing factors as success of a project when based on technology adoption according to Caniels *et al*. (2011) is a two-way traffic considering both sides of the divide. Adopting this model as a best practice to technology adoption may just be one of the several factors that influence PMIS adoption in disaster management projects. Furthermore, it may only be financially endowed fire stations who can adopt this model constructs thus reversing the perceived direction of causation.

Bagozzi (2007) research suggests that technology adoption factors are only considered based on the knowledge of the recipients. This is however a gap on the various studies which support a positive influence of knowledge levels on technology adoption as Kim *et al.* (2007) noted that literacy level and career development were not significantly related to technology adoption. This conclusion however according to Benard and Goodyear (2014) may not hold in many instances since technology literacy levels defined in capacity availability is a key factor of influence as literacy in technology will aid in faster adoption process and define the level of the adoption depending on the level of skills on the technology being adopted.

These criticisms therefore suggest that it is not sufficient to focus on one particular factor and completely ignore the influence of others in the level of adoption of PMIS. Again, this is not to say that models like UTAUT and TAM are not important, but it should be noted that the principal factors may vary in importance depending on the environment technology adoption and importance of the factor over time (Chung, Chen & Reid, 2009). On the other hand, the models reviewed in the literature are useful if they are used as tools for guidance rather than prescriptive and definite techniques. It should be pointed out that each of the models attempts to predict appropriate factors to consider during technology adoption from analysis of organization environments based on their strategies of implementation of various projects (Harper *et al*., 1990). At the arctic extremes, these analogies may apply quiet well. But this should pose the question as to why organization with varied projects in varied fields should apply the same models and methodologies. Further Hong, Thong and Tam (2006) notes that this kind of analysis should encourage information technology practitioners in the disaster management field to think carefully about the factors that influence technology adoption and how the level of adoption contributes to the goals of that organization and in particular fire stations as the disaster management projects agents.

2.7 Research Gaps

The reviewed literature revealed mixed results of the factors influencing level of PMIS adoption in disaster management projects in fire stations which makes it difficult to make conclusion on the real indicators of level of technology adoption especially in disaster management projects. Secondly, the studies were mainly done in developed countries where the setup may not be the same as those in the developing countries and Kenya in particular. In Kenya, studies on factors of technology adoption have not focused on the level of adoption. Njoki (2013) carried out a study on the role of PMIS towards the success of projects focusing on construction projects in Nairobi Kenya. She concluded that most construction projects in Kenya do not have standard or generic factors to consider in the adoption of technologies like PMIS. She found out that technologies must not only provide reliable and accurate information to a project team, the quality of the information generated by the adopted system must be above board. This study only considered two of the information technology characteristics which included quality of software and information output.

It can also be noted that majority of the work on technology adoption adopts the TAM and UTAUT model perspectives which emphasizes a set of constructs to be tested as generic factors influencing technologies like PMIS and their adoption in organizations like fire stations. However, research studies on technology adoption based on social construction and grounded theory seems to ignore these generic constructs and provides for studies to test their variables in an environment defined by a proposed model within the context of a particular field like disaster management. Therefore, central to this study is the application of a model based on the social construction and grounded theory to define the factors that influence technology adoption in disaster management projects.

There is also a need to question the veracity of the link between factors influencing PMIS adoption and the level of this adoption within the context of disaster management projects in fire stations. Analysis of data relating to the question of a link between the factors influencing technology adoption and disaster management project success reveals that there is uncertainty as to the direction of the link. Kim and Joo (2009) in their study confirm this link but fails to show the candid causal relationship between PMIS adoption and project success. Raymond and Bergeron (2008) on the other hand have noted that while some studies have been able to show an association between PMIS adoption, stakeholder involvement, policies and top management support, they have not clearly explained when, why and how this association existed and does not identify the inter-connections. The gaps identified were summarised in the table 2.1.

Table 2.1: Summary of Study Gaps

Variable	Study	County	Conclusion	Gap
Top Management Support	Young and Jordan (2008) Dong *et al.* (2009	USA	Effective top management support is one of the strongest enablers of PMIS	Top management support has not been sufficiently integrated into existing user

Variable	Study	County	Conclusion	Gap
	Neufield *et al*. (2007)		implementation in fire stations as it is viewed as a clear commitment and allocation of sufficient resources	adoption theories and little literature specific to its success in technology uptake. The UTAUT model relied on by the authors does not specifically measure top management support in its constructs.
	Njoki (2013) Davis, Bagozzi and Warshaw (1989)	Kenya USA	Top management support encourages technology usage, better performance, positive user perception influence, and improvement in overall technology.	Conclusions were drawn from construction projects management view assuming that all projects are construction related.
Capacity Availability	Majharul (2012) Neufield *et al*. (2007)	Australia USA	Capacity availability is an important determinant of technology adoption and is driven by social	Technology can be adopted not because of its perceived usefulness but because of perceived social pressure.

Variable	Study	County	Conclusion	Gap
			environment.	
	Caniels *et al*. (2011)	USA	Advances in technology continuing at an extra-ordinary pace enables highly complex capacity availability.	Focuses on the users of the technology devoid of other stakeholders involved.
	Sargent *et al*. (2012)	Australia	Capacity availability for a station depends on the theory surrounding inclination by the employees	It assumes personality traits such as routine seeking, emotional reaction, short-term focus, and cognitive rigidly as given by Oreg et al (2012).
Teamwork Policies	Quazi and Talukder (2011)	Australia	Teamwork policies have direct impact on technology and methodology of adoption.	Policy induced technology adoption advocated increases the cost of adoption and does not provide flexibility.
	Tripathi (2011)	India	Technology adoption wholly depended on organization teams and policies defining their use	Individuals at the fire stations belong to multiple social worlds and not only the organization-based. Technology

Variable	Study	County	Conclusion	Gap
			of the technology within the organization.	diffuses when individuals introduces it into their social worlds thus teamwork policies as professed by the author ignored this aspect.
Stakeholders Involvement	Quazi and Talukder (2011)	Australia	Balancing Stakeholders interest drives the uptake of technology.	Policy induced technology adoption advocated increases the cost of adoption and does not provide flexibility.
	Tripathi (2011)	India	Technology adoption wholly depended on organization teams and policies defining their use of the technology within the organization.	Individuals at the fire stations belong to multiple social worlds and not only the organization-based. Technology diffuses when individuals introduces it into their social worlds thus teamwork policies as professed by the author ignored this aspect.

The summary above are drawn from the study discussions relevant to the area of study and specifically to the factors influencing the levels of PMIS adoption in disaster management projects in fire stations in Nairobi metropolis, Kenya.

2.8 Summary

This chapter reviewed the relevant literature and the considerable discussion and deconstruction of PMIS adoption and adoption, various factors influencing this adoption and the links between the two constructs. The study examined the way in which various factors can influence adoption of PMIS and may be used to provide a coherent comprehensive bundle of consideration during technology adoption and adoption. This led to suggestions that there is a way in which the factors should be considered to have a positive adoption of PMIS in disaster management projects in fire stations. The review examined how the factors should be aligned the disaster management project life cycle. The generic factors provided by various models including TAM and UTAUT are the ones considered by many organizations more so in the construction project management when considering PMIS technology adoption and adoption. It was also noted that these generic factors can be easily considered as a standard process in implementation process of PMIS but non-generic models which considers the environment in which the technology is adopted should be taken into consideration to define the level of adoption.

Top management support is deemed as a strategic factor in linking PMIS adoption and the level of adoption in disaster management projects. Many of the studies that considered top management support were of the opinion that the factor must manifest itself in the manner in which the top management of the fire station is involved, the finances released, the personnel assigned to the technology and the number of other technologies given green-light for adoption within the station. It is in this sense that the literature is non-conclusive on the generic factors by the theories of TAM, management, stakeholders and UTAUT thereby the social construction and grounded theory suggesting that the environment be considered in the adoption and adoption of any technology. Conclusively, the contribution of factors of adoption and adoption of PMIS may make on the level of technology adoption is closely linked to the business environment including the macro and micro contexts, thus the bundling of these factors within the practices of the fire stations in disaster management projects.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents a systematic description of the methodology that was used to conduct the research. It comprises on sections on research design, population, census, instruments, data collection procedure, pilot test, data processing and measurement variables.

3.2 Research Design

According to Kothari (2004), a research design is a framework that guides the collection and analysis of the data and is a detailed plan for how research study is conducted according to data required and in the order of research questions investigations in an economical manner. The study applied mixed method research combining both the qualitative and quantitative research designs, measures and techniques. Creswell (2005) describes the research approach as involving philosophical assumptions, the use of qualitative and quantitative approaches, and the mixing of both approaches in a study. The mixed approach allows the collection of both qualitative and quantitative data in the same study and allows the study to determine the level to which one approach is used over the other and dependently high on study purpose (Creswell, 2005). Kothari (2004) notes that this approach also includes triangulation, development, initiation and expansion thus allowed the study to match design strategies with the relation to their goals in attempting to understand specific phenomenon.

According to Bwisa (2015b) in his guide to research methods and while elaborating on the common methods and types of social science research, notes that qualitative research is primarily an exploratory research and enables the research gain an understanding of the underlying opinions, reasons, and motivations while providing insight into the problem for potential qualitative research. Further that quantitative research on the other hand, is formal, objective; systematic processes in which the numerical data are used to obtain information about the world and enables the study to examine the relationships among variables.

The benefit of the approach selected by the study was that the study contained information from data that is merged hence the results produced helped in understanding better the factors that influence level of level of PMIS adoption in disaster management projects. However, Creswell (2005) notes that the fact that the study may determine the priority to one or other form of quantitative or qualitative research may lead to bias. The mixed method research should not be considered inherently valid but instead its trustworthiness and credibility must be assured through the application of rules and procedures and attention to quality criteria.

Kothari (2004) notes that ethical concern in research deal with voluntary participation, no harm to respondents, anonymity and confidentiality, identifying purpose and sponsor, and analysing and reporting. In order to eliminate or control any ethical concerns, the study made sure that the participation to the process is completely voluntary but this was also projected to lead to a low response rate which leads to response bias (Creswell, 2003). To encourage high response, the study met with all the respondents personally before the commencement of the research. The research ensured confidentiality and individual permission was sort from the individual fire stations and the respondents informed of the consent and the purpose of the research study.

3.3 Target Population

According to Berg (2001), target population is the larger population to which the study ultimately would like to generalize the results of the study. Nairobi vision 2030 metropolitan report (2008) lists constituents to include Nairobi, Kiambu, Muranga, Machakos and Kajiado counties. In order to realise its seventh key result area (KRA) of a safe and secure region, the report identifies fourteen sub county fire stations within the listed counties as area of focus. These stations are listed as: Nairobi; Kiambu; Olkejuado; Thika; Machakos; Ruiru; Limuru; Masaku; Kikuyu; Githunguri; Kiambaa; Kajiado; Mavoko; and Kang'undo. Out of the fourteen listed only six fire stations located in Nairobi and Kiambu counties have embraced PMIS technology in various forms according the reviewed report 2010 (Nairobi vision 2030 report review, 2010). These six stations are listed as: Nairobi; Thika; Machakos; Limuru; Kikuyu; and Kiambu. Thus, these six fire stations have been proposed to qualify as the target fire stations for the study.

The six fire stations identified above allowed the study to define the target respondents of the study. The study identified six categories of the target respondents, namely, directors, fire station commander, head of departments, ambulance attendants, first aiders, and lead firemen. In addition, there were 119 Nairobi county fire station personnel, 27 for Machakos county and 88 for Kiambu county and hence the total target population was 234 comprising of 3 directors, 8 fire station commanders, 22 heads of departments, 26 ambulance attendants, 28 first aiders, and 147 lead firemen. The target population were then stratified as shown in Table 3.1.

Table 3.1: Target Population

No.	Strata	Nairobi	Thika	Kiambu	Machakos	Limuru	Kikuyu	Total
1	Directors	1	1	-	1	-	-	3
2	Fire Station Commander	3	1	1	1	1	1	8
3	Head of Departments	9	3	2	2	2	4	22
4	Ambulance Attendants	12	3	2	4	3	2	26
5	First Aiders	20	2	1	3	1	1	28
6	Lead Firemen	74	27	12	16	14	4	147
	TOTAL	**119**	**37**	**18**	**27**	**21**	**12**	**234**

Source: Kenya Fire Brigade Association (KENFIBA, 2015)

3.4 Census Study

The actual respondents for the research were made up of 234 fire station personnel from the fire stations in Nairobi Metropolis, Kenya that comprised the target population. Since the population is small, a census method was applied to consider all the respondents in the survey. This was therefore a census survey encompassing all the directors, station commanders, heads of departments, ambulance attendants, first aiders, and lead firemen. Pilot census was conducted at Kericho County Fire Station which is under the Kisumu Metropolis, Kenya.

3.5 Data Collection Instruments

The study used the questionnaire and interview guide as the main instruments.

3.5.1 Instruments

Quantitative data was collected from the fire stations through administering a questionnaire while qualitative data was collected through application of interview guide and use of observation guide to compliment the qualitative data. The questionnaire was applied to collect primary data. Creswell (2005) indicates that the questionnaire as an instrument has the advantage of reaching out to large numbers of respondents within a short time; is able to give the respondents adequate time to respond to the items; offers a sense of security in terms of confidentiality to the respondents; and finally notes that it is an objective method since there is no bias resulting from the personal characteristics as in an interview.

The questionnaire has been divided into five sections as follows: the first section collected information on personal and the specific station details; the second section established the influence of top management support on the level of level of adoption of PMIS; third section determined the influence of capacity availability and level of level of adoption of PMIS; fourth section found out the teamwork policies influence and level of level of adoption of PMIS; and finally the fifth section of questionnaire addressed the opinion of the respondents on the influence of stakeholders' involvement and the level of level of PMIS adoption. The questionnaire has incorporated the McClosky and Mueller satisfaction scale to measure the satisfaction levels of the respondents on the various variables with respect to level of level of adoption of PMIS.

The research conducted interviews using the interview guide (appendix 2) in order to try and achieve an in-depth personal information in order to generate a favourable quality on a personal response basis to enable the study to probe deeper on the factors of study. According to Mugenda and Mugenda (2003) interviews provides an opportunity for eliciting information and to observe both the subject and the total situation to which respondent is responding. Secondary data was collected through the evaluation of publications, reports, organizational journals and review of information from the websites of various fire stations and county governments in as far as they provide relevant and up-to-date information.

The study also reviewed secondary data from contents of historical documents which included newspapers, commentaries, speeches, Hansards from the Kenyan parliament. Interviews were used to explain certain phenomena such as the influence of top management and stakeholder's involvement on the levels of PMIS adoption in disaster management projects in fire stations.

3.5.2 Measurement of Variables

The measurement of the variables of the study was based on the singular philosophy of logical positivism as professed by Creswell (2003) that it does not concerns matters of facts but rather the choice between the many frameworks hence the logical analysis by logical positivism as a major instrument in resolving philosophical problem which is an axiomatic system which acquires an empirical interpretation. Considering these therefore, suitable statements which establish a correlation between real objectives and the processes and the abstract concepts of the theory were developed as psychometric measures. The psychometric measures for this particular study were the variables on levels of PMIS adoption and top management support, capacity availability, teamwork policies, and the stakeholder's involvement.

Levels of PMIS Adoption

The study focuses on factors that when in place will determine the levels of PMIS adoption measurable by the degree to which PMIS is adopted in three distinct levels of high, low and no adoption. In order to avoid the omission and commission of sensitive PMIS adoption information, a more indirect approach was applied. Levels of PMIS adoption was therefore measured by objective measures whereby adoption levels of high, low and no adoption were measured as the degree to which PMIS is adopted within the fire stations. A five-point Likert scale (with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Disagree) was used for each of the two-statement corresponding the items assessing the levels of PMIS adoption. The mean score was calculated as the average items assessed on fire stations perceived levels of PMIS adoption and therefore the higher the score the better the levels of PMIS adoption.

Independent Variables: Top Management Support, Capacity Availabilities, Teamwork Policies, Stakeholders Involvement

In order to assess the dimensions of top management support (with sub-variables as perceived PMIS usefulness, key staff involvement, and communication), capacity availabilities (with sub-variables as knowledge and skills, innovativeness, and sustainable team), teamwork policies (with sub-variables as policy availabilities, policy appropriateness, policies responsiveness), and stakeholders involvement (with sub-variables as consultations, participation, and training, a measurement variable comprising of a 12-item scale was used (Appendix 1) and was developed from arguments from Malcolm (2010) and modified by Njoki (2013) for construction projects management study. The mean score for top management support was therefore calculated to determine the levels of influence on PMIS adoption. This mean score was the average of the 12-items with a higher score indicating higher levels of PMIS adoption.

The study measured the level of PMIS adoption by objective and subjective measures. Studies have adopted various approaches to the measurement of technology adoption. This study adopted the use of Likert scale approach which appeared to be the commonest to the measurement of level of adoption of PMIS (Ifejika *et al*. 2008; Hill & Linehan, 2011; Sezgin *et al*. 2011). According to Agbamu (2006) there are five procedures through which this measurement can be undertaken and this includes: (1) obtaining adoption index on the factors of adoption through the use of sigma scoring method; (2) Calculating the percentages of the factorial adopters; (3) Assigning numerical values to each factor of adoption; (4) Use of Likert scale to measure perception of the factors contribution to level of adoption; and (5) mean scoring for disaggregated levels of adoption focusing on the factors. This research therefore chose to measure the level of PMIS adoption by applying option four which involves the use of Likert scales. This process involved asking the fire station personnel to respond to a set of questions on a 1 – 5 Likert scale that ranges from strongly-disagree, disagree, indifferent, agree to strongly-agree respectively and with reference to the factors of technology adoption on the PMIS model they have adopted. The level of PMIS adoption was the numerical values of the responses on the factors of influence. The relationship between the factors of technology adoption and the level of PMIS adoption was tested by multiple regressions and an r^2 value determined to show whether the level of influence of top management support, capacity availability, teamwork policies and stakeholder involvement could be used to predict the level of technology adoption at the fire station. This was done by measuring the level of adoption by using logistical regression since this research was not able to measure level of PMIS adoption at interval level.

Table 3.2: Operationalization of the Study Variables

Type of Variable	Variable Name	Operationalizing Indicators of Variables
Dependent Variable	Levels of PMIS Adoption	• Perceptive influence level of PMIS adoption (Measured as either High Level, Low Level or No PMIS Adoption)
Independent Variables		
Factors of Influence	Top Management Support	• Degree of key staff involvement in PMIS adoption. • Degree of perceived usefulness of PMIS use in disaster management projects. • Level of ease with which communication from and to top management flows on the use of PMIS technology.
	Capacity Availabilities	• Highest levels of education on technology-based disaster management projects. • Levels of innovativeness in application of PMIS based technology. • Degree to which the fire station is able to source and maintain experts on PMIS technology
	Teamwork Policies	• Level of policy availability on PMIS adoption. • Level of policy appropriateness for PMIS adoption at the fire station. • Degree of policy responsiveness in PMIS adoption.
	Stakeholders	• Perceived degree of consultation with

Type of Variable	Variable Name	Operationalizing Indicators of Variables
	Involvement	stakeholders on new PMIS adoption. • Level of participation of stakeholders in PMIS adoption at the fire station. • Level of involvement of stakeholders in understanding the PMIS adoption process.

3.6 Pilot Study

A dry run of the main census was conducted at the Kericho County Fire Station which according to Kenya Vision 2030 strategic plan and IIEBC (2010) policy paper lies in Kisumu Metropolis, Kenya, has total respondents of 41 which is more than the 10% recommended for pilot study (Creswell, 2003) and exhibits the same characteristics as the stations under study. This dry run enabled the study to pre-test all the research instruments. The research assistants for the census were familiarised with the research tools during this census study. Data obtained from the pilot study was then used to moderate the final research instruments.

3.7 Data Collection

The study applied for a research permit from the National Council for Science, Technology and Innovation (NACOSTI) to conduct the research in Kenya. The individual fire stations were contacted with an introduction letter requesting for permission to collect data and a questionnaire was dropped at the respective county secretary's desks as is the requirement with county governments. The county secretary in whose docket the fire stations fall was briefed on the purpose of the study. The fire station commanders were sought and recruited to introduce the researcher and the research assistants to the other staff members as they are well known and familiar with their respective stations. Three research assistants were recruited and trained to assist in data collection. The number of questionnaires that was utilised for this study was 234 as this was a census study. The questionnaires were then self-administered by three research assistants recruited and trained for this particular purpose. Once the questionnaires were dropped, the respondents were given two weeks to fill them after which the research assistants went back for them.

Interviews were conducted at the fire stations and details notes taken during the interviews. The informant of the interviews were the fire station commanders and one informant were interviewed per day to make it easier to transcribe the information immediately before moving to the next station to ensure accuracy and completeness of notes taken. The observation guide was applied concurrently and especially during the interview sessions where the station commander was requested to take the researcher on a tour of the station and especially the completed and on-going projects to observe reflect on their life-cycle and approach levels that incorporates PMIS.

3.8 Data Processing and Data Analysis

Data analysis involves getting the feel for the data, testing the goodness of the data and finally testing the hypothesis developed for the research with the main aim being making sense out of text and image data (Creswell, 2003). Data processing therefore involves preparing data for analysis, moving deeper into understanding it, presenting it and making interpretation for a larger meaning. Creswell further notes that data analysis first involved coding the responses, tabulating the data, and performing several statistical computations which relates mostly to averages, frequencies, percentages, and regression coefficients.

For the specific objective one on top management support, the study collected both qualitative and quantitative data. For the qualitative data, thematic areas were identified and the responses placed into particular themes, each of which were coded as standalone variables. From these descriptive statistics was generated and thereby creating a platform for linkage with literature and hence some inference. The study also asked for the number of disaster management response projects that the stations were able to handle before the implementation of the form of PMIS in place and the number thereafter. Such data was analysed using the t-test to evaluate existence of any significant impact(s) of PMIS. Finally, the study constructed a Likert scale for the sub-variables that ensued from this specific objective and for this data was analysed using the ordinal regression model.

On capacity availability the study collected both qualitative and quantitative data and thematic areas were identified for specific themes which were coded as single variables. And in order to create a linkage and generate inference, each of the themes were used to generate descriptive statistics. For this particular objective, the study asked for the number of trainings related to PMIS in the last three years and whether the station organized familiarization training on PMIS use on disaster management projects. The data was also analysed using the *t*-test to evaluate the existence of any significant impact(s) on PMIS. The study also constructed a Likert scale on the sub-variables of capacity availability of which data generated were analysed using the ordinal regression model as appropriate. The thematic areas for teamwork policies and stakeholder involvement was also identified from the collected qualitative and quantitative data and coded as single variables. From these a linkage was created and inferences generated to formulate the descriptive statistics for the third and fourth objective respectively.

3.8.1 Qualitative Data Analysis

In order to achieve the qualitative objective, the attitudinal index used was drawn from the attitudinal analysis adopted from Jaffe and Pastemark attitudinal model of 1994 where the scales items needed both intentional and non-intentional support. This model is designed such that it automatically eliminates the index of any opinion which does belong to its neutral sequence. This approach had also been operationalised in the work of Mwaura, Gathenya and Kihoro (2015). The psychometric scores were calculated and these were then attached to the different alternatives that specified the levels that characterised the opinion of the fire station respondents to the questions. The study used a scale ranging from 1 to 5 whereby 1 was assumed to the worst-case scenario by the fire personnel and a scale of 5 indicating best case scenario as presented in table 3.3.

Table 3.3: Operationalization of Attitudinal Psychometric Scores

Scale 1	Scale 2	Scale 3	Scale 4	Scale 5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree
Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree
Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree
Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree

The index was calculated by looking at the scales 4 and 5 and 1 and 2 while the scale rating 3 was ignored in index calculation.

3.8.2 Test for Reliability for the Observed Values

According to Njoki (2013) reliability refers to the consistency of measurements in that it is the degree to which the instruments gives similar results over a number of repeated trials. Njoki further notes that in social science research, reliability is frequently assessed using the test – retest reliability method and that reliability is increased by including as many similar items on a measure, by testing a diverse sample of individuals and by using uniform testing procedures.

Validity is the degree to which the results obtained from the analysis of the data actually represent the phenomenon under study (Mugenda & Mugenda, 2003). Kothari (2004) on the other hand, defines validity as the degree by which the sample of test items represents the content the test is designed to measure. Content validity was employed by this study as a measure of the degree to which data collected using the stated instrument represents a specific domain or content of the study. As suggested by Mugenda and Mugenda (2003), this study ensured content validity by using professionals and experts in the fields of projects management and in particular, review the research instruments with the professors and lecturers in the department of entrepreneurship, technology, leadership and management (ETLM) and especially with the supervisors. Content validity was evaluated through the actual administration of the pilot group.

Cronbach's coefficient alpha was used to check for internal consistency in responses from the Linkert scale and evaluate the reliability of the measures. The test gave an overall alpha of 0.78 which was above the recommended above 0.70 (Cronbach, 1951) hence the data considered to be credible for analysis.

3.8.3 Statistical Measurement Models

According to Kothari (2004) and Creswell (2003), multiple regression analysis attempts to determine whether a group of variables when combined together can predict a given dependent variable and in essence attempt to increase the accuracy of the estimate. The general multiple regression models for this study was:

$$\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon}$$

Where: $\mathbf{Y}$ = is the dependent variable adoption of PMIS

$\boldsymbol{\beta_0}$ is the constant

$\boldsymbol{\beta}$ is the coefficient of $\mathbf{X_i}$ for i = 1, 2, 3, 4

$\mathbf{X_1}$ is the top management support

$\mathbf{X_2}$ is the Capacity Availability

$\mathbf{X_3}$ is the teamwork policies

$\mathbf{X_4}$ is the Stakeholder involvement

$\boldsymbol{\beta_1, \beta_2, \beta_3, \beta_4}$ are the regression coefficients

$\boldsymbol{\varepsilon}$ is the error term brought about by the environment.

3.8.4 Test of Hypotheses

The research questions that were modelled in this study had the hypothesis developed. To test these hypotheses, the analysis of variance (ANOVA) and the F-test was generated. The F-test that constituted the test of hypothesis was based on the statistical significance of R2 which is an indicator of goodness of fit of the full model (the factors influencing the levels of PMIS adoption). This was only considered where the statistical significance was $p<0.05$.

3.8.5 Correlation Analysis

In order to obtain the linear relationships between the various independent variables and the dependent variables of levels of PMIS adoption, Spearman's rho correlation was used. This choice was made over the Pearson's product moment correlation because it correlates ranks between two ordered variables, and the fact that Spearman's rho correlation is used when data has too many abnormalities to correct thus scores can be reduced to ranks and called outliers. The extreme scores that were difficult to handle before ranking no longer posed a threat to the study as the largest number of distributions was equalized in the census study (Agbamu, 2006).

The symbol **r** symbolizes the correlation coefficient and varies over a range of +1 to -1 whereby the sign signifies the form of relationship between the independent variables and the dependent variables. This situation was construed as true where the significance level was $p<0.05$ and $p<0.01$. The absence of a relationship between the independent variables and the dependent variables was expressed by a correlation coefficient of zero.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This study's general objective was to investigate the factors that influence the level of adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya. The specific objectives were: to determine whether top management support influences the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya; to examine whether capacity availability influences the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya; to analyse whether teamwork policies influences the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya; and to examine whether stakeholders' involvement influences the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya. In order to address the specific objectives of this study, this chapter outlines a detailed descriptive and inferential statistics, the research findings and discussions and particularly outlining how each of the hypothesis as stated in chapter one was tested.

4.2 General Characteristics of the Study Samples

This section of the study focuses on the general characteristics of the study which includes fire stations response rate, the departments' response rates, the experience of the respondents, location of disaster management projects at the station, and the PMIS type implemented at the station.

4.2.1 Respondents Response Rate

A total of 234 respondents from six Nairobi Metropolis fire stations were censured in the study (see Table 4.1). These were Nairobi, Thika, Kiambu, Machakos, Limuru, and Kikuyu. Out of the 234 employees censored in the study 228 responded which was a response rate of 97.4%. Out of the six questionnaires from nonrespondents one was partly filled and therefore not included in the analysis while the remaining five did not get a response from their respective respondents. According to Mugenda and Mugenda (2003) a response rate of more than 10% of the sample is adequate for data analysis. Kennedy *et al*. (2011) on the other hand argues that a response rate exceeding 30% of the total census size provides enough data that can be used to generalize the characteristics of the study problem as expressed by the opinions of few respondents in the target population. This means therefore that the data that was gathered from the 228 respondents demonstrated the true nature of the factors influencing the level of adoption of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya. Therefore, the 97.4% response rate was deemed adequate for the study to proceed with data analysis and interpretation.

Of the six fire stations, Nairobi had the highest number of respondents (49.1%) participating in the study while Kikuyu had the lowest number participating at 5.1%. Thika had a response rate of 15.4%, Kiambu 7.9%, Machakos 11.1%, and Limuru 9.0%. Table 4.1 provides an illustration of the response rate by various Nairobi Metropolis fire stations under study.

Table 4.1: Respondents Response Rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Nairobi	115	49.1	50.4	50.4
	Thika	36	15.4	15.8	66.2
	Kiambu	18	7.7	7.9	74.1
	Machakos	26	11.1	11.4	85.5
	Limuru	21	9.0	9.2	94.7
	Kikuyu	12	5.1	5.3	100.0
	Total	**228**	**97.4**	**100.0**	
Missing	System	6	2.6		
Total		**234**	**100.0**		

This study finding is in congruent with that of Bowen, Morara and Mureithi (2009) while studying management of business challenges among small and micro enterprises in Nairobi-Kenya which received a response rate of 79.2%. Also, the study is supported by Bharosa, Lee and Janssen (2010) who noted that the response rates for the various departments within fire stations is varied.

4.2.2 Fire Station Departments

The respondents of the study were drawn from various departments of the Nairobi Metropolis fire stations that participated in the study. From Table 4.2 it was observed that the lead firemen department had the highest number of participants at 62.0% while the office of the director had the lowest participants at 0.9%. Other departments that participated in the study included head of department at 9.0%, first aiders at 11.5%, fire station commanders at 3.0% and ambulance attendants at 11.1%.

Table 4.2: Fire Station Departments from which Respondents were Drawn

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Director	2	.9	.9	.9
	Head of Department	21	9.0	9.2	10.1
	First Aider	27	11.5	11.8	21.9
	Fire Station Commander	7	3.0	3.1	25.0
	Ambulance Attendant	26	11.1	11.4	36.4
	Lead Fireman	145	62.0	63.6	100.0
	Total	**228**	**97.4**	**100.0**	
Missing	0	6	2.6		
Total		**234**	**100.0**		

This study agrees with those of Lango (2014) and Malcolm (2010) who also found out that most fire departments are dominated by the lead firemen whose role directly corresponds to the response operations and implementation of disaster management projects. Other studies that also found lead firemen domination is that of Sargent *et al*. (2012) who opined that this domination is as a result of inclination of the fire stations towards male oriented work structures. From the finding it can therefore be concluded that fire station departments are dominated majorly by lead firemen.

4.2.3 Respondents Experience with the Station

The level of experience of the respondents that participated in the study was measured as the number of years the respondents has been working with the fire station within the Nairobi Metropolis. Majority (47.9%) of the respondents have worked with their stations for between 5 to 10 years while minorities (11.5%) have either been with the station for below 5 years or above 20 years. The respondents who have been with the station for between 16 to 20 years were recorded as 26.5%.

Table 4.3: Respondent Experience at the Station

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Below 5 years	27	11.5	11.8	11.8
	5 - 10 years	112	47.9	49.1	61.0
	16 - 20 years	62	26.5	27.2	88.2
	Above 20 years	27	11.5	11.8	100.0
	Total	**228**	**97.4**	**100.0**	
Missing	0	6	2.6		
Total		**234**	**100.0**		

This implies that most fire stations personnel have diverse years of experience which shows that as the fire stations establish themselves and take ground in disaster management projects and their major operations, their existence and sustainability is dependent upon strategic planning on the adoption of PMIS.

4.2.4 Respondent Gender

Out of a total of 228 respondents, 209 representing 91.7% were male while 19 representing 8.3% were female showing a clear gender disparity at the various fire stations in Nairobi Metropolis. The gender category of the various respondents from the fire stations is as analyzed in Table 4.4.

Table 4.4: Respondents Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	209	89.3	91.7	91.7
	Female	19	8.1	8.3	100.0
	Total	**228**	**97.4**	**100.0**	
Missing	0	6	2.6		
Total		**234**	**100.0**		

Table 4.4 shows that majority of the respondents were male who represented 91.7% of the sample while 8.3% were female. This implies that fire stations employees are male dominated. This agrees with a study by Njoki (2013) and Gairson (2013) who opined that in spite of women being major players in Kenya's economy, and notably in agriculture and business sector, men dominate the formal sector citing the ratio of men to women in formal sectors at 74%: 26%. Other studies that have identified male domination in the formal and informal sector include that of Otieno *et al.* (2010).

4.2.5 PMIS Implemented at the Stations'

The generated data from the respondents on the type of PMIS implemented at their respective station indicated that majority of the respondents at 65.4% indicated that their station uses *Excel* PMIS while minority at 15.0% indicated that their station uses the e-ProMIS to manage its project related activities while those who indicated that their station has implemented the fire department management system were 17.1%.

Table 4.5: Fire Stations' PMIS Implemented

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	e-ProMIS	35	15.0	15.4	15.4
	Excel PMIS	153	65.4	67.1	82.5
	Fire Department Management System	40	17.1	17.5	100.0
	Total	**228**	**97.5**	**100.0**	
Missing	0	6	2.5		
Total		**234**	**100.0**		

These findings agree with those of Eriksson & Westerberg (2011) who while studying effects of cooperative procurement procedures on construction projects found out that large majority of the respondents were relying on Ms Excel as a major tool in managing the construction projects. Further Warden, Daya and LeGrady (2007) found out that most emergency management institutions, fire stations included, mostly used spreadsheets and database based on Ms Excel and very few had a specific system dedicated to project management. This is also confirmed by Suardin *et al.* (2009) who found out that the specific fire department MIS and the e-ProMIS were easy to build with Ms Excel as screening tools, options evaluation and assessment of quality checks. This therefore gives an indication that Ms Excel is used widely in most fire stations in different forms as the major PMIS tool in managing projects in disaster management.

4.3 Descriptive Statistics

The purpose of this study was to investigate the factors influencing the level of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya. The study analyzed descriptive statistics focusing on the objective factors of the study which were: top management support; capacity availability; teamwork policies; and stakeholder involvement.

4.3.1 Top Management Support and Level of PMIS Adoption

This section analyses and presents factor analysis on top management support and the level of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya. The research section focused on the core variables of top management support which were: Perceived usefulness; key-staff involvement; and communication.

a) Top management perceived usefulness and level of PMIS adoption

From the analysis majority of the respondents at 77.2% (176) were not aware whether a contract between the fire station and PMIS service provider existed for the PMIS implemented at the station while minority representing 2.6% (6) gave an indication that there was an existing contract for the PMIS implemented at the station which is an indication that the contract existence is only known by the station's top management. Also 20.2% (46) of the respondents indicated that there was no existence of a contract for the PMIS implemented. The results of this analysis are indicated in Table 4.6.

Table 4.6: Top Management Support on Contractual Agreement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	6	2.0	2.6	2.6
	No	46	19.7	20.2	22.8
	Don't Know	176	68.9	77.2	**100**
	Total	**228**	**90.6**	**100.0**	
Missing	0	6	9.4		
Total		**234**	**100.0**		

These findings are similar with those of Lewis, Agarwal and Sambamurthy (2003) whose findings indicated that beliefs about technology usefulness are influenced by top management commitment to the adoption process. Further Davis, Bargozzi and Warshaw (1989) findings that top management perceived usefulness of a technology had the guiding factor in its implementation, is also attested by these results. The findings therefore affirm that top management support plays a significant role in perceived usefulness of PMIS adoption in disaster management projects in fire stations.

When factor analysis was conducted on the perceived usefulness and top management support only one component was extracted for the 11 items. However, from the analysis two items were suppressed and dropped from further analysis because they had a loading of lower than 0.4. Analysis of the factors loading revealed that the contract ensures that fire personnel have skills required to use PMIS had the highest loading value of 0.757.

The other variables had loading values as follows: Contract ensures each fire personnel using the PMIS goes through training yearly had a loading value of 0.738; PMIS service contractor will conduct extensive training in aspect PMIS quality had a loading value of 0.734; New PMIS knowledge impacted periodically as per contract as they work in squads had a loading value of 0.714; Contract enables employees to take more responsibilities using the PMIS had a loading value of 0.651; Contract performance appraisal enable identification of PMIS training needs had a loading value of 0.647; PMIS contract ensures real-time support to fire personnel in the field had a loading value of 0.602; Contract training agreement leads to improved fire personnel performance using PMIS had a loading value of 0.574; and finally PMIS contract ensures continuous maintenance to the system to reduce downtime had a loading value of 0.555.

The following items were suppressed and dropped from further analysis because they had loading values of less than 0.4: PMIS contract is an indication of modernization of the fire station had a loading value of 0.180; and PMIS contract has a great effect on the performance of fire personnel had a loading value of 0.164. These results are presented in Table 4.7.

Table 4.7: Perceived Usefulness Factor Analysis

Component Matrix[a]	Component 1
Contract ensures that fire personnel have skills required to use PMIS	.757
Contract ensures each fire personnel using the PMIS goes through training yearly	.738
PMIS service contractor will conduct extensive training in aspect PMIS quality	.734
New PMIS knowledge impacted periodically as per contract as they work in squads	.714
Contract enables employees to take more responsibilities using the PMIS	.651
Contract performance appraisal enable identification of PMIS training needs	.647
PMIS contract ensures real-time support to fire personnel in the field	.602
Contract training agreement leads to improved fire personnel performance using PMIS	.574
PMIS contract ensures continuous maintenance to the system to reduce downtime	.555
PMIS contract is an indication of modernization of the fire station	**.180**
PMIS contract has a great effect on the performance of fire personnel	**.164**

Note: the bolded items were dropped from further analysis.

This finding is consistent with that of Pearce and Rice (2013) who while comparing mobile and personal computer internet users concluded that the perceived usefulness of a technology must be supported by the top management and that technology modernization and its contracts does not necessarily attest as a factor of usefulness perception. This is also confirmed by Macharia and Pelser (2014) whose findings reported that the perceived usefulness of information and communication technology adoption had the highest mean score of 5.74 and therefore was a significant predictor of top management support of technology adoption.

When reliability test was done using the Cronbach's Alpha for the items, before removing and after removing the inadequate indicator, it was found that the value was 0.762 before removing and it increased to 0.815 after removing the inadequate indicator. According to Ngui (2014) while quoting Creswell (2003) notes that the closer the Cronbach's alpha is to one, the higher the internal consistency reliability. Therefore, the results of this analysis indicate that the data collected was reliable since the alpha coefficient values of 0.762 and 0.815 were very close to one as obtained from the research variables. These were above 0.75 and an alpha coefficient of higher than 0.75 signifies that the data gathered has a relatively high internal consistency and therefore can be generalized to the respondents' opinion on the study problem. The results of this analysis are as presented in Table 4.8.

Table 4.8: Reliability Analysis: Perceived Usefulness

Cronbach's Alpha	Cronbach's Alpha Before Extracting a	Number of Items
Before removing the inadequate indicator	0.762	11
After removing the inadequate indicator	0.815	9

This finding concurs with that of Kazi and Mannan (2013) who studied the factors affecting adoption of mobile banking technology and reported that their reliability analysis for perceived usefulness and top management support was well above the value of 0.70 after removing the inadequate indicator. This is also confirmed by Macharia and Pelser (2014) whose reliability before removing the inadequate indicators was 0.574 and 0.851 after removing the inadequate indicators in perceived usefulness of ICT and top management in the Kenyan higher education.

b) Top management key staff involvement support and level of PMIS adoption

The study conducted an analysis on the number of disaster response projects the fire stations can handle without the application of any form of technology management system at the fire stations at Nairobi Metropolis, Kenya. Majority of the respondent at 82.0% (187) indicated that the response would be less than 20 disaster response projects, with 17.1% indicating a response of between 20 and 50 disaster response projected while only 0.9% (2) was of the view that the disaster response projects will be over 50. This finding is consistent with the findings of International Federation of the Red Cross (IFRC, 2014) report on global disaster occurrences. IFRC (2014) notes that on average there were 8869 disasters worldwide in the year 2014 and out of this figure Africa had 1522 and while Kenya contributed an average of 342 disasters to the African figure. This is an indication that technology has not been fully embraced to combat disasters. The result of the analysis is as presented in Table 4.9.

Table 4.9: Disaster Management Projects with no Technology Applied

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 20	187	79.9	82.0	82.0
	Between 20 to 50	39	16.8	17.1	99.1
	Over 50	2	0.6	0.9	**100**
	Total	**228**	**97.3**	**100.0**	
Missing	0	6	2.7		
Total		**234**	**100.0**		

The above findings are consistent with the view of various authors (Karodia, Cowden & Magaba, 2014; Ahuja, Yang & Shankar, 2010; Barki and Huff, 2005) whose opinions were that technology aids in the implementation of projects such as disaster management projects and the failure to use PMIS in form would eventually lead to low number of projects completed in a given year. This therefore indicates that a failure by top management to support the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya would eventually lead to low number of projects completed within a given period of time.

The research also analyzed responses of the respondents on the number of disaster response projects where technology was to be applied in any form. From the analysis it was noted that majority of the respondents at 89.9% (205) were of the view that the disaster response project will be above 50 were technology to be applied in any form while 6.1% (14) were of the view that the response project will be between 20 and 50 and minor 4.0% (9) indicated that the disaster response projects will be less than 20 were technology to be applied in any form.

Table 4.10: Annual Disaster Projects and use of Technology

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Less than 20	9	3.9	4.0	4.0
	Between 20 to 50	14	5.8	6.1	10.1
	Over 50	205	87.6	89.9	**100**
	Total	**228**	**97.3**	**100.0**	
Missing	0	6	2.7		
Total		**234**	**100.0**		

This finding is similar to that done by several authors whose findings opined that the use of technology in projects within an organization or company increases the number of projects completed within a given period of time and therefore the support of top management on technology implementation reflects directly on the number of projects completed (Karodia, Cowden & Magaba, 2014; Ahuja, Yang & Shankar, 2010; Barki and Huff, 2005). This therefore concludes that top management support of technology adoption in disaster management projects in fire stations is a receipt to high number of projects completed within a period of time.

c) Top management communication support and level of PMIS adoption

In analyzing communication channel used by top management the study considered the means as telephone, e-mail, memos, meetings, and letters. From the analysis it was evident that majority of the respondents at 42.5% (97) were of the opinion that telephone is mostly used followed by meetings at 24.5% (56) and memos at 23.6% (54). However, the respondents had a lower considerable opinion on the usage of e-mail and letters at 2.1% (5) and 7.3% (16) respectively. Malcom (2010) notes that it is standard practice for disaster management project response apparatus to have radio telephone. The analysis is presented in Table 4.11.

Informants were interviewed on the importance of communication support strategies pursued by the fire stations by asking them on the available communication channels provided in enhancing levels of adoption of technology at the station. An overwhelming majority of the informant indicated telephone as the most commonly used followed closed by meetings and memos while letters and emails were the least used. This corroborated with the information provided in the questionnaire.

Table 4.11: Top Management Communication Channels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Telephone	97	41.8	42.5	42.5
	E-Mail	5	1.9	2.1	44.6
	Memos	54	23.3	23.6	68.2
	Meetings	56	24.1	24.5	92.7
	Letters	16	6.9	7.3	**100**
	Total	**228**	**98.0**	**100.0**	
Missing	0	6	2.6		
Total		**234**	**100.0**		

This finding is consistent with those of other authors who opined that communication plays an important role in PMIS adoption in disaster management projects in fire stations and that it helps in diffusing the acceptance to the lowest levels of the station (Pan and Jang, 2008; Oliveira and Martins, 2011). Further Premkumar and Roberts (2009) findings concur with the findings above that top management support through communication is commonly done through telephone, e-mail and meetings with the stakeholders involved in PMIS adoption in disaster management projects. These assertions therefore mean that the major component of communication by the top management in support of PMIS adoption is the use of telephone, meetings and memos at the fire station in Nairobi Metropolis, Kenya.

The research also seeks to establish whether the communication channels used by the top management in communicating with fire team involved in disaster management projects was part of a reporting standard requirement at the station. From the analysis it was found that majority of the respondents at 68.8% (157) indicated in the affirmative while 18.8% (43) indicated no. Of the 228 respondents that answered the question, 12.4% (28) did not know whether the communication channel used by the top management was part of a standard procedure or not. The result of this analysis is presented in Table 4.12.

Table 4.12: Top Management Communication Reporting Standards

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	157	67.5	68.8	68.8
	No	43	18.2	18.8	87.6
	Don't Know	28	11.7	12.4	**100**
	Total	**228**	**97.4**	**100.0**	
Missing	0	6	2.6		
Total		**234**	**100.0**		

Kaiser and Ahlemann (2010) in their study dubbed *measuring project management information systems success* notes that information technology has been embraced in major organizations including fire stations and its use embedded in daily operational policies and standards. The analysis of this study therefore confirms the study in retrospect as it defines the usage of technology at the fire stations. Oliveira and Welch (2013) further confirms that local governments which includes fire department which are part of the local governments use technology aided communication strategies as part of standard reporting procedures and PMIS generated reports from disaster management projects forms part of the standard reports.

PMBOK (2008) outlines specific variables that are strategically considered to aid the adoption of any technology in an organization PMIS included. Malcom (2010) and Njoki (2013) also provide preliminary variables considered to be perceived as of importance when implementing technology that includes PMIS in an organization. It is for this particular reason that the research sort to find out the influence of top management support variables on the level of PMIS adoption in disaster management in fire stations in Nairobi Metropolis, Kenya. Majority of the respondents at 48.6% were not sure whether the station management has a solid contract with the PMIS software providers while 44.2% did not agree with the statement and only 7.2% agreed with the statement.

Majority of the respondents (60.9%) agreed that station management has involved key staff to handle the processes, schedules and reporting of PMIS in disaster management projects implementation, also large majority at 70.3 agreed that station management involves PMIS in all the phases of fire station projects. Only a small percentage of the respondents (8.6%) agreed with the statement that station management keeps pressure on the fire station team to use PMIS in all the phases of disaster management project but majority of the respondents at 78.3% agreed that fire station management considers PMIS as a strategic resource. The following statement had an agreement rate as follows:

Reports are generated using PMIS for presentation to the station management at the county office had an agreement rate of 76.7%; station chief officer is involved as key authorization officer during the start of any project and PMIS use is part of the authorization had an agreement rate of 99.6%; Station management organizes on-going training on the use of the indicated PMIS had an agreement rate of 7.3%; The PMIS reporting requirement has enabled the station managers to put in place communication plan had an agreement rate of 62.9%; The performance contracts are based on progress reports generated using PMIS in every phase of the disaster management project had an agreement rate of 48.5%; Top management has supported new IT systems and technologies in disaster project management to enhance fire service delivery had an agreement rate of 71%; and the statement the most important phases of disaster project management supported by top management includes: conception; design; response operation; and recovery & reporting had an agreement rate of 12.4%. The result of this analysis is presented in Table 4.13.

Table 4.13: Top Management Support Factors and Level of PMIS Adoption

Indicators	SD %	D %	N %	A %	SA %	Total %
Station management has a solid contract with the PMIS software providers.	18.6	25.6	48.6	7.2	0.0	100.0
Station management has involved key staff to handle the processes, schedules and reporting of PMIS in disaster management projects implementation.	8.6	3.6	26.9	48.2	12.7	100.0
Station management involves PMIS in all the phases of fire station projects.	11.3	5.5	12.9	58.1	12.2	100.0
Station management keeps pressure on the fire station team to use PMIS in all the phases of disaster management project.	75.3	9.7	6.4	8.6	0.0	100.0
Fire station management considers PMIS as a strategic resource.	5.9	3.7	12.1	49.7	28.6	100.0
Reports are generated using PMIS for presentation to the station management at the county office.	2.8	16.2	4.3	62.4	14.3	100.0
Station chief officer is involved as key authorization officer during the start of any project and PMIS use is part of the authorization.	0.4	0.0	0.0	71.5	28.1	100.0

Indicators	SD %	D %	N %	A %	SA %	Total %
Station management organizes on-going training on the use of the indicated PMIS.	8.2	48.2	36.3	3.3	4.0	100.0
The PMIS reporting requirement has enabled the station managers to put in place communication plan.	6.7	2.3	28.1	58.7	4.2	100.0
The performance contracts are based on progress reports generated using PMIS in every phase of the disaster management project.	32.1	11.3	8.1	45.4	3.1	100.0
Top management has supported new IT systems and technologies in disaster project management to enhance fire service delivery.	11.2	7.3	10.5	70.5	0.5	100.0
The most important phases of disaster project management supported by top management includes: conception; design; response operation; and recovery & reporting.	7.5	0.3	79.8	11.6	0.8	100.0

SD =strongly disagree: D = disagree: N= neutral: A =agree: SA =strongly agree

This finding concurs with that of Njoki (2013), Kamau (2013), and Wachira (2014) that concluded that top management support is pivotal on the factor of engaging the top most personnel of the organization in order for a technology adoption to be successful. From the finding therefore, it can be concluded that top management support of the fire station directors is paramount for the PMIS adoption in disaster management projects to succeed.

d) Regression analysis of top management support and level of PMIS adoption

The study conducted a regression analysis to determine the significant relationship of top management support against the level of PMIS adoption. Table 4.14 shows that the coefficient of determination is 0.569 therefore this means that about 56.9% of the variation in the level of PMIS adoption is explained by top management support. The regression equation appears to be relatively useful for making prediction since the values of R^2 is slightly more than a half.

Table 4.14: Model summary: Top Management Support

Model	R	R Squared	Adjusted R Square	Std. Error of the Estimate
1	.757[a]	.572	.569	.603

a. Predictors: (Constants), Top management support

The finding is in congruence with the study done by Pan and Jan (2008) and Premkumar and Roberts (2009) whose analysis on top management adjusted R square concluded that top management communication on technology adoption is vital and the form of communication must include the top most personnel of the department where the implementation of the project is to be done. On the other hand, Kruger and Johnson (2010) also confirms the findings as the R square reading of 0.57 confirms the model relationship with adoption of technology. It can therefore be concluded that top management support plays a great influence on the level of adoption of PMIS in disaster management projects in fire stations by quantifiable figures above average.

Table 4.15 presents the results of the Analysis of Variance (ANOVA) on the top management support versus the level of PMIS adoption. The ANOVA results for regression coefficients indicate that the significance of the F is 0.00 which is less than 0.05. This indicates that the regression model statistically predicts the outcome variable hence meaning it is a good fit for the data. Therefore, from the results there is a significant relationship between top management support and the level of PMIS adoption.

Table 4.15: ANOVA – Top Management Support

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.179	1	18.179	50.336	.000[a]
	Residual	13.725	227	.363		
	Total	31.904	228			

a. Predictors: (Constant), Top management support
b. Dependent Variable: Level of PMIS adoption

The ANOVA results are corroborated by the findings of Young and Jordan (2008) and Feder and Slade (1984) who concluded that top management support has a significant relationship with technology adoption and further suggesting that the top management support encourages technology usage, better performance, and heightens the adoption levels within the organisation.

The research also sorts to determine the beta coefficients of top management support verses the level of PMIS adoption in disaster management projects at the fire stations. Table 4.16 show that there was a positive relationship since the coefficients of top management support was 0.808 which is significantly greater than zero. The t statistic (7.097) was also greater than zero hence demonstrating that the top management support had a positive influence on the level of PMIS adoption. With the significance coefficient value of 0.000 which is less than the p-value of 0.05, we reject the null hypothesis that there is no significance relationship between top management support and the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

Table 4.16: Coefficients – Top Management Support

Model		Unstandardized coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.609	.414		1.480	.150
	Top management support	.808	.116	.757	7.097	.000

a. Dependent Variable: Level of PMIS Adoption

The *t- statistical* analysis concurs with the studies done by several authors that top management support contributes a significant positive influence on the adoption on PMIS in disaster management projects in fire stations and confirmed also as the guiding managerial intervention aimed at ensuring that there is full adoption of the technology and its applications (Malcolm, 2010; Davis, Bagozzi & Warshaw, 1989; Lewis, Agarwal & Sambamurthy, 2013; Karodia, Cowden & Magaba, 2014; Ahuja, Yang & Shankar, 2010).

4.3.2 Capacity Availability and Level of PMIS Adoption

The study sought to determine the influence of capacity availability on the level of PMIS adoption in disaster management projects in fire stations. The findings which focused on capacity availability variables knowledge and skills, innovativeness and sustainable team are presented in the subsequent sections.

a) Knowledge and Skills

The respondents were asked to state whether the fire station had a dedicated information technology team to handle the PMIS reporting and features. Majority of the respondents at 65.7% (154) were of the opinion that the fire station does not have dedicated information technology personnel to handle PMIS operations and reporting. 23.9% (55) were not aware whether there were information technology personnel in place to handle PMIS operations while only 8.3% (19) agreed that there was one in place. This finding is presented in table 4.17.

Table 4.17: Availability of Dedicated IT Personnel at the Fire Station

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	19	8.1	8.3	8.3
	No	154	65.8	67.5	75.8
	Don't Know	55	23.9	24.2	**100**
	Total	**228**	**97.8**	**100.0**	
Missing	0	6	2.2		
Total		**234**	**100.0**		

These findings prove the assertions by Lertwongsatien and Wongpinunwatana (2003) and Bassellier and Benbasat (2004) who opined that organizations focus in technology adoption is usually on areas that are non-information technology areas hence knowledge and skills on technology not focused on. This is further confirmed by Sahin and Thompson (2007) who opines that technology plays an integral part in the daily life of an organization and the instilling of knowledge and skills on part of the PMIS users is key in its success.

Further the research sought to determine the respondents view on whether the fire station had a formal training programme geared towards acquisition of PMIS knowledge and skills. From the analysis it was evident that majority at 37.2% (85) were of the opinion that PMIS does not have a formal training programme on PMIS while 32.4% (74) affirmed the same and 30.4% (69) were not able to tell whether there was a training programme or not. The findings of this analysis are presented in Table 4.18.

Table 4.18: Availability of Formal Training on PMIS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	74	30.8	32.4	32.4
	No	85	36.5	37.2	69.6
	Don't Know	69	29.9	30.4	**100**
	Total	**228**	**97.2**	**100.0**	
Missing	0	6	2.8		
Total		**234**	**100.0**		

Craig (2013) in his publication of *the industrial fire world, a training in concept* confirms these findings by asserting that technological support trainings have largely been ignored in public safety support organizations including fire stations as this is not usually their core mandate. But Njoki (2013) found out that a fire station with dedicated training and skills towards an information technology-based system like PMIS improves on the efficiency disaster management project operations.

b) Innovativeness

The research sought to find out whether the fire stations encourages innovation by ensuring there is a pre-requisite skill in information technology for newly recruited fire personnel. From the findings it was evident that majority of the respondents at 86.8% (198) affirmed that the station requires newly recruited personnel to have pre-requisite knowledge in information technology. However, a small minority at 4.8% (11) and 8.4% (19) indicated in the negative and don't know status respectively. The result of this analysis is presented in Table 4.19.

Table 4.19: Pre-Requisite Knowledge for Information Technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	198	84.7	86.8	86.8
	No	11	4.6	4.8	91.6
	Don't Know	19	7.8	8.4	**100**
	Total	**228**	**97.1**	**100.0**	
Missing	0	6	2.9		
Total		**234**	**100.0**		

This finding is supported by that of Blayse and Maley (2004) and Straub (2009) who opined that technology adoption require the adopters to have a pre-requisite knowledge and skills in the same to enhance their individual innovativeness to enable the full adoption of a new technology. Similarly, Agarwal and Sambamurthy (2003) believe that technology adoption is influence by top management support of pre-requite knowledge in the same to enhance innovativeness in the adoption level of the technology. This therefore shows that for a PMIS to be keenly adopted in disaster management projects, it is important for the fire station personnel to have a pre-requisite knowledge in PMIS to enhance their innovativeness in the adoption process within the fire station.

c) Sustainable team

In order to establish the influence of top management support of sustainable team and the level of PMIS adoption at the fire station, the respondents were asked to indicate in their own opinion the kind of additional support they needed either from their department or management to enhance the use of the current PMIS in place at the station. The responses were reviewed and coded their mean and standard deviation generated for analysis. From the analysis it was established that the management empowerment of the fire station team members to make autonomous reporting using the available PMIS had a score of 4.9921 indicating that most of the respondents felt that autonomous reporting using the available PMIS had a bearing on its adoption.

Also considered as a sustainable team attribute to be given more weight in the adoption of PMIS at the station is the employment of a dedicated personnel to handle PMIS usage and its application at the station which had a score of 4.8254; establishing a mentorship programme for new recruits without PMIS skills and knowledge which had a score of 4.7025; management should share in the vision of PMIS application in day-to-day usage and long-term objectives which had a score of 4.5000; and finally the department to ensure that all reporting are generated using the PMIS in place for future records which had a score of 3.8900. The finding of this analysis is presented in Table 4.20.

These findings were corroborated by themes that emerged from the interviews with majority of the informant interviewed indicating that the management should empower the station team members to make autonomous reporting using the available PMIS technology and at the same time it should employ dedicated personnel to handle the usage and application PMIS technology at the station. The interview revealed that most of the informant were not keen in ensuring that the fire station departments ensure that all reporting is generated using the PMIS technology for future records but would rather have the fire station management share in the vision of PMIS application in day-to-day usage and their intended long-term objectives.

Table 4.20: Sustainable Team Attributes and Level of PMIS Adoption

Sustainable team attributes	Mean	Std. Dev.
Management should share in the vision of PMIS application in day-to-day usage and long-term objectives	4.5000	.75845
Management should employ dedicated personnel to handle PMIS usage and application at the station	4.8254	.45256

Sustainable team attributes	Mean	Std. Dev.
The department should ensure that all reporting is generated using the PMIS in place for future records	3.8900	1.54902
The management should establish a mentorship programme for new recruits without PMIS skills and knowledge	4.7025	.40120
Management should empower the station team members to make autonomous reporting using the available PMIS	4.9921	.78542

The findings agree with Mazvimavi *et al.* (2008) and Choudhary, Thakur and Suri (2013) who observed that in order to ensure there is full adoption of technology like PMIS in disaster management project, the fire station must have a dedicated team, participation of the stakeholders involved in implementation and integration of the PMIS technology with the users involved in its daily operations. Further Dewick and Miozzo (2004) suggest conclusively that that the station should militate against the achievement of policy aims to promote the use of sustainable PMIS technology. This according to the authors should be done through mentorship programmes and ensure that the PMIS adoption levels is a success.

Further the respondents were asked to indicate their level of agreement with the following statements regarding capacity availability. The study sought to determine the level of capacity availability for the fire station by the respondents. These findings are presented in Table 4.21. The findings of the study showed that majority of the respondents at 83.5% did not agree that the station conducts extensive training on PMIS for all its employees in all aspects of the phases of disaster management project. The findings mean that the capacity of respondents on PMIS is low and minimal training is conducted on the same.

Table 4.21: Capacity Availability Factors and Level of PMIS Adoption

Indicators	SD %	D %	N %	A %	SA %	Total %
The station conducts extensive training on PMIS for all its employees in all aspects of the phases of disaster management project	9.2	74.3	9.1	7.4	0.0	100.0
Employees in every job category go through training programs related to PMIS every year	5.1	20.6	3.2	55.5	15.6	100.0
Personnel requirement for the disaster management projects at the station are identified through formal appraisal mechanisms supported by PMIS.	12.8	6.5	69.3	11.4	0.0	100.0
There are formal training programmes to teach new employees on the use of the PMIS in place.	19.8	13.8	0.0	45.6	20.8	100.0
The PMIS in place encourages new knowledge and skills in implementing disaster management projects	23.1	15.8	40.9	20.2	0.0	100.0
Capacity needs identified through the use PMIS at the station are realistic, useful and based on the operation strategy of the strategy.	0.0	8.3	85.4	3.5	2.8	100.0
The station is allocated capacity and training budget every year	6.8	6.7	0.0	40.9	45.6	100.0
Capacity availability influences the use PMIS in disaster management projects at the station	0.0	2.2	8.5	59.2	30.1	100.0
Capacity availability affects the attitude of employees on the use of PMIS in disaster management projects	25.6	11.4	25.0	35.7	2.3	100.0
Capacity availability on PMIS affects the number of disaster management projects implemented by the fire station.	1.8	8.5	9.7	14.2	65.8	100.0

SD =strongly disagree: D = disagree: N= neutral: A =agree: SA =strongly agree

The finding is supported by Choudhary, Thakur and Suri (2013) whose conclusion suggested that capacity availability factors of an organization such as fire station determines the levels of adoption of technology in such organization and further agrees that an organization must have dedicated personnel in order to achieve the desired high project completion rating.

As to whether eemployees' in every job category go through training programs related to PMIS every year, the results showed that 71.1% of the respondents agreed with the statement. The result implies that in a year the employees have at least a training programme related to PMIS but may not be necessarily a PMIS training passé.

The study also sought to find out whether PMIS appraisal mechanisms. The findings showed that 69.3% of the respondents were neutral on the statement that personnel requirement for the disaster management projects at the station are identified through formal appraisal mechanisms supported by PMIS. The statement is therefore an indication that majority of the respondents are not aware whether the kind of PMIS at the station supports formal appraisal mechanisms. Further, the findings showed that 66.4% of the respondents agreed to the statement that there are formal training programmes to orient new employees on the use of the PMIS in place; however, majority of the respondents at 40.9% were not able to affirm whether or not the PMIS in place encourages new knowledge and skills in implementing disaster management projects.

The respondents were also neutral at 85.4% on the statement that capacity needs identified through the use PMIS at the station are realistic, useful and based on the operation strategy while majority of the respondents at 86.5% concurred with the statement that the station is allocated capacity and training budget every year. As to whether capacity availability influences the use of PMIS in disaster management projects at the station majority of the respondents at 89.3% agreed with the statement. This is an indication that there is significant reliance on capacity availability in the use of PMIS in disaster management. Further majority of the respondents at 80% agreed that capacity availability on PMIS affects the number of disaster management projects implemented by the fire station.

d) Regression analysis of capacity availability and PMIS adoption

Regression analysis was further conducted by the study to establish the relationship between capacity availability and level of PMIS adoption. The results showed that the coefficient of determination R^2 is 0.624 which implied that 62.4% of the variation in the level of PMIS adoption is explained by capacity availability. The regression equation appears to be relatively useful for making predictions since the value of R is near 1. This analysis is presented in Table 4.22.

Table 4.22: Model Summary - Capacity Availability

Model	R	R Squared	Adjusted R Square	Std. Error of the Estimate
1	.789[a]	.624	.614	.559

a. Predictors: (Constant), Capacity Availability

This finding concurs with that of del Carmen Haro-Domínguez *et al.* (2007) and Wennekers *et al.* (2005) whose findings on capacity availability indicated that there is significance influence of capacity availability on the level of technology adoption. Further Wennekers *et al.* on regressing the capacity availability factor found that it influences 63.0% of the level of technology adoption. Riddel and Schwer (2003) findings also indicated that capacity availability influenced the adoption of technology by 35.0% with a significant positive relationship hence concurring the findings of the study above.

Further the research conducted analysis of variance (ANOVA) which showed that the regression coefficients indicate that the significance of F is 0.00 which is less than 0.05. This in essence indicates that the regression model is statistically significant predictor of the outcome variable. There is therefore a significant relationship between capacity availability and the level of PMIS adoption. This analysis is presented in Table 4.23.

Table 4.23: ANOVA – Capacity Availability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.952	1	19.952	63.477	.000[a]
	Residual	11.944	227	.312		
	Total	31.896	228			

a. Predictors: (Constant), Capacity Availability

b. Dependent Variable: Level of PMIS adoption

This finding is in consistent with that of Mazvimavi *et al.* (2008) whose significance of F was less than 0.05 and concluded that the capacity availability model was a significant predictor of technology adoption further suggesting that disaster management project implementation be pegged on the mentorship programme within the fire station focusing solely on capacity to handle the technology aiding the project.

The analysis of the coefficient in table 4.24 shows a beta coefficient of 0.774 which implies a strong positive relationship between capacity availability and the dependent variable level of PMIS adoption. Further, the findings revealed that the test was statistically significant with the significance value of 0.000 which is less than that of the p-value of 0.05. The student t statistic of 7.965 was also greater than zero hence demonstrating that capacity availability had a positive influence on the level of PMIS adoption. Therefore, with the significance value of 0.000 which is less than the p-value of 0.05, the study rejects the null hypothesis that there is no significant relationship between capacity availability and level of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya. The null hypothesis that there is a significance relationship between capacity availability on the level of PMIS adoption in disaster management projects in fire stations in Nairobi metropolis, Kenya is therefore accepted.

Table 4.24: Coefficients – Capacity Availability

Model		Unstandardized coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.847	.336		2.507	.014
	Capacity Availability	.774	.095	.789	7.965	.000

a. Dependent Variable: Level of PMIS Adoption

Source: SPSS Ver. 21 Generated analysis for the study

These findings are similar to those of Rothaermel and Alexandre (2009) whose *t* statistic indicated that capacity availability and firm performance generated a *t* statistic of greater value than zero which indicated there was a significant relationship. However, these findings are also contradicted by Pokharel (2005) who generated a statistical test of -4.5 ($P<0.05$) attesting that there no significant relationship between capacity availability and the adoption of technology. This is a clear indication that capacity availability has a significant influence on the level of adoption of technology.

4.3.3 Teamwork Policies and Level of PMIS Adoption

The study sought to determine the influence of teamwork policies on the level of PMIS adoption and the findings of the study are presented in the subsequent sections.

a) Policy Availability

The respondents were asked to indicate whether the station had a standard policy on the formation of various teams at the fire stations. From the analysis it was noted that majority of the respondents at 83.7% were affirmative that there was a standard policy while minority at 16.3% did not agree. This analysis indicates therefore that most of the stations within Nairobi Metropolis have some form of policy group formation and selection. This analysis is presented in Table 4.25.

Table 4.25: Policy Availability at the Various Stations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	191	81.6	83.7	83.7
	No	37	14.9	16.3	**100.0**
	Total	**228**	**97.9**	**100.0**	
Missing	0	6	2.1		
Total		**234**	**100.0**		

This finding concurs with that of Kerr and Newell (2003) and Del Aguila-Obra and Padilla-Melendez (2006) who found out that policy availability as a project development instrument in an organization is an indication that the station can provide a more efficient technology adoption like PMIS in disaster management projects. This therefore analogizes that policy availability within a fire station to support the adoption of PMIS in disaster management projects is an important factor of consideration.

Further the respondents were asked to state whether there was a team formed to specifically handle PMIS implementation and its use in disaster management projects that are undertaken by the fire stations. From the analysis majority of the respondents at 62.8% noted that there was no team while only 34.7% agreed that there was a team to handle PMIS implementation at its use in disaster management projects at the fire stations. The findings mean that the fire stations to some level have established teams to handle PMIS but to a large level have not achieved the required threshold for these teams to be visibly recognised among the members of the fire station staff. This analysis is presented in Table 4.26.

Table 4.26: Team Availability for PMIS Use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	83	34.7	36.5	36.5
	No	145	62.8	63.5	**100.0**
	Total	**228**	**97.5**	**100.0**	
Missing	0	6	2.5		
Total		**234**	**100.0**		

This finding agrees with the findings of Jain and McLean (2003) that concluded that most fire stations have established teams but none of the teams is dedicated to technology development including PMIS use in disaster management projects. These assertions are also confirmed by Mathew (2005) and Chan *et al.* (2004) who concludes that policies may be available but none is usually dedicated to the use of technology like PMIS in disaster management projects at the fire stations. This is an indication that the fire stations in Nairobi Metropolis have not taken to great lengths to formulate policies that are focused directly on the use of PMIS in disaster management projects.

b) Policy Appropriateness

In order to assess the policy appropriateness of the various teams at the fire station, the respondents were asked to indicate their opinion on the usefulness of the station policies on formation of teams with regards to PMIS application in disaster management projects at the station. The opinion of the respondents was analysis on the basis of Porter (1985) *the competitive advantage: creating and sustaining superior performance* who outlays that policies and especially those targeting teamwork varies in their specificity, consistency, power, authority and stability and that the higher a policy is on one or all of the attributes, the greater the chances of its successful implementation. The analysis of the appropriateness of the fire station policies is presented in Table 4.27.

Table 4.27: Sustainable Team Attributes and Level of PMIS Adoption

Policy appropriateness attributes	Mean	Std. Dev.
The fire station policies are specific but gives details in covering a particular area	2.4550	.80858
Various policies within the station are aligned with each other hence consistent	2.4711	.80533
Policies within the station are laws themselves being advocated for by the highest authority of the station	2.5250	.92295
The policies rewards and sanctions individuals within the fire station	2.6078	.77376
The fire station policies have been in existence for a long period of term (Stability)	2.2722	.79237

From the analysis the opinion of the respondents on the statement that fire station policies are specific but gives details in covering a particular area had a mean of 2.4550 and a standard deviation of 0.80858. The other appropriate policy attributes had the following results: The statement that various policies within the station are aligned with each other hence consistent had a mean of 2.4311 and a standard deviation of 0.80533; the statement that policies within the station are laws themselves being advocated for by the highest authority of the station had a mean of 3.8250 and a standard deviation of 0.92295; the statement The policies rewards and sanctions individuals within the fire station had a mean of 2.3078 and a standard deviation of 0.77376 ;and finally the statement The fire station policies have been in existence for a long period of term (Stability) had a mean of 2.1710 and a standard deviation of 0.70237.

The findings above are in agreement with the findings of the Kenya Ministry of Local Governments (2009); Kerr and Newell (2003) and Markard and Truffer (2008) who agrees that teamwork policies plays an important in the adoption of technology and advocates for policy-induced technology adoption, a policy-focused on environment for implementation of technology based systems including PMIS; and integration of innovative systems through a multi-level perspective to ensure policies supports technology adoption. Kerr and Newell opine that policies that are laws themselves are highly advocated by higher authorities in organizations like fire stations and are deemed to succeed as they are the center of focus and gives power to the executer.

c) Policies Responsiveness

The respondents were asked to either agree or disagree in their own opinion whether the fire station was committed to formulating teamwork policies that responds to the continuous use of PMIS-based disaster management projects implementations. This analysis is presented in table 4.28. From the analysis majority of the respondents at 52.2% (119) did not agree that the fire station is committed to formulating team work policies responding to continuous use of PMIS-based disaster management projects implementation while 47.8% (109) agreed that this was the case. The findings therefore mean that the policies formulated by the fire stations are not geared towards responding to continuous use of PMIS-based disaster management projects implemented at the fire stations.

Table 4.28: Fire Station Commitment to Formulating Teamwork Policies.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	109	47.2	47.8	47.8
	No	119	49.6	52.2	**100.0**
	Total	**228**	**96.8**	**100.0**	
Missing	0	6	3.2		
Total		**234**	**100.0**		

These findings agree with the findings of various authors and particularly Lindell, Prater and Perry (2006) whose book notes that policy appropriateness is paramount to the success of technology adoption and its continuous use within the station whether the station structure is changed or not. Also, Herawati and Santoso (2011) concludes that there are no tangible commitments on the policy formulators in fire stations embracing the use of technologies including PMIS and Stephens and Ruth (2005) terms this as a receipt for further disasters as commitment to the policies shows a commitment to the adoption of technology. This is an indication therefore that most fire stations are not committed to formulating policies that are specifically responding to the needs of the fire stations embracing the use of technology like PMIS in disaster management projects and this in turn may result to low levels of technology adoption.

The study further sought to find out the level of agreement of the respondents with the factors of teamwork policies. The respondents were therefore asked to state their level of agreement with the statement regarding to teamwork policies. The findings are presented in table 4.30. The respondents were asked to indicate whether the PMIS is used to ensure appropriate team composition for the disaster project phases. Majority of the respondents at 71.0% agreed that indeed this was the case at their various stations. As to whether disaster project management ensures the team assigned to various phases are committed to team processes, leadership and accountability, the study findings showed that 65.5% agreed that this was the case while 12.0% strongly agreed with the statement. The study findings therefore imply that the fire station have applied use of PMIS in team selection to enhance commitment of the team to the station disaster management project processes, leadership and accountability. The study also sought to find out whether there is team independent on each other within the phases of the project to ensure successful project delivery.

The findings of the study showed that 77.5% of the respondents agreed that there is team interdependent on each other within the phases of the project to ensure successful project delivery. The study also sought to find out whether a team's commitment to a project stage at the fire station is captured by PMIS. The findings of the study showed that 80.0% of the respondents disagreed with the statement while only paltry 7.5% respondents agreed. This is an indication that most of the fire stations have no system or processes to capture the various teams' commitment to a project stage. On teamwork success at the station depending on open communication and positive feedback aided by PMIS in all stages of the project and environment, the results showed that 80.5% agreed that this is the case while 68.5% of the respondents were undecided as to whether teamwork reward to shared goals defined by success indicators in PMIS motivates members in achieving project success. On PMIS enabling team members in disaster management projects to define the project implementation strategies at the fire station majority of the respondents at 80.0% agreed that this was the case. This therefore means that PMIS plays a major role at the fire stations by defining the various roles played by different team members during a project implementation. The study also sought to find out whether the station always organizes for teambuilding training for the station staff members. The findings of the study showed that 67.0% of the respondents agreed that the station always organized team building training. This means that majority of the fire stations have ensured team cohesiveness through teambuilding training and therefore use of team-based software as suggested by Malcom (2010) is easily embraced by the stations.

The study also sought to find out whether all potential conflicts within the team arising as a result of conflict in PMIS processes are addressed by the station manager promptly. The study findings showed that majority of the respondents at 85.0% agreed that this was the case. This therefore means that station managers have taken responsibility in ensuring that conflicts arising from PMIS processes are promptly solved. On the other hand, 88.0% of the respondents were of the view that the fire station usually forms a team for every job to be undertaken during a major project while 65.0% of the respondents did not agree with the statement that the team duties are organized as per schedules produced by PMIS software. This means therefore that most of the fire stations have not fully integrated PMIS into their normal operations. Finally, on the statement that PMIS software used in disaster project management produces schedules and reports that are applied by the station management in annual review of teamwork policies, slight majority of the respondents at 59.5% were affirmative on the statement with 28.0% disagreeing with the statement. This means that the fire stations integration of PMIS application in disaster project management has not been fully implemented to include its use in annual review of teamwork policies.

Table 4.29: Teamwork Policy Factors and Level of PMIS Adoption

Indicators	SD %	D %	N %	A %	SA %	Total %
PMIS is used to ensure appropriate team composition for the disaster project phases	0.0	7.5	17.0	70.5	5.0	100.0
Disaster projects management using PMIS ensure the team assigned to various phases are committed to team processes, leadership & accountability	5.0	4.0	13.5	65.5	12.0	100.0
Team interdepend on each other within the phases of the project to ensure successful project delivery	5.0	12.5	5.0	70.0	7.5	100.0
A team's commitment to a project stage at the fire station is captured by PMIS	7.5	72.5	12.5	2.5	5.0	100.0
Teamwork success at the station depends on open communication and positive feedback aided by PMIS in all stages of the project and the environment	0.0	10.0	9.5	76.5	4.0	100.0
Teamwork reward to shared goals defined by success indicators in PMIS motivates members in achieving project success.	2.5	5.0	68.5	11.5	0.0	100.0
PMIS enables team members in disaster projects to define the project implementation strategies at the fire station	0.0	12.5	7.5	77.5	2.5	100.0
The station always organizes for teambuilding training for the station	8.5	2.5	22.0	60.5	6.5	100.0
All potential conflicts within the team arising as a result of conflict in PMIS processes are addressed by the station manager promptly	0.0	15.0	0.0	75.0	10.0	100.0
The fire station usually forms a team for every job to be undertaken during a major project	0.0	5.5	6.5	85.5	2.5	100.0
Team duties are organized as per schedules produced by PMIS software	8.5	65.0	5.5	10.0	10.5	100.0

Indicators	SD %	D %	N %	A %	SA %	Total %
PMIS software used in disaster project management produces schedules and reports that are applied by the station management in annual review of teamwork policies	2.5	25.5	12.5	52.5	7.0	100.0

From the findings of the study, it was evident that most fire stations practiced teamwork as evident in the factors in table 4.29. These findings agree with those of Galegher, Kraut and Egido (2014) whose book on intellectual team focused on social and technological foundations of cooperative work and notes that most of the work staff are engaged in require some degree of cooperation and communication with others which is essence some kind of teamwork. Gaba (2010) on the other hand while studying crisis resource management and teamwork training in anaesthesia found out that the qualifications and training alone cannot be banked on to achieve the job especially where technology like PMIS is involved and agree that there is need for teamwork that focuses on every job to be undertaken, open communication and feed, and one where the technology defines the strategies of implementations at source of project origin.

d) Regression Analysis of Teamwork Policies and Adoption of PMIS

The study conducted another regression analysis to test the relationship between teamwork policies and level of adoption of PMIS. The results in Table 4.30 show that the coefficient of determination (R^2) was 0.480 which means that 48.0% of the variance in the adoption of PMIS at the fire stations is explained by teamwork policies. This result though is positive it is a weak representation and therefore means there are equally other factors which determine level of adoption of PMIS in disaster management projects at the stations.

Table 4.30: Model Summary - Teamwork Policies

Model	R	R Squared	Adjusted R Square	Std. Error of the Estimate
1	.692[a]	.480	.466	.658

a. Predictors: (Constant), Teamwork Policies

This is similar to Oh, Ahn and Kim (2003) and He, Cao and Li (2007) whose regression coefficients were 0.404 and 0.345 respectively and stressed the importance of teamwork policies in technology adoption further opining that there is need to expand the use of teamwork policies in technology adoption to increase the levels of adoption. This in essence means that PMIS technology adoption is dependent on teamwork policies and the levels to which these technologies are integrated within the fire station.

The study also conducted an analysis of variance (ANOVA) showed that the significance of the F is 0.00 which is less than 0.05 implying that the regression model is statistically a significant predictor of the resulting outcome variable.

Table 4.31: ANOVA – Teamwork Policies

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	15.362	1	15.362	35.305	.000[a]
	Residual	16.534	227	.435		
	Total	31.896	228			

a. Predictors: (Constant), Teamwork policies

b. Dependent Variable: Level of PMIS adoption

Richardson (2009) while conducting a study on diffusion of technology adoption in Cambodia confirms similarly as above as the ANOVA results indicated that seven of the eight characteristics which included teamwork policies significantly impacted adoption. Further Hsu, Lu and Hsu (2007) and Lee and Brown (2008) ANOVA results indicated that the impact of teamwork policies is strong when market share of dominant technology and non-dominant technology is similar and at the same time indicating that there is no significant difference between potential adopters and users.

The study further analysed the beta coefficients of teamwork policies visa viz the level of PMIS adoption and the results in Table 4.32 showed that there was a significant relationship between the teamwork policies and level of adoption PMIS and that this relationship was positive since the coefficient of teamwork policies is 0.589 which is significantly greater than zero. The t statistics (5.942) was also greater than zero demonstrating that the teamwork policies had a positive influence on the level of adoption of PMIS in disaster management projects in fire stations. Since the significance value of 0.000 is less than that of the p-value of 0.05, the study rejects the null hypothesis that there is no significance relationship between teamwork policies and the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya. The alternative hypothesis that there is a significant relationship between teamwork policies and the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya is therefore accepted.

Table 4.32: Coefficients – Teamwork Policies

Model		Unstandardized coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.380	.361		3.803	.001
	Teamwork policies	.589	.098	.692	5.942	.000

a. Dependent Variable: Level of PMIS Adoption

Various authors agree with the findings of this study that teamwork policies have a significant influence on the level of adoption of PMIS in disaster management projects in fire stations (Richardson, 2009; Lu and Hsu, 2007; Lee & Brown, 2008;

Oh, Ahn & Kim, 2003; He, Cao, & Li, 2007; Lindell, Prater & Perry, 2006). This is an indication that teamwork policies have a major influence on the adoption levels of PMIS in disaster management projects and plays a critical role of integrating the adoption level with relevant policy formulations.

4.3.4 Stakeholders Involvement and Level of PMIS Adoption

In this section the study sought to determine the influence of stakeholder involvement on the adoption of PMIS. The analysis of the variable was focused on the sub-variables which were consultation, participation and training.

a) Consultation

The study sought to find out whether the fire station consult with its stakeholders on the use of PMIS which is an information technology-based system in disaster management project. The respondents were asked to indicate their agreement with the statement that the fire station in the last three years has organized a stakeholder's consultation forum on the use of PMIS system in disaster management projects. From the findings presented in Table 4.33 it was evident that majority of the respondents at 72.4% (165) were of the opinion that the fire station has not organized any consultative forum on the use of PMIS on disaster management projects while minority at 27.6% (63) indicated that the station has organized such event in the last three years. The findings mean that fire stations have largely not considered consultative forums on use PMIS as a way of ensuring high implementation orders are achieved.

Table 4.33: Stakeholder Consultation at the Fire Station

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	63	27.1	27.6	27.6
	No	165	68.9	72.4	**100.0**
	Total	**228**	**96.0**	**100.0**	
Missing	0	6	4.0		
Total		**234**	**100.0**		

This finding is similar to that of Ahmad, Kyratsis and Holmes (2012) and that of Pinkse and Dommisse (2009) who opined that most organizations like fire stations have not involved their fire station members in the adoption of technology hence the slow pace being witnessed. Further, Sanford and Rose (2007) concur that stakeholders' consultations have been ignored in most public projects technology adoption and fire stations have not been able to include all their stakeholders in implementation of technology adoption process.

The respondents were further asked to indicate in the affirmative or not whether the fire station takes into consideration grievances from stakeholders including the fire station members on the use of PMIS technology in disaster management projects. Analysis of the findings revealed that revealed that a slight majority at 57.0% (130) disagreed with the statement while 43.0% (98) agreed with the statement. The findings are presented in Table 4.34. The finding therefore to a larger extent indicates that fire stations in Nairobi Metropolis have not involved their members in participation of PMIS technology adoption in disaster management projects.

Table 4.34: Stakeholder Input Consideration on PMIS Use

		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	98	41.5	43.0	43.0
Valid	No	130	55.7	57.0	**100.0**
	Total	**228**	**97.2**	**100.0**	
Missing	0	6	2.8		
Total		**234**	**100.0**		

The findings mean that the fire stations to a larger extent have not implemented efficient and candid stakeholders' consultative forums on use and application of information technology-based applications like PMIS in disaster management projects. Bailur (2007) while using stakeholder theory to analyse telecentre projects opines that stakeholders plays a greater role in technology implementation in projects and notes that most organization including fire stations tend to ignore this premise hence leading to low absorption rates of technology in projects.

b) Participation

The study sought to establish whether the fire station is required by law, regulation or voluntarily to engage stakeholders in PMIS implementation in disaster management projects either internally or externally. Majority of the respondents at 75.9% (173) agreed that the station required either by law, regulation or voluntarily to engage stakeholders on the use of technologies like PMIS on disaster management projects while 24.1% (55) did not agree with this statement. This analysis is presented in Table 4.35.

Table 4.35: Stakeholder Participation in PMIS Application

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	173	74.5	75.9	75.9
	No	55	23.7	24.1	**100.0**
	Total	**228**	**98.2**	**100.0**	
Missing	0	6	1.8		
Total		**234**	**100.0**		

The findings mean that the fire station members are aware that the station is required either by law, regulation or voluntarily consider participation of stakeholders in use of PMIS in disaster management projects. These findings agree with Rowley (2010) who opined that e-government stakeholders have an important role to play in ensuring that the technology being implemented have a long-term success and further notes that their involvement also contributes to the development of knowledge, practices, policies and evaluation procedures that are geared towards achieving full participation in the e-government system like PMIS in disaster management projects.

c) Training

The study sought to establish whether the fire stations consider training as a component of stakeholder involvement in the use of PMIS in disaster management projects at the station. The findings are presented in Table 4.36. From the findings it is was evident that the statement fire station members usually lack important trainings on the use of PMIS in disaster projects management at the station had the highest mean of 2.9.12 and a standard deviation of 0.84251; fire station members receive workplace training relation to technology implementation in disaster management projects regularly had a mean of 2.5684 and a standard deviation of 0.79002; fire station members have skills that are considered above average in the industry had a mean of 2.1785 and a standard deviation of 0.91985; fire station management believe that continuous training of stakeholders on use of PMIS is important had a mean of 1.4852 and standard deviation of 0.81732; and fire station technical training is usually supported by technology-based application had a mean of 1.2452 and a standard deviation of 0.63465.

Table 4.36: Stakeholders' Training and Level of PMIS Adoption

Training attributes	Mean	Std. Dev.
Fire station management believe that continuous training of stakeholders on use of PMIS is important.	1.4852	.81732
Fire station members receive workplace training relation to technology implementation in disaster management projects regularly	2.5684	.79002
Fire station members have skills that are considered above average in the industry	2.1785	.91985
Fire station members usually lack important trainings on the use of PMIS in disaster projects management at the station	2.9012	.84251
Fire station technical training is usually supported by technology-based application	1.2452	.63465

The finding is in tandem with the findings of Poon *et al.* (2006) and Rogers (2000) who affirmed that the barrier to technology adoption in an organization is the limited training of the stakeholders involved in the adoption process. Further the authors assert that stakeholders training should be continuous, and the training should be directly related to the technology being implemented for its adoption to be successful. These assertions have also been supported by Sarkis, Gonzalez-Torre and Adenso-Diaz (2010) who concluded that stakeholders training have a direct relationship with the levels of adoption of technology. The finding therefore implies that the fire stations have not involved stakeholders in their implementation of PMIS in disaster management projects and it can be loosely concluded that stakeholders training is an important factor of technology adoption.

The respondents were asked to state their levels of agreement with the following statement of factors of stakeholder involvement in adoption of PMIS. The findings are presented in Table 4.37. The study sought to determine the level of satisfaction of factors of stakeholder involvement at the fire station.

Table 4.37: Stakeholder Involvement Factors and Level of PMIS Adoption

Indicators	SD %	D %	N %	A %	SA %	Total %
The PMIS software has been applied to manage stakeholders with social responsibilities which includes economic, legal, environmental and ethical.	5.5	7.0	7.5	73.5	6.5	100.0
PMIS software has enabled the exploration of stakeholders' needs and constrains to the disaster management projects.	2.0	8.0	70.0	12.5	7.5	100.0
Communication with stakeholders involved in disaster management project is captured by PMIS system.	3.5	4.0	12.5	76.5	3.5	100.0
The fire station understands the areas of stakeholder's interests	0.0	12.5	12.5	68.5	6.5	100.0
The PMIS software in use identifies the stakeholders of interest in every disaster management project undertaken.	6.0	9.0	35.0	45.0	5.0	100.0
PMIS reports promote a good relationship between the fire station and the stakeholders	5.0	12.5	50.0	32.5	0.0	100.0
PMIS software analyses conflicts and coalitions among stakeholders in disaster management projects within the station.	0.0	12.0	69.0	15.5	3.5	100.0
The PMIS software predicts the influence of stakeholders accurately during disaster management projects implementation.	0.0	10.5	55.5	25.5	8.5	100.0

Indicators	SD %	D %	N %	A %	SA %	Total %
From PMIS modules, schedules and reports the fire station is able to appropriately formulate strategies to manage stakeholders at the various phases of disaster management project.	3.5	9.5	39.5	45.5	2.0	100.0
PMIS software in use allows for the assessment of power, attributes, and proximity of stakeholders within the project at the fire station.	0.0	10.5	35.5	54.0	0.0	100.0
PMIS software ranks allow easy compromise of stakeholder conflicts within the disaster management projects effectively.	1.5	24.0	25.5	45.5	3.5	100.0
PMIS software gives a clear picture in formulation of a statement of project mission.	0.0	12.5	12.5	67.5	7.5	100.0
PMIS software in place allows predicting the stakeholders' reactions during the disaster management project phase's implementation for immediate re-strategizing.	5.0	10.0	35.0	45.0	5.0	100.0
PMIS software enables in assessing the stakeholder behaviours.	5.0	12.5	38.0	42.5	2.0	100.0

The findings show that 80.0% of the respondents agreed that PMIS software has been applied to manage stakeholders with social responsibilities which includes economic, legal, environmental and ethical. According to Chung, Chen and Reid (2009) the findings is an indication that the type of PMIS at the fire stations aid in managing the stakeholders. And as to whether PMIS software has enabled the exploration of stakeholders needs and constrains to the disaster management projects the results showed the 70.0% of the respondents were neither for nor against the statement which according to Rowley (2010) that the adoption levels for PMIS within the fire station is yet to be fully understood by all the stakeholders. The findings imply that the respondents are not sure whether the PMIS software at the station has enabled exploration of stakeholder needs and constrains to the disaster management projects.

The study sought to establish whether communication with stakeholders involved in disaster management project is captured by PMIS system. The findings show that 80.0% agreed that this was the case at the fire stations. This finding agrees with those of Littlejohn (2001) in the theories of human communication and opines that technology-based applications can only efficient within an organization when they aid communication with the various stakeholders. As to whether the fire stations understood the areas of stakeholders' interests, 75.0% of respondents agreed with the statement. At the same time 50.0% of the respondents were of the opinion that the PMIS software in use at the station identifies the stakeholders of interest in every disaster management undertaken.

The study findings also had the following level of agreement with the statements: 50.0% of the respondents neither agreed nor disagreed with the statement PMIS reports promote a good relationship between the fire station and the stakeholders; 69.0% of respondents neither agreed nor disagreed with the statement that PMIS software analyses conflicts and coalitions among stakeholders in disaster management projects within the station; and 55.5% neither agreed nor disagreed with the statement that the PMIS software predicts the influence of stakeholders accurately during disaster management projects implementation.

Further, 47.5% of the respondents agreed that PMIS modules, schedules and reports the fire station is able to appropriately formulate strategies to manage stakeholders at the various phases of disaster management project; 54.0% of the respondents agreed that PMIS software in use allows for the assessment of power, attributes, and proximity of stakeholders within the project at the fire station; 49% of the respondents agreed that PMIS software ranks allow easy compromise of stakeholder conflicts within the disaster management projects effectively; 75.0% of the respondents agreed that PMIS software gives a clear picture in formulation of a statement of project mission; 50.0% of the respondents agreed that PMIS software in place allows predicting the stakeholders' reactions during the disaster management project phase's implementation for immediate re-strategizing; and finally 44.5% of the respondents agreed that PMIS software enables in assessing the stakeholder behaviours.

d) Regression analysis of relationship between stakeholder involvement and adoption of PMIS

The regression analysis on the stakeholder involvement show that coefficient of determination is 0.486 which imply that 48.6% variance in the adoption of PMIS at the fire station is explained by the stakeholder involvement. The regression equation is therefore relatively useful for making predictions however it is not very strong which may mean that there are other variables influencing adoption of PMIS. This analysis is presented in Table 4.38.

Table 4.38: Model Summary - Stakeholder Involvement

Model	R	R Squared	Adjusted R Square	Std. Error of the Estimate
1	.698[a]	.486	.472	.658

a. Predictors: (Constant), Stakeholder Involvement

This finding is similar to that of Karki and Bauer (2004, October) and Zorn, Flanagin and Shoham (2011) whose regression findings confirmed that stakeholder involvement has a direct influence on the adoption of technology in organization like fire stations and by extension the adoption in disaster management projects. This finding implies that stakeholder involvement is a key important factor in the adoption of PMIS in fire stations but has not been considered in totality by the fire stations.

The ANOVA results in Table 4.39 showed that the significance of the F statistics is 0.000 which is less than 0.05. This implies that there was a significant relationship between stakeholder involvement and level of PMIS adoption.

Table 4.39: ANOVA – Stakeholders Involvement

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.434	1	15.434	35.609	.000[a]
	Residual	16.470	227	.435		
	Total	31.904	228			

a. Predictors: (Constant), Stakeholder Involvement
b. Dependent Variable: Level of PMIS adoption

This finding is similar to that of ANOVA results by Chloudrie and Dwivedi (2006) and Bajwa *et al.* (2005) whose ANOVA results concluded that stakeholder involvement has a significant influence on technology adoption and the variation positively significant.

The beta coefficients of stakeholder involvement verse the adoption of PMIS results presented in Table 4.40 show that there was a significant relationship between the stakeholder involvement and level of adoption of PMIS and this was a positive relationship since the coefficient of stakeholder involvement was 0.594 which was greater than zero. The t statistics was also greater than zero (5.969), This demonstrated that the stakeholder involvement had a positive influence on the level of PMIS adoption. With the level of significance value of 0.000 which is less than the P-value of 0.05, the study rejects the null hypothesis that there is no significant relationship between stakeholder involvement and the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya. The alternative hypothesis that there is significant relationship between stakeholder involvement and the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya is therefore accepted.

Table 4.40: Coefficients – Stakeholders Involvement

Model		Unstandardized coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.512	.343		4.425	.000
	Stakeholder Involvement	.594	.099	.698	5.969	.000

a. Dependent Variable: Level of PMIS Adoption

This finding is supported by Zorn, Flanagin and Shoham (2011) and Karki and Bauer (2004, October) whose *Beta* coefficients were greater than zero and established that in technology adoption, the stakeholder's involvement influences positively this relationship. From the finding it can be concluded that stakeholder involvement is of critical importance in the adoption of PMIS in disaster management projects in fire stations.

4.3.4 Perceived Levels of PMIS Adoption

From the model representation in Appendix 6, majority of the respondents who participated in the study at 75.0% indicated that the levels of PMIS adoption were at the low level at their various stations, with 20.6% of the respondents opining that the levels of PMIS adoption were high. At the same time a minority of the respondents at 4.4% indicated that there was no adoption of PMIS technology in their stations.

According to the results of the interviews, the majority of the fire station respondents interviewed were of the opinion that there were low levels of PMIS adoption in their stations but still felt that it was the management decision to influence the levels of uptake. Only a few of the informants indicated that there were completely no PMIS technology adopted at their stations in any form.

4.3.5 Aggregate of the Independent Variables

Four technology adoption factors (top management support, capacity availability, teamwork policies, and stakeholder involvement) were considered by the research as the dimensions/components of the independent variable of the study on the dependent variable which was the adoption of PMIS. With regard to top management support the finding revealed that it had a mean of 3.6618 and a standard deviation of 0.77222 with the respondents comprising those disagreed to those strongly agreeing. As to whether capacity availability was a factor of PMIS adoption the mean response was 4.0899 with a standard deviation of 0.84445 with the response comprising of those strongly disagreeing and those strongly agreeing. Teamwork policies had a mean of 4.2806 with a standard deviation of 0.58896 and the respondents comprising of those disagreeing and strongly agreeing. On the other hand, stakeholder involvement had a mean of 4.0527 with a standard deviation of 0.73410 with the respondents comprising of those strongly disagreeing and strongly agreeing.

Table 4.41: Summary of Mean and Standard Deviation of Technology Adoption Factors

Technology Adoption Factors	Mean	Std. Dev.	Min.	Max.
Top Management Support	3.6618	.77222	2.00	5.00
Capacity Availability	4.0899	.84445	1.00	5.00
Teamwork Policies	4.2806	.58896	2.00	5.00
Stakeholders Involvement	4.0527	.73410	1.00	5.00

Ranked on a scale: 1 – 1.8 (strongly disagree): 1.8 – 2.6 (disagree):
2.6 – 3.4 (neutral): 3.4 – 4.2 (agree): 4.2 – 5.0 (strongly agree)

Authors Njoki (2013), Sargent *et al.* (2011), He Cao and Li (2007), Lee and Brown (2008), and Lu and Hsu (2007) agree with the findings as they concluded that teamwork policies play the greatest role in ensuring the full adoption of any given technology in an organization like fire stations. Further the authors suggest that it is teamwork policies that will define the perceptions on the potential users within the fire stations and subsequent implementation hence significantly important. Njoki (2013) and Caniels (2011) on the other hand routes for top management support as the leading factor of consideration and in their studies notes that its importance and focus determine the level of PMIS implementation. However, PMBOK (2008) routes for the consideration of all the factors of technology adoption in equal lengths without consideration to the more significant ones as one factor's contribution to the levels of adoption cannot be ignored and overlook one factor, according to PMBOK, may lead to decrease in the adoption levels of technology.

4.4 Normality Test

Park (2015) while studying univariate analysis and normality test using SAS, Stata and SPSS notes that for a model to fit to some given data, the dependent variable in this case the adoption of PMIS has to be normality distributed.

4.4.1 Q – Q Plot

For a normally distributed data Wang *et al.* (2011, December) opined that the observed values should be spread along a straight diagonal line in a plotted graph. From normal Q-Q plot (Appendix 5) most of the observed values are spread very close to the straight line and some falling within the line. This therefore shows that there is a highly likelihood that the data is normally distributed. This finding therefore confirms the Q – Q plot.

4.5 Correlation Results

The study conducted correlation analysis to test the strength of association and relationship between the core research variables. According to Mugenda and Mugenda (2003) and later by Kothari (2004) correlation is the measure of the relationship and their association between two continuous numeric variables. Kothari further asserts that correlation indicates both direction and degree to which they covary with one another from case to case without implying that one is causing the other. Correlation analysis results will give a correlation coefficient which in cases will measure the linear association between two variables (Creswell, 2003).

The value of the correlation coefficients from the findings of the study ranges from -1 and +1. These findings for this particular study analysis are presented in Table 4.42.

Table 4.42: Correlation Results – All Variables

			1	2	3	4	5	6
1	Top Management Support	Pearson Correlation	1					
		Sig. (2-Tailed)						
		N	228					
2	Capacity Availability	Pearson Correlation	.576**	1				
		Sig. (2-Tailed)	.000					
		N	228	228				
3	Teamwork Policies	Pearson Correlation	.463**	.667(**)	1			
		Sig. (2-Tailed)	.002	.000				
		N	228	228	228			
4	Stakeholder Involvement	Pearson Correlation	.333*	.705**	.745**	1		
		Sig. (2-Tailed)	.036	.000	.000			
		N	228	228	228	228		
5	PMIS Adoption	Pearson Correlation	.057	.357*	.446**	.387*	1	
		Sig. (2-Tailed)	.032	.025	.005	.015		
		N	228	228	228	228	228	

* Correlation is significant at the 0.05 level (2-tailed)
** Correlations is significant at the 0.01 level (2-tailed)

A correlation coefficient of +1 indicates that two variables in a study are perfectly related in a positive linear while a correlation of -1 indicates that two variables perfectly negatively linearly related and a correlation of coefficient of 0 indicates that between the two variables there is no relationship. The results of correlation presented in table 4.46 above show that top management support was positively related to capacity availability at the stations with a Pearson's Correlation Coefficient of $r = 0.576$ and at a level of significance of 0.000. This relationship was considered statistically significant as the p-value is less than 0.05 and the relationship moderately strong. The analysis also show that teamwork policies was positively correlated to top management support with a Pearson's Correlation Coefficient of $r = 0.463$ and a level of significance of 0.002 and this result was considered statistically significant as the value of $p = 0.05$ however the relationship was not very strong. The findings showed that teamwork policies had a positive correlation with capacity availabilities with a Pearson's Correlation Coefficient of $r = 0.667$ and a level of significance of 0.000. This relationship was considered statistically significant as the p-value was less than 0.05 and this relationship was considered moderately strong.

The findings of the study also showed stakeholder involvement had a positive correlation with top management support with a Pearson's Correlation Coefficient of $r = 0.333$ and a level of significance of 0.036. This relationship was considered statistically significant as the p-value was less than 0.05 however this relationship was considered as relatively weak. The findings show that stakeholder involvement was positively correlated to capacity availability with a Pearson's Correlation Coefficient of $r = 0.705$ and a level of significance of 0.000. This relationship was considered statistically significant as the p-value was less than 0.05 and the relationship described as very strong. The findings also showed that stakeholder involvement is positively correlated to teamwork policies with a Pearson's Correlation Coefficient of $r = 0.745$ and a level of significance of 0.000. This relationship was noted as statistically significant as the p-value was less than 0.05 and the relationship also described as very strong.

From the findings of the study PMIS adoption had a positive correlation with top management support with a Pearson's Correlation Coefficient of $r = 0.057$ and a level of significance of 0.032. This relationship was noted as statistically significant as the p-value was less than 0.05 however the relationship was noted as very weak. The findings of the study showed that PMIS adoption had a positive correlation with capacity availability with a Pearson's Correlation Coefficient of $r = 0.357$ and a level of significance of 0.025. This relationship was noted as statistically significant as the p-value was less than 0.05 and the relationship also described as not strong. The findings of the study showed that PMIS adoption had a positive correlation with teamwork policies with a Pearson's Correlation Coefficient of $r = 0.446$ and a level of significance of 0.005. This relationship was noted as statistically significant as the p-value was less than 0.05 and the relationship also described as not strong. Finally, the findings of the study showed that PMIS adoption had a positive correlation with stakeholders' involvement with a Pearson's Correlation Coefficient of $r = 0.387$ and a level of significance of 0.015. This relationship was noted as statistically significant as the p-value was less than 0.05 and the relationship also described as relatively weak.

4.6 Regression Analysis

The research study further carried out regression analysis to determine the relationship between the top management support, capacity availability, teamwork policies, and stakeholder involvement and the adoption of PMIS. While introducing linear regression analysis, Montgomery, Peck and Vining (2015), describes regression analysis as a statistical process of estimating the relationship between variables and mainly used in generating equation that describes the statistical relationship between one or more predictors variables and the response variables. The research study regression analysis results were presented using regression model summary tables, analysis of variance (ANOVA) table and beta coefficient tables as shown.

4.6.1 Combined Effect Model

Cohen *et. al.* (2013) notes that multiple regression estimates are used to test and compare theoretically motivated models, and asserts that it is of interest to determine the relative importance of the predictors. Multiple regressions were applied for this study to determine whether independent variables top management support, capacity availability, teamwork policies and stakeholder involvement affects the dependent variable adoption of PMIS. The findings are presented in Table 4.43.

The results show that the coefficient of determination was 0.695 which mean that 69.5% of variation in adoption of PMIS is explained by top management support, capacity availability, teamwork policies, and stakeholder involvement. The regression equation is deemed useful in making predictions. The R square and adjusted R is high implying that there is a high variation that can be explained by the model.

Table 4.43: Overall Model Summary

Model	R	R Squared	Adjusted R Square	Std. Error of the Estimate
1	.836[a]	.695	.662	.528

a. Predictors: (Constant), Top management support, Capacity availability, Teamwork policies, Stakeholder involvement

The ANOVA results for the regression coefficients for the study is presented on Table 4.44 showed that the significance of the F statistics is 0.000 which is less than 0.05 implying that there was a significant relationship between the top management support, capacity availability, teamwork policies, and stakeholder involvement and adoption of PMIS.

Table 4.44: Overall ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.192	1	5.547	19.999	.000[a]
	Residual	9.708	227	.278		
	Total	31.900	228			

a. Predictors: (Constant), Top management support, Capacity availability, Teamwork policies, Stakeholder Involvement
b. Dependent Variable: Level of PMIS adoption

The study sought to determine the beta coefficient of the variables of the study and the findings are presented in Table 4.45. The regression model was therefore written as Level of PMIS adoption = 0.405 + 0.294 top management support + 0.416 capacity availability + 0.021 teamwork policies + 0.169 stakeholders' involvement.

Table 4.45: Overall Coefficients

Model		Unstandardized coefficients B	Unstandardized coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.405	.368		1.099	.021
	Top management support	.294	.171	.275	1.713	.046
	Capacity availability	.416	.193	.423	2.160	.039
	Teamwork Policies	.021	.159	.025	.130	.039
	Stakeholder involvement	.169	.136	.199	1.257	.018

a. Dependent Variable: Level of PMIS Adoption

$$\boldsymbol{Y = 0.405 + 0.294X_1 + 0.416X_2 + 0.021X_3 + 0.169X_4}$$

The Beta Coefficients in the regression showed that all the tested variables had a positive relationship with the level of PMIS adoption. The findings from the table showed that all the variables tested were statistically significant with p-value less than 0.05.

X_1 = 0.294 which implied that a unit change in the top management support resulted into a 0.294 change in the adoption of PMIS.

X_2 = 0.416 which implied that a unit change in the top management support resulted into a 0.416 change in the adoption of PMIS.

X_3 = 0.21 which implied that a unit change in the top management support resulted into a 0.21 change in the adoption of PMIS.

X_4 = 0.169 which implied that a unit change in the top management support resulted into a 0.169 change in the adoption of PMIS.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter presents the summary of findings, conclusions and recommendations of the study. The objective of this study was to determine the factors influencing the level of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya. The objectives of the study were to determine the influence of top management support on the level of PMIS adoption; determine the influence of capacity availabilities on the level of PMIS adoption; determine the influence of teamwork policies on the level of PMIS adoption; and finally, determine the influence of stakeholder involvement on the level of PMIS adoption.

5.2 Summary

The purpose of this study was to determine the factors influencing the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya. In particular the study was designed to explore the degree to which levels of PMIS adoption was influenced by the dimensions of top management support, capacity availabilities, teamwork policies, and stakeholder's involvement.

Specific Objective 1: To determine the influence of top management support on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya

Top management support according to Njoki (2013) and Malcolm (2010) is one of the key considerations that determines the levels of technological uptake and especially in disaster management projects in fire stations. This study attempted to find out whether level of PMIS adoption in disaster management projects in fire stations was influenced by the degree of top management support dimensions of key staff involvement, perceived PMIS usefulness, and communication. Top management being the key decision makers for the fire station are directly key consideration in determining the levels of technology adoption. According to Onsel *et al.* (2013) top management allows fire stations to seamlessly adopt technologies which are geared towards improving the success rates of disaster projects and enhance competitive advantage in providing public safety services. The top management strategies of involving key staff in the PMIS technology process is vital for its success and so is the creation of the perceptive usefulness of the technology (Bailur, 2007). At the same time, it is important to be concerned about communication with the adoption levels of the PMIS technology and a structured communication by the top management and the fire station is considered by Finegold and Frenkel (2006) as a strategy that would include all employees of the station at all levels. Thus, top management support plays a key influence which is central to levels of PMIS technology adoption in disaster management project (Dong, Neufeld, & Higgins, 2009). Therefore, the research sought to find out if all the above top management strategies influenced the levels of PMIS adoption in disaster management projects in fire stations. The results showed that there was poor top management support when measured in terms of perceived PMIS usefulness, key staff involved in PMIS, and communication. The results were reflective of IFRC (2014) report on global disaster occurrence that Africa contributed to major world disasters due to poor levels of adoption of disaster management technologies.

From the research it was found out that there is a significant influence of top management support on the level of adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya. It was also found that top management factors have a positive influence on the level of PMIS adoption. In general, this study found that three sets of top management support factors – top management perceived usefulness, top management key staff involvement support, and top management communication support contributed significantly to level of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya. When all these factors were applied, it was found that the level of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya will improve by 56.9%. This finding is consistent with those of

Young and Jordan (2008) who suggests that top management support is the most important and critical success factor for a project success and justifies this in the context of project management as not one of the many factors but a technology adoption factor to significantly consider during technology implementation in projects. The study also corroborates the findings of Zwikael (2008) and Kwak and Anbari (2009) who opined that top management support highly influences the level of the tools of project management which includes PMIS procured and used in a given project and the level of the use of the tool which is wholly dependent on the support given to the fire stations by their top management.

Specific Objective 2: To examine the influence of capacity availability on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

Fire stations with enhanced capacities replete with knowledge and skills, innovativeness, and sustainable team according to Gupta, Dasgupta and Gupta (2008) will experience higher levels of PMIS adoption in disaster management projects as they would ordinary have the required skills and knowledge in the area of technology application, they would be able to innovate to adapt to the unique requirements of the environment, and at the same time be sustainable within the resources of the station. This study sort to find out if these assertions were true

From this research it was found that capacity availability has a significant influence on the level of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya. When capacity availability was implemented significantly the adoption of PMIS in disaster management projects according to the study was improved by 62.4%. From the study it was found that there is a positive influence between capacity availability and the level of PMIS adoption. Study found out that the capacity availability indicators of knowledge and skills; innovativeness; and sustainable team had a significant influence on the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya. Of particular importance from the study findings was that capacity availability influences the use of PMIS in disaster management projects at the stations.

The role of the fire station in ensuring there is capacity was therefore found to be of particular impotence and the implementation of technology-based projects management system like PMIS at the fire stations was heavily dependent on it. These findings agree with previous study results by Lee *et al.* (2012) while studying *deploying initial attack resources for wildfire suppression*, that capacity availability linked with the overall fire station's strategy in implementation of technology-based resources for disaster project management enables the fire stations achieve best results in technology use improving the level of such technology adoption with the station. Further Lee *et al.* suggests that capacity availability within the fire station increases the capacity of the disaster management project's planning and decision-making authorities as they will be able to evaluate several scenarios using the PMIS in place and make amicable final conclusions in executing a given project deliverables. It was found that fire stations in Nairobi Metropolis, Kenya are now taking capacity availability seriously and have set budgets for the process. Specifically, this study established that in order to ensure improved knowledge and skills at the fire station, the stations were training their staff on annual basis in PMIS-based knowledge and skills.

From this study, it was also found that there is evidence of significant influence of innovativeness and sustainable team on the capacity available within the fire stations. The technologies adopted by fire stations were noted to require the station capacity to be innovative it their usage and the station management to ensure that the team is sustainable to enable the level of the technology adoption be felt within the implementation of the disaster management projects within the station and beyond. The study found out that capacity availability influences the use of PMIS at the fire stations which is an indication of the station's reliability on capacity availability for adoption of PMIS. These findings are consistent with those of Degel *et al.* (2014) who noted that there is a significant positive influence between capacity availability and adoption of information technology in fire stations.

Most of the respondents agreed that capacity availability influences the number of disaster management projects undertaken at the fire station. This was an indication that most fire stations linked their implementation of the various disaster management projects to adoption of technology-based applications like PMIS and this therefore influenced the level of adoption of PMIS at the station to ensure effective projects management is realised. This is consistent with Aktaş *et al.* (2013) who agree that knowledge and skills, innovativeness and sustainability are key in optimizing the capacity of a fire station and that capacity availability in any fire station should play a key role in the adjunct operations and implementation of key technologies. This is further supported by Njoki (2013) that capacity availability and the development of fire station staff and studying their relations in terms of knowledge, skills, innovativeness, and sustainability are helpful tools to improve the adoption of technology-based project management applications like PMIS and are some of the key factors that influences the adoption of PMIS in disaster management projects.

The findings of the study by Poston *et al.* (2013) also show that capacity availability and their effectiveness in the use of information technology like PMIS through innovation, enhanced capacity and skills, and sustainability boost their morale and influence the adoption of PMIS in disaster management projects. From the research it was evident that most of the fire stations did not have dedicated technology-based personnel to handle the PMIS in place and that most of the staff at the fire station believed that the stations required newly recruited personnel to have a pre-requisite knowledge in information technology. Chen *et al.* (2008) notes in studying *coordination in emergency response management* that it is through knowledge and skills that people learnt how to be innovative and further improve on sustainability on the use of technology in disaster management projects. They suggest that the key ingredient to achieving a full adoption of technology in disaster management stations is through ensuring capacity availability within the stations as it has an influence on the adoption of technology-based application like PMIS in disaster management projects.

Specific Objective 3: To analyse the influence of teamwork policy on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

Kazi and Mannan (2013) concluded that the levels of technology adoption such as PMIS is higher in organization like fire stations where these policies are considered available for application within the organs of the station, appropriate for enabling the environment of implementation, and finally are responsive in the sense that when applied the results are verifiable. This study, therefore sought to find out whether this was accurate.

From the study it was found that there is a positive correlation between teamwork policies and adoption of PMIS. This meant that they co-vary. However, the study also revealed that the fire stations did not have a standard policy on the various formations of teams at the fire stations. This research also found out that policy appropriateness within the fire stations were considered as the main contributors to adoption on PMIS in terms of rewards and sanctions and also the study revealed that most fire stations are not committed to formulating teamwork policies that seeks to respond to continuous use of PMIS-based disaster management projects. However, when fire station formulates teamwork policies with respect to adoption of PMIS at the fire stations, the adoption of PMIS improves by 48.0% in terms of policy appropriateness, availabilities, and responsiveness.

The study revealed that the fire stations have a policy on the formation of teams for various projects related to disaster management however the study also noted that there was no team specifically formed to handled PMIS related disaster management projects with only 34.7% of the respondents agreeing that there was a team for the same. This supported the findings of DeMarco and Lister (2013) who noted that for projects to be productive there must be policies supporting both the formation of the teams and the teams being involved in specific projects which includes information technologies like PMIS. Dennis (1999) while reviewing past, present and proposed fire projects in Indonesia also found that there is a positive relationship between teamwork policies availabilities and team formation specifically to handle PMIS in disaster management projects. The research also established that there is a close relationship between policy appropriateness and the adoption of PMIS in disaster management projects with most of the respondents concluding that policies within the fire station rewards and sanctions individuals within the fire station. This finding supports that of Rehman *et al.* (2007) who while studying factors affecting technology adoption in livestock farming system found out that one of the factors hindering technology adoption is the appropriateness of the technology. This research therefore shows pragmatically that the adoption of PMIS in disaster management projects needs to consider beliefs, attitudes and specific needs of the potential users including the fire stations and integrated system.

The study also found out that most fire stations did not have responsive policies that addresses the continuous usage of PMIS in disaster management projects however most of the respondents agreed that there was team interdependent on each other with the various phases of the project to ensure successful completion. While conducting a synthesis of fire policy and science, Dellasala (2004) agrees that policies needs to have direct management priorities to be responsive to complexity of adoption of technology in projects. Further Sesan (2014) also while evaluating the context-responsive approaches to stove technology development in Nigeria and Kenya confirms that technology adoption in organizations like fire stations are cultural rather than economic but states that the context-responsiveness element of the technology is a direct factor of significance in PMIS adoption in disaster management projects.

Specific Objective 4: To examine the influence of stakeholders' involvement on the levels of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya

The elements of stakeholders' involvement include consulting the identified stakeholders in disaster management project on the PMIS adoption process, seeking their participation in PMIS adoption in all the phases of the disaster management projects, through training to understand the changes that will be brought about by embracing the new technology (Pearce & Rice, 2013). The study went out to enquire whether the involvement of stakeholders' taking into its dimensions of consultation, participation, and training have an influence on the levels of PMIS adoption.

From this research it was found that there is a positive correlation between stakeholders' involvement and the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya. It was found that stakeholders' involvement has a positive influence on the adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya. Stakeholders' involvement was found to contribute to a 48.6% variance in the adoption of PMIS in disaster management projects in fire stations. This is consistent with findings from a similar study by Zook *et al.* (2010) who found out that stakeholder involvement has a positive influence on the level of adoption of technology like PMIS. The study found out that information technology adoption depended heavily on the stakeholders whose adoption levels of the same technology could make a quantifiable difference in disaster management projects related to relief and aid agencies. Further it asserts that stakeholders influence in PMIS adoption gives power to new avenue of interaction between the disaster management project implementation and new innovations for improvement within the station itself. Further Dodgson, Gann, and Salter (2010) in their simulation technology and organization in fire engineering with a focus on the use of elevators in cases of fire confirms that stakeholders' involvement in technology adoption is the key to its success in usage. They assert that stakeholders play a key influence in PMIS adoption in fire stations and as such every technology adoption process should strive to put in place a framework that explores how the tensions between the various stakeholders are dealt with and appreciated for a negotiated future success in adoption of technology-based disaster management projects like PMIS.

The study also found out that the fire stations have not considered consultative forums on the use of PMIS in disaster management projects in fire stations in

Nairobi Metropolis, Kenya. Further the study was able to establish that the stations were not able to take into consideration grievances from the stakeholders who included the fire station members on the use of technology-based application like PMIS in disaster management projects. When the opinions of the stakeholders are not taken into considerations there is a general feeling that they do not own the technology, its application and operations in the various disaster management projects (Njoki, 2013). This is confirmed also by Oliveira and Welch (2013) in their study of social media technology use in local government revealing that local governments use of social media technology in government projects including disaster management projects does not in most cases consider the grievances of all the stakeholders involved. Further they note that stakeholders play a key role in technology adoption in any organization and should therefore be considered in every step of its adoption and their input taken into considerations.

The study also established that the fire stations are required by law to seek the participation of all stakeholders in projects affecting them directly or indirectly including the disaster management projects. The study also revealed that the fire stations did lack important component of stakeholder involvement which was training as majority in the fire stations stated that they lack important trainings on PMIS and skills that can be considered above average in relation to PMIS use and application. Further the research revealed that most of the fire stations do not involved their stakeholders in training as a component of stakeholder involvement in disaster management project implementation. The findings revealed that majority of the fire station members usually lacked important trainings on the use of PMIS in disaster project management. This finding agrees with that of Gagnon *et al.* (2012) that found out that the technology adoption environment coupled with non-involvement of stakeholders through training as a component directly influences the levels of adoption of the same technology.

5.3 Conclusions

On the basis of the research and data analysis, the following conclusions were made from the findings.

5.3.1 Influence of Top Management Support

From the study it is concluded that top management support has a significant positive influence on the levels of adoption of PMIS in disaster management in fire stations in Nairobi Metropolis, Kenya. When top management factors (perceived PMIS usefulness, key-staff involvement, and communication) were used, it was found out that there was a 56.9% variance in level of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya. Among the three factors of top management, perceived PMIS usefulness and key-staff involvement are considered highly significant factors which influence adoption of PMIS. However, communication has the least influence on the adoption of PMIS.

Therefore, top management support influences the levels of PMIS adoption to a very great level. Based on the results of the study, it is concluded that using only perceived PMIS usefulness and key-staff involvement is not sufficient to improve the adoption of the PMIS. If all fire stations in Nairobi Metropolis use all the top management support factors together, they will increase the adoption of PMIS. This is because there is a strong positive correlation between top management support and level of PMIS adoption. From this study it is also concluded that demographic characteristics have a significant influence on the level of PMIS adoption in disaster management projects in fire stations in Nairobi Metropolis, Kenya. With demographic factors as the only independent variables, the level of adoption of PMIS in disaster management projects in fire stations will change by 36.0%. From the obtained data it was concluded that there is a significant influence of respondent station, respondent experience at the station, and fire stations' PMIS implemented on the perception of the fire station about top management support on the level of adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya.

This study therefore generally concludes that top management support is one of the most critical components of PMIS adoption across all fire stations in disaster management projects. Implementation of top management support factors results in greater adoption of technology-based adoption in disaster management projects in fire stations in Kenya.

5.3.2 Influence of Capacity Availabilities

From the findings of the study, it is concluded that capacity availabilities have a high influence on the levels of adoption of PMIS in disaster management projects in fire stations in Nairobi Metropolis, Kenya. From the study it is concluded that capacity availabilities influence PMIS adoption to a great extent. The use of capacity availabilities explains a 62.4% variance in the adoption of PMIS in disaster management projects. The role of the fire station is seen in ensuring they are able to attract, retain, motivate and develop capacities according to current and future requirements in technology adoption-based systems like PMIS and in line with the findings from other earlier studies done by Njoki (2013). Capacity availabilities is occurring for those fire stations that are focused more knowledge and skills, innovation, and sustainability in disaster management projects. From the obtained data it is also concluded that a significant number of the fire stations does not have in place a dedicated team with information technology knowledge and skills to handle PMIS operations and reporting in disaster management projects.

The specific strategies used in capacity availabilities will therefore directly impact the success of PMIS adoption in disaster management projects in fire stations. From this study it was found out that there is a significant positive link between a formal PMIS training at the fire station and its adoption and the study concludes that majority of the fire stations do not have in place a formal training in relation to PMIS application in disaster management projects at the station. The study concludes that innovative capacity availabilities have a significantly high influence on the adoption on PMIS in disaster management projects in fire stations. This study also concludes that sustainability in capacity availabilities plays a significant influence in adoption of PMIS in disaster management projects and further concludes that the focus for sustainability should be on autonomous reporting, employment of dedicated personnel, shared vision of PMIS application in day-to-day usage and long-term objectives, generating all reporting using PMIS for future records, and mentorship programme for new recruits without PMIS skills and knowledge.

5.3.3 Influence of Teamwork Policies

From this study it is concluded that teamwork policies influence the levels of adoption of PMIS in disaster management projects in fire stations in Kenya. The use of teamwork policies explains a 48.0% variance in adoption of PMIS in disaster management projects. From this study, it is concluded that there is a significant direct positive relationship between teamwork policies and adoption of PMIS. The results of correlation matrix have supported the hypothesis that there exists a positive relationship between teamwork policies and adoption of PMIS. Based on the findings of this study, it is concluded that teamwork policies influence adoption of PMIS which in turn influence the performance of the fire station in disaster management projects implementation. Malcolm (2010) did a similar study and found a positive correlation between teamwork policies and perceived adoption of PMIS. Njoki (2013) on the other hand did a study on the factors influence the adoption of PMIS in construction projects in Nairobi County and found out that lack of effective teamwork policies in project implementation lowers the levels of adoption of PMIS and this impact negatively on the productivity of the fire stations.

From the study it is concluded that majority of the fire stations have a standard policy on the formation teams. Teamwork policies availabilities have a significant contribution to make to the success of adoption of PMIS in disaster management projects. Fire station policies play a very important role in the adoption of PMIS in disaster management projects and in the achievement of the fire stations strategic plan by consistently updating the expertise to meet the present and future adoption demands. The fire stations use policies setup to ensure there is appropriateness in application of technologies like PMIS in their projects and that the policies respond to the requirement of the adoption process. Apart from the fire stations having policies that influences the formation of teams within the work station, the study concluded that majority of the fire stations have not constituted the teams to specifically respond to PMIS adoption in disaster management projects. Fire stations in Kenya therefore use policies in order to create understanding among the fire personnel on their duties, attitudes and behaviour geared towards disaster projects implementation. The development of specific policies directed towards core skills in PMIS is therefore key to its adoption in disaster management projects at the fire stations.

5.3.4 Influence of Stakeholder Involvement

From this study it is concluded that stakeholder involvement influences the adoption of PMIS in disaster management projects in fire stations to a greater extent. Stakeholder involvement contributes to a significant 48.6% variance in adoption of PMIS in disaster management projects in fire stations. From this research, it was found that there is a positive correlation between stakeholder involvement in projects and the adoption of PMIS in disaster management projects in fire stations in Nairobi Metroplolis, Kenya. From the study it can be concluded that majority of the fire stations does not consult with its stakeholders on their involvement on the use of PMIS in disaster management projects. This meant that most of the fire stations had not largely considered consultative forums with the stakeholders as a way of ensuring there is a high implementation orders are achieved in the adoption of PMIS in disaster management projects. And as such many of the stakeholders can be concluded from the study that they are aggrieved that their input is not necessarily needed or considered.

It can however be observed that the fire stations are required by law, regulation and standard policies within Kenya to engage the stakeholders in technology adoption which includes the adoption of PMIS in disaster management projects. It can also be concluded that majority of the respondents sampled in this study lay more emphasis on training as an aspect of stakeholder’s involvement rather than the actual managerial recommendations on technology usage. This could imply that they played a major role in influencing the overall adoption of PMIS in disaster management projects in fire stations. It is widely expected that the stakeholder involvement be part of the fire stations policies. This would help fire stations achieve congruence between PMIS adoption and the stakeholder involvement strategy chosen.

5.4 Recommendations

Based on the findings and conclusions of the study, the study provides the following recommendations aimed at ensuring that the factors of PMIS adoption adopted by fire stations in Kenya plays a positive impact in ensuring improvement levels on the adoption of technology in disaster management projects.

5.4.1 Fire Stations Top Management Support

Factors of technology adoption: top management support, capacity availability, teamwork policies, and stakeholder involvement influence the adoption of PMIS in disaster management projects in fire stations. The consideration of PMIS perceived usefulness, key-staff involvement, communication, knowledge and skills, innovativeness, sustainable team, policies availabilities, policies appropriateness, policies responsiveness, consultation, participation, and training are considered a significant insight for fire station managers. The results of this study have demonstrated that factors of PMIS adoption are crucial to the success of its level of adoption in disaster management projects. Fire stations should therefore through their managers be actively involved in reviewing the factors of technology adoption as it has a direct influence on the station achieving its goal of successful implementation of a technology like PMIS and subsequent success in its adoption in disaster management projects. The results of this study have helped to determine the crucial factors of PMIS adoption in disaster management projects in fire stations and recommends that fire stations focus on the application of these factors to ensure level of PMIS adoption are successful. In addition, this study recommends that fire stations increasingly recognise the role played by the key factors and in particular, the stakeholders’ involvement as it is key to achieving the other factors.

5.4.2 Policies to Support PMIS Adoption

Fire station in Kenya should match their technology adoption strategies with dynamic environment and adoption factors with environment in order to achieve fire station outcomes and fire station bottom-line successes in technology adoption. Fire stations in Kenya should therefore develop and document strategies for top management support, capacity availability, teamwork policies, and stakeholder involvement to enhance the adoption of PMIS in disaster management projects. The fire stations intending to improve their disaster project management should therefore ensure that the way they implement the factors of adoption is unique in order to ensure that they have a competitive edge and have all stakeholders on board. These findings recommend that fire stations should carefully consider the alignment of PMIS adoption to the disaster management project being implemented and factors of importance consideration so that they support and supplement one another. In addition, it is proposed that in light of these findings, the fire station policy makers evaluate technology adoption practices and levels of adoption of technology and specifically PMIS to ascertain the degree to which they are aligned to the factors of PMIS adoption.

5.4.3 Theoretical Implication

The findings of this research confirmed that factors in this study had four dimensions: top management support, capacity availability, teamwork policies, and stakeholder involvement on the adoption of PMIS and they underlay a single main factor which was factors of influence, the independent variable of this study. These converged to the hypothesized model with levels of adoption of PMIS being the dependent variable, therefore since this was adapted from Charmaz (2008); Gubrium and Holstein (1997); and Henwood and Pidgeon (2003), their adaption topology could be used to determine the factors influencing levels of adoption of PMIS in fire stations in Kenya. This meant that although these factors of technology adoption levels were developed using literature and theoretical context from the western developed countries, their items converged to fit to their respective dimensions and concluded that configurationally, the theory was applicable in the Kenyan context.

Therefore, it is recommended that the models presented by the scholars Charmaz (2008), Gubrium and Holstein (1997), and Henwood and Pidgeon (2003) can be applied in the Kenyan context.

5.4.4 Involving Stakeholders in PMIS Adoption Process

From the study it is recommended that scholars and practitioners in project management and disaster management should actively engage in joint research that will be used to assist fire station managers to effectively understand the link between factors of technology adoption and the success of technology adoption in disaster management projects. The academic research will be a foundation in ensuring that there is consistency between the theory of PMIS adoption and its practice. Training institutions including universities and colleges should work together with project management professionals to develop curriculum for teaching students taking disaster management and projects management to ensure a proper link between theory and practice. It should also be made mandatory for students to attend internships or industrial attachment before they graduate in order to apply the learned theories in class in practical fire station environment. This will ensure that the graduate leaving the training institutions have the pre-requisite orientation skills in technological application in disaster management projects and that the factors of adoption are clear and candid.

5.5 Suggestions for Further Research

The findings of the study, as summarized in the previous section have several implications of theory, methodology, and practice.

5.5.1 Theoretical Studies and Academic Implications

The findings of this study have contributed to the existing stock of knowledge in the literature of levels of Project Management Information Systems (PMIS) adoption in disaster management projects by relating this to the experience of fire station community in a developing country. Despite this known fact of the importance of factors influencing PMIS adoption in disaster management projects in fire stations, there had been a gap in empirical knowledge in developing countries, in this case Kenya, about the factors influencing the levels of PMIS adoption in disaster management projects in public fire stations. Therefore, the findings of this study have contributed to filling this knowledge gap.

This study laid its emphasis on the definition of factors of influencing the levels of PMIS adoption as top management support (perceived PMIS usefulness in disaster management projects, key staff involvement, and communication), capacities Availability (knowledge and skills availability, innovativeness of station towards use of PMIS, and sustainable team at the station linked to the PMIS technology), teamwork policies (policies availability, their appropriateness to the fire station environment, and the policy response which is verifiable), and stakeholders involvement (participation, consultation, and training). A study should be carried out to cover the other aspects of technology adoption orientation that influence the levels of adoption other than top management support, capacities availability, teamwork policies, stakeholders' involvements; and their dimensions of perceived PMIS usefulness, key-staff-involvement, communication, knowledge & skills, innovativeness, sustainable team, policies availability appropriateness and responsiveness, and stakeholder's consultation, participation, and training.

This study did not consider any moderating effect on the factors influencing the levels of PMIS adoption. Other studies could be undertaken to look into the moderating effects factors related to the fire stations, the disaster management projects, or the environment.

5.5.2 Studies on Methods and Methodological Implications

This study employed explorative design and utilised both qualitative and quantative approaches. Though qualitative results from the study disclosed that the factors indicated influenced the levels of PMIS adoption in disaster management projects at the fire station, unavailability of reliable disaster management project data from the respective fire stations had to be obtain from their union umbrella KENFIBA database to establish the actual number of projects undertaken by the fire stations and at the same time establish actual and true level of PMIS adoption at the station. Attempting to examine the factors influencing levels of PMIS adoption should not be dependent solely on reported quantitative PMIS adoption information that is provided qualitatively.

Models have been developed in this particular study and future studies could test all the factors and develop further models using the constructs used in this study as well as other known parameters relevant to the study.

5.5.3 Practice Implications

The findings of this study indicate that fire stations can improve their success rates in implementation of disaster management projects through considering the factors influencing the levels of PMIS adoption but only if this is based on the understanding of opportunities and threats of the environment where the fire station is operating within the weakness/strengths of internal operations and the systems that impact on their PMIS adoption levels. Future studies could evaluate these opportunities/threats – strengths/weaknesses influence as a means of establishing the levels of PMIS adoption in disaster management projects in fire stations.

5.5.4 Policy Intervention

The study was carried out during an electioneering period and intense political activities (2015-2017). Future studies could focus on periods of low political and economic turbulence. These kinds of comparative studies could help key policy developers and their implementation arms in understanding the technology usage behaviour and reduce their effects on the levels of PMIS adoption in disaster management project. The study findings reveal that only 8.3% of the fire station personnel were female. This requires a policy implementation attention. If Kenya is to achieve the two thirds gender rule as stipulated in its constitution of 2010, then a policy focusing on gender balance at the fire stations should be looked into.

REFERENCES

Adams, N. B. (2002). Educational computing concerns of postsecondary faculty. *Journal of Research on Technology in Education*, *34*(3), 285 – 303.

Adler, N. (1996). *International Dimensions of Organizational Behaviour.* Cincinnati: Southwestern.

Agarwal, R and Prasad J (1998), "A conceptual and operational definition of personal innovativeness in the domain of Information technology", Information system research, Vol.9, No.2, pp 204-215

Ahmad, R., Kyratsis, Y., & Holmes, A. (2012). When the user is not the chooser: learning from stakeholder involvement in technology adoption decisions in infection control. *Journal of Hospital Infection*, *81*(3), 163-168.

Ahuja, V., Yang, J., & Shankar, R. (2010). Benchmarking framework to measure extent of ICT adoption for building project management. *Journal of construction engineering and management*, *136*(5), 538-545.

Aktaş, E., Özaydın, Ö., Bozkaya, B., Ülengin, F., & Önsel, Ş. (2013). Optimizing fire station locations for the Istanbul metropolitan municipality. *Interfaces*, *43*(3), 240-255.

Ali, A.S., & Rahmat, I., (2010). The performance measurement of construction projects managed by ISO-certified contractors in Malaysia. *Journal of Retail & Leisure Property* (2010) 9, 25–35.

Armstrong, M.A. (2009).*A Handbook of Human Resources Management*. (11th ed.). London: Kogan Page.

Bagozzi, R. P. (2007). "The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift," *Journal of the AIS* (8:4), pp. 244-254.

Bai, L., and Ying, Z. (2008). Improving inventory management in small businesses. A case study. A doctoral dissertation, Jonkoping International Business School, Jonkoping University. Available from ProQuest Dissertations and Thesis database. (UMI No.3327832).

Bailur, S. (2007). Using Stakeholder Theory to Analyze Telecenter Projects. *Information Technologies and International Development*, 3(3), 61-80. http://dx.doi.org/10.1162/itid.2007.3.3.61

Bajwa, D. S., Lewis, L. F., Pervan, G., & Lai, V. S. (2005). The adoption and use of collaboration information technologies: International comparisons. *Journal of Information technology*, *20*(2), 130-140.

Barki, H., & Huff, S. L. (2005). Change, attitude to change, and decision support system success. *Information & Management*, *9*(5), 261-268.

Barney, J.B. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-120.

Bassellier, G., & Benbasat, I. (2004). Business competence of information technology professionals: Conceptual development and influence on IT-business partnerships. *MIS quarterly*, 673-694.

Becker, E. (2001, August 27). Prairie farmers reap conservation's rewards. *The New York Times*. Retrieved from http://www.nytimes.com

Benbasat, I., & Barki, H. (2007). Quo vadis, TAM? *Journal of the Association for Information Systems, 8*, 211–218.

Benjamin, R. I., & Levinson, E. (1993). A Framework for Managing IT-Enabled Change. *Sloan Management Review*, Summer 1993, 23-33.

Bernard, J. M., & Goodyear, R. K. (2014). Technology in Supervision (5th ed.). Boston: Pearson Education, Inc.

Bertalanffy, von, L. (1968). *General systems theory*. New York: Braziller.

Bharosa, N., Lee, J., & Janssen, M. (2010). Challenges and obstacles in sharing and coordinating information during multi-agency disaster response: Propositions from field exercises. *Information Systems Frontiers*, *12*(1), 49-65.

Birnbaum, R. (1988). *How colleges work: The cybernetics of academic organization and leadership*. San Francisco: Jossey-Bass.

Bischak, D.P., et al. (2013). Analysis and management of periodic review, order-up-to level inventory systems with order crossover. *Production and Operations Management*.

Bissell, R. (2005). Future challenges to human survival in the 21st century. In W. L. Waugh & A. Young (Eds.). *The future of emergency management: Papers from the 2005 Higher Education Conference (pp. 3 -6).* Emmitsburg, MD.

Blayse, A. M., & Manley, K. (2004). Key influences on construction innovation. *Construction innovation*, *4*(3), 143-154.

Boon, C, Paauwe, J, Boselie, P & Den Hartog, DN 2009, 'Institutional Pressures and HRM: Developing Institutional Fit', *Personnel Review*, vol.38, no. 5, pp. 492-508.

Boulding, K. (1978). *Ecodynamics: A New Theory of Societal Evolution*. Beverly Hills, CA: Sage Publications.

Bowen, M., Morara, M., & Mureithi, M. (2009). Management of business challenges among small and micro enterprises in Nairobi-Kenya. *KCA journal of business management*, *2*(1).

Boxell, P., F., and Purcell, J. (2003). Strategic and Human Resource Management. Palgrave Macmillan. *Business and Economics.* Vol.2.

Burr, V. (1995), *An introduction to social constructionism*. London, UK: Routledge

Bwisa, H. (2008). Your Proposal Writing Companion. How to write a problem statement (1st ed., Vol.1, pp. 1 – 15). Nairobi, Kenya: Henry M. Bwisa, Professor of Entrepreneurship.

Bwisa, H. (2015a). What is a theoretical framework?. Resource categories. *Professor Bwisa eLearning Portal. Accessed October 17, 2015. Available at: http://www.professorbwisa.com/index.php?option=com_content&view=article&id=132:theoretical-framework*

Bwisa, H. (2015b). A guide to research methods: Common methods and types of social science research. Resource categories. *Professor Bwisa eLearning Portal. Accessed November 23, 2015. Available at: http://www.professorbwisa.com/index.php?option=com_content&view=article&id=135:research-methods*

Callero, P.L., Howard, J.A., & Piliavin, J.A. (1987). Helping behavior as role behavior: Disclosing social structure and history in the analysis of prosocial action. *Social Psychology Quarterly*, 50(3), 247-256.

Caniels, M. C.J., & Bakens R. J.J.M. (2011). The effects of Project Management Information Systems on decision making in a multi project environment. Retrieved 18/09/2015 from http://goo.gl/oeq4p

Casner, M., Andersen, D., & Isaacs, S. M. (2005). The impact of a new CPR assist device on rate of return of spontaneous circulation in out-of-hospital cardiac arrest. *Prehospital Emergency Care*, *9*(1), 61-67.

Chan, T. C., Killeen, J., Griswold, W., & Lenert, L. (2004). Information technology and emergency medical care during disasters. *Academic emergency medicine*, *11*(11), 1229-1236.

Charmaz, K. (2008). Constructionism and Grounded Theory. In J. A. Holstein & J. F. Gubrium (Eds.), *Handbook of Constructionist Research* (pp.397-417). New York: The Guilford Press.

Chatora, G. (2005). A critical evaluation of the Regional Disaster Response Training Programme of the International Fideration of Red Cross and Red Crescent Societies in Southern African (2000 – 2004). *Zimbabwe Open University, Harare.*

Checkland, P. (1981). Systems Thinking, Systems Practice. Chichester: Wiley.

Checkland, P., & Scholes, J. (1990). Soft Systems Methodology in Action. Chichester: John Wiley and Son.

Chen, R., Sharman, R., Rao, H. R., & Upadhyaya, S. J. (2008). Coordination in emergency response management. *Communications of the ACM*, *51*(5), 66-73.

Childs, M. (2010). Learners' Experience of Presence in Virtual Worlds. *Thesis Dissertation.* Submitted at the University of Warwick, Institute of Education.

Choudhary, A. K., Thakur, S. K., & Suri, V. K. (2013). Technology transfer model on integrated nutrient management technology for sustainable crop production in high-value cash crops and vegetables in northwestern Himalayas. *Communications in soil science and plant analysis*, *44*(11), 1684-1699.

Choudrie, J., & Dwivedi, Y. K. (2006). Investigating factors influencing adoption of broadband in the household. *Journal of Computer Information Systems*, *46*(4), 25-34.

Chua, C. E. H., Straub, D. W., Khoo, H. M., Kadiyala, S., & Kuechler, D. (2005). The Evolution of E-Commerce Research: A Stakeholder Perspective. *Journal of Electronic Commerce Research*, 6(4), 262-279.

Chung, W., Chen, H., & Reid, E. (2009). Business stakeholder analyzer: An experiment of classifying stakeholders on the web. *Journal of the American Society for Information science and Technology*, 60(1), 59–74.

Clarkson, M.B.E., (1998). "A Stakeholder Framework for Analysing and Evaluating Corporate Social Performance," Academy of Management Review,20(1), pp. 92-117.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). *Applied multiple regression/correlation analysis for the behavioral sciences*. Routledge.

Corbin, J. & Strauss, A. (1990). Grounded theory method: Procedures, canons, and evaluative criteria. Qualitative Sociology, 13, 3-21.

Coser, L., R. (1975). The Complexity of Roles as a Seedbed of Individual Autonomy", in: *The Idea of Social Structure: Papers in Honor of Robert K. Merton, 1975*

Craig, H., S. (2013, October 15). The Industrial Fire World, A training in concept. *IFW News. Saudi Aramco Embraces Live Training Concepts*. Volume 23, No.2. Accessed November 23, 2015. Retrieved from http://fireworld.com/Archives/tabid/93/articleType/ArticleView/articleId/86879/TRAINING-IN-CONTEXT.aspx

Creswell. J. (2003). *Research Design: Qualitative, Quantitative, and Mixed Approaches,* (2nd Ed.). New Dehli. Sage Publications.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests, *Psychometrika*, *16*, 297– 334

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *Management Information Systems Quarterly* Vol.13 (3). pp.319-339.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science*, *35*(8), 982-1003.

Degel, D., Wiesche, L., Rachuba, S., & Werners, B. (2014). Reorganizing an existing volunteer fire station network in Germany. *Socio-Economic Planning Sciences*, *48*(2), 149-157.

Del Aguila-Obra, A. R., & Padilla-Melendez, A. (2006). Organizational factors affecting Internet technology adoption. *Internet research*, *16*(1), 94-110.

del Carmen Haro-Domínguez, M., Arias-Aranda, D., Lloréns-Montes, F. J., & Moreno, A. R. (2007). The impact of absorptive capacity on technological acquisitions engineering consulting companies. *Technovation*, *27*(8), 417-425.

Dellasala, D. A., Williams, J. E., Williams, C. D., & Franklin, J. F. (2004). Beyond smoke and mirrors: a synthesis of fire policy and science. *Conservation Biology*, *18*(4), 976-986.

DeMarco, T., & Lister, T. (2013). *Peopleware: productive projects and teams*. Addison-Wesley.

Dennis, R. (1999). *A review of fire projects in Indonesia, 1982-1998*. CIFOR.

Dewick, P., & Miozzo, M. (2004). Networks and innovation: sustainable technologies in Scottish social housing. *R&D Management*, *34*(3), 323-333.

Dierickx, I.; Cool, K. (1989), Asset Stock Accumulation and Sustainability of Competitive Advantage. Management Science; 35, (12), pp. 1504–1511.

DiMaggio, PJ & Powell, W (1991), 'Introduction', *The New Institutionalism in Organizational Analysis*, The University of Chicago Press, Chicago.

Dodds, W. B., Monroe, K. B., and Grewal, D. (1991). "Effects of Price, Brand, and Store Information on Buyers," *Journal of Marketing Research* (28:3), pp. 307-319.

Dodgson, M., Gann, D. M., & Salter, A. (2007). "In case of fire, please use the elevator": Simulation technology and organization in fire engineering. *Organization Science*, *18*(5), 849-864.

Dong, L., Neufeld, D. and Higgins, C. (2009) 'Top management support of enterprise
systems implementations', *Journal of Information Technology,* **24** (1), 55-80

Drabek, T., E. (2005). Theories relevant to emergency management versus a theory of
emergency management. *Journal of emergency management 3,* No. 4, Pp.52

Drabek, T.E., Hoetmer, G.J. (1991) Emergency management: principles and practice for local government, International City Management Association, Washington DC.

Drucker, P., F., (2002). *The Effective Executive Revised.* Harper Collins.

Dyer, J. (2005). *Human Resource Management: Evolving Roles and Responsibilities.* Washington DC: Bureau of National Affairs.

Eden, C., & van der Heijden, K. (1993). The Relationship between Stakeholder Analysis and Scenario Planning (Paper Presented in the Strategy Seminar, at the London School of Economics), Strathclyde Business School.

Eriksson, P.E., & Westerberg, M., (2011). Effects of cooperative procurement procedures on construction project performance: A conceptual framework. *International Journal of Project Management,* 29 (2), 197-208.

EVAN, W. M. and FREEMAN, R. E. (1993). "A Stakeholder Theory of Modern Corporation: Kantian Capitalism". In Beauchamp and Bowie, Ethical Theory and Business, Prentice Hall.

Feder, G. & Slade, R. (1984) "The acquisition of information and the adoption of new Technology." *American Journal of Agricultural Economics*. American Agricultural Economics Association. 66 (August 1984):312-320.

Feder, G., E. R. Just and D. Zilberman. (1985) "Adoption of Agricultural Innovations in Developing Countries: A Survey." *Economic Development and Cultural Change.* 33:255-298.

Finegold, D., & Frenkel, S. (2006). Managing people where people really matter. The management of human resource in biotech companies. *International Journal of Human Resource Management*. 17(1), 1-24.

Fogarty, L. G., Pearce, H. G., Catchpole, W. R., & Alexander, M. E. (1998, November). Adoption vs. adaptation: lessons from applying the Canadian forest fire danger rating system in New Zealand. In *Proceedings, 3rd International Conference on Forest Fire Research and 14th Fire and Forest Meteorology Conference, Luso, Coimbra, Portugal* (pp. 1011-1028).

Freeman, R. E. (1984). Strategic Management: A Stakeholder Approach. Boston: Pitman.

French, S. (1996). Multi attribute decision support in the event of a nuclear accident. *Journal of Multi Criteria Decision Analysis*, *5*(1), 39-57.

Gaba, D. M. (2010). Crisis resource management and teamwork training in anesthesia.

Gagnon, M. P., Desmartis, M., Labrecque, M., Car, J., Pagliari, C., Pluye, P., ... & Légaré, F. (2012). Systematic review of factors influencing the adoption of information and communication technologies by healthcare professionals. *Journal of medical systems*, *36*(1), 241-277.

Gairson, P., S. (2013). Examining the value of fire prevention inspections in commercial occupancies. *Online Theses and Dissertations.* Paper 167.

Galegher, J., Kraut, R. E., & Egido, C. (2014). *Intellectual teamwork: Social and technological foundations of cooperative work*. Psychology Press.

Gallivan, M. J. (2000) 'Examining workgroup influence on technology usage: a community of practice perspective', *Proceedings 2000 ACM SIGCPR,* The conference on Computer personnel research, ACM Press Chicago, IL, 54–66

Geist, H. J., & Lambin, E. F. (2002). Proximate causes and underlying driving forces of tropical deforestation: Tropical forests are disappearing as the result of many pressures, both local and regional, acting in various combinations in different geographical locations. *BioScience*, *52*(2), 143-150.

Gergen K. J. *(1978). Toward generative theory. Journal of Personality and Social Psychology, 36, 1344-1360.*

Gerhart, B., Minkhoff, H.B., & Olsen, R.N. (1995). Employee compensation, theory, practice, and evidence. Center for Advanced Human Resource Studies, Cornell University, Ithaca, NY: working paper 95-04.

Gershner, V. T., & Snider, S. L. (2001). Integrating the use of internet as an instructional tool: Examining the process of change. *Journal of Educational Computing Research, 25*(3), 283-300.

Glaser, B. & Strauss, A. (1967). The Discovery of Grounded Theory: Strategies for Qualitative Research. Chicago: Aldine.

GOK, (2007). Kenya Vision 2030: A Globally Competitive and Prosperous Kenya, Government of Kenya, Nairobi, Kenya.

Granito, J. (2014), "Evaluation and Planning of Public Fire Protection," NFPA Fire Protection Handbook, Seventeenth Edition, Arthur E. Cote. P.E., Jim L. Lingville, eds., National Fire Protection Association, Sec. 10, Chapter 4, 10-43.

Grant, R. (2008). *Contemporary Strategy Analysis.* (6th ed.) Oxford: Blackwell.

Green, B. L., Grace, M. C., & Gleser, G. C. (1985). Identifying survivors at risk: Long-term impairment following the Beverly Hills Supper Club fire. *Journal of Consulting and Clinical Psychology*, *53*(5), 672.

Grewal, R& Dharwadkar, R2002, 'The Role of the Institutional Environment in Marketing Channels', *Journal of Marketing*, vol. 66, no. 3

Gubrium, J. F., & Holstein, J. A. (1997). *The new language of qualitative method.* New York: Oxford University Press.

Gupta, B., Dasgupta, S., and Gupta, A. (2008). "Adoption of ICT in a Government Organization in a Developing Country: An Empirical Study," *Journal of Strategic Information Systems* (17:2), pp. 140-154.

Haddow, G., Bullock, J., Coppola, D. P., (2007). *Introduction to emergency management*. Butterworth-Heinemann.

Hall, G. E. (1979). The concerns-based approach to facilitating change. Educational Horizons, 57, 202–208.

Hall, G. E., & Hord, S. M. (2001). *Implementing change: Patterns, principles, and potholes*. Boston: Allyn and Bacon.

Hall, G.E., George, A.A., & Rutherford, W.L. (1979). *Measuring stages of concern about the innovation: A manual for use of the SoC questionnaire* (2nd ed.). Austin, TX: Southwest Educational Development Laboratory.

Harper, J. K., M. E. Rister, J. W. Mjelde, B. M. Drees, and Way M. O. (1990). Factors influencing the adoption of insect management technology. *American Journal of Agricultural Economics.* 72(4) (November 1990):997-1005.

Haslama, R.A., Hidea, S.A., Gibbb, A.G.F., Gyia, D.E., Pavitt, T., Atkinsona, S., & Duff, A.R. (2005). Contributing factors in construction accidents. *Applied Ergonomics* 2005; 36:401–15.

He, X. F., Cao, H., & Li, F. M. (2007). Econometric analysis of the determinants of adoption of rainwater harvesting and supplementary irrigation technology (RHSIT) in the semiarid Loess Plateau of China. *Agricultural water management*, *89*(3), 243-250.

Henwood, K., & Pidgeon, N. (2003). Grounded theory in psychological research. In P. M. Camic, J. E. Rhodes, & L. Yardley (Eds.), *Qualitative research in psychology: Expanding perspectives in methodology and design* (pp. 131–155). Washington, DC: American Psychological Association.

Herawati, H., & Santoso, H. (2011). Tropical forest susceptibility to and risk of fire under changing climate: A review of fire nature, policy and institutions in Indonesia. *Forest Policy and Economics*, *13*(4), 227-233.

Holland, C. P., & Light, B. (1999). A critical success factor model for ERP implementation. *IEEE Software, 16*(3), 30–36.

Hong, S. J., Thong J. Y. L., and Tam, K. Y. (2006).. "Understanding Continued Information Technology Usage Behavior: A Comparison of Three Models in the Context of Mobile Internet, *"Decision Support Systems* (42:3), pp. 1819-1834.

Hsu, C. L., Lu, H. P., & Hsu, H. H. (2007). Adoption of the mobile Internet: An empirical study of multimedia message service (MMS). *Omega*, *35*(6), 715-726.

Igbaria, M., Zinatelli, N., Cragg, P., and Cavaye, A. L. M. (1997). "Personal Computing Acceptance Factors in Small Firms: A Structural Equation Model," *MIS Quarterly* (21:3), pp. 279-305.

Infante, D.A., Rancer, A.S. & Womack, D.F. (1997). *Building communication theory*. Prospect Heights, Illinois: Waveland Press. itSMF Finland & Kuopio University 2008, *IT service management survey*, itSMF Finland

International Federation of Red Cross. (IFRC, 2010). World Disasters Annual Report 2004: Urban Risks. Accessed on November 23, 2015: https://www.ifrc.org/en/publications-and-reports/world-disasters-report/wdr2010/.

International Federation of Red Cross. (IFRC, 2014). Analysis of contingency planning systems for Disaster Management Authorities in Southern Africa.

International Standards Organization. ([ISO], 2014). *Standards.* Retrieved from: http://www.iso.org/iso/home/standards.htm

ISDR (2013). UN Special Representative of the Secretary-General for Disaster Risk Reduction. Proposed elements for consideration in the post-2015 framework for disaster risk reduction. Geneva: *United Nations Office for Disaster Risk Reduction*; 2013. Available from: http://www.preventionweb.net/files/35888_srsgelements.pdf [cited 2015 Dec. 28].

ITU-WTD, (2003). World Summit on the Information Society, World Telecommunications Development Report, ITU, Geneva, Switzerland

Jackson, S.E., & Schuler, R.S. (1995). Understanding human resource management in the context of organizations and their environments. Annual Review of Psychology, 46, 237-204.

Jain, S., & McLean, C. (2003, December). Simulation for emergency response: a framework for modeling and simulation for emergency response. In *Proceedings of the 35th conference on Winter simulation: driving innovation* (pp. 1068-1076). Winter Simulation Conference.

Jaffe, E. D., & Pasternak, H. (1994). An attitudinal model to determine the export intention of non-exporting, small manufacturers. *International Marketing Review*, *11*(3), 17-32.

Jones, T. and Wicks, A. 1999: Convergent stakeholder theory. Academy of Management Review, 24, 206–21

Kaiser, M. G., & Ahlemann, F. (2010). Measuring Project Management Information Systems Success: Towards a Conceptual Model and Survey Instrument. Retrieved 15/07/15 from http://aisel.aisnet.org/ecis2010/20/

Kamau, T. (2013). *Information Technology Project Management Methodologies and Information Technology Projects Performance in Kenyan Commercial Banks* (Doctoral dissertation, University of Nairobi).

Kapucu, N. (2009). Inter-organizational coordination in complex environments of disasters: the evolution of inter-governmental disease response systems. *Journal of Homeland Security and emergency management,* 6 (1), 1-26.

Kapucu, N., & Van Wart, M. (2006). The emerging role of public sector in managing extreme events: Lessons learned. *Administration & society, 38(3), 279-308.*

Kariuki, J. N. (2011). *The relationship between the level of Technological innovation and financial Performance of commercial banks in Kenya* (Doctoral dissertation, university of Nairobi).

Karki, L. B., & Bauer, S. (2004, October). Technology adoption and household food security. Analyzing factors determining technology adoption and impact of project intervention: A case of smallholder peasants in Nepal. In *Proceedings of Deutscher Tropentag Workshop* (pp. 5-7).

Karodia, A. M., Cowden, R., & Magaba, M. (2014). The Impact of Technological Changes on Project Management at a Company Operating in the Construction Industry. *Nigerian Chapter of Arabian Journal of Business and Management Review*, *2*(9), 113-148.

Katz, D., & Kahn, R.L. (1978). The social psychology of organizations. New York, NY: Wiley

Kazi, A. K., & Mannan, M. A. (2013). Factors affecting adoption of mobile banking in Pakistan: Empirical Evidence. *International Journal of Research in Business and Social Science*, *2*(3), 54.

Kenya Airport Authority (KAA, 2014). Nairobi Airport Terminal Building. Retrieved from: aviationsafetynetwork.com

Kenya Law Reporting, (2012). Kenya County Governments Act No. 17 of 2012. Retrieved November 23, 2017, from KLR website: www.kenyalaw.org/klr/.../Acts/CountyGovernmentsAct_No17 of 2012.pdf

Kerr, S., and Newell, R. (2003). Policy-induced technology adoption: Evidence from the US Lead Phasedown. *Discussion Papers, Resources for the future.* 01-14. Accessed 23/11/2015 from: http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-01-14.pdf

Khan, Shaji A.; Lederer, Albert L.; and Mirchandani, Dinesh A. (2013) "Top Management Support, Collective Mindfulness, and Information Systems Performance," *Journal of International Technology and Information Management*: Vol. 22: Iss. 1, Article 6. Available at: http://scholarworks.lib.csusb.edu/jitim/vol22/iss1/6

Kim, H. W., Chan, H. C., and Gupta, S. (2007). Value-Based Adoption of Mobile Internet: An Empirical Investigation, *Decision Support Systems* (43:1), pp. 111-126.

Kim, H., and Joo, M. (2009). Project Management Information Systems for Construction Managers (CM): Current constituents and future extensions. *College of Architecture, Myongji University, Yongin, Korea. CM Division, Heerim Architects & Planners, Seoul, Korea.* S18-1

Kothari, C.R. (2004). *Research Methodology: Methods and Techniques,* (2nd Ed.). New Dehli: New Age International Publishers Ltd.

Kruger, C. N., & Johnson, R. D. (2010). Information management as an enabler of knowledge management maturity: A South African perspective. *International Journal of Information Management*, *30*(1), 57-67.

Kwak, Y. H., & Anbari, F. T. (2009). Analyzing project management research: Perspectives from top management journals. *International Journal of Project Management*, *27*(5), 435-446.

Laarmans, R. (1999). *Communicatie zonder Mensen*. Amsterdam: Uitgeverij Boom.

Lango, O., B. (2015). Critical Factors Influencing Success of Fire Safety Projects: A Case Study of Kiambu County Fire Stations. *International Journal of Social Sciences and Entrepreneurship*, 3 (1), 186-220

Laplume, A., Karan S., and Reginald L. (2008). Stakeholder Theory: Reviewing a Theory That Moves Us. *Journal of Management* **34** (6): 1152–1189. *doi*:*10.1177/0149206308324322*.

Lee Y., Kozar K., A, Larsen K., R., T. (2011). The technology acceptance model: past, present, and future. Communication Association for Information Systems; 12:752–80

Lee, S., & Brown, J. S. (2008). Examining broadband adoption factors: An empirical analysis between countries. *info*, *10*(1), 25-39.

Lee, Y., Fried, J. S., Albers, H. J., & Haight, R. G. (2012). Deploying initial attack resources for wildfire suppression: spatial coordination, budget constraints, and capacity constraints. *Canadian Journal of Forest Research*, *43*(1), 56-65.

Leeds-Hurwitz, W. (2009). Social construction of reality. In S. Littlejohn, & K. Foss (Eds.), Encyclopaedia of communication theory. (pp. 892-895). Thousand Oaks, CA: SAGE Publications, Inc. doi: http://dx.doi.org.ezproxy.fau.edu/10.4135/9781412959384.n344

Lertwongsatien, C., & Wongpinunwatana, N. (2003). E-commerce adoption in Thailand: An empirical study of Small and Medium Enterprises (SMEs). *Journal of Global Information Technology Management*, *6*(3), 67-83.

Leshem, S., and Trafford, V. (2007). Overlooking the conceptual framework. *Innovations in Education and Teaching International.* Oranim Academic College of Education, Israel, Anglia Ruskin University, UK.

Lewis, W., Agarwal, R., & Sambamurthy, V. (2003). Sources of influence on beliefs about information technology use: An empirical study of knowledge workers. *MIS quarterly*, 657-678.

Lienert, C., Sherrill, C., & Myers, B. (2001). Physical educators' concerns about integrating children with disabilities: A cross cultural comparison. *Adapted Physical Activity Quarterly, 18*(1), 1 - 17.

Lim, C.S. & Mohamed, M.Z., (2000). Criteria for project success, an exploratory reexamination. *International Journal of Project management* volume 17 no. 4 pp 243-248.

Lim, G., Ahn, H., & Lee, H. (2005). Formulating Strategies for Stakeholder Management: A Case-Based Reasoning Approach. Expert System Applications, 28(4). 831-840. Accessed November 18, 2015, http://dx.doi.org/10.1016/j.eswa.2004.12.038

Lindell, M. K., Prater, C., & Perry, R. W. (2006). *Wiley pathways introduction to emergency management*. John Wiley & Sons.

Littlejohn, S.W. (2001). *Theories of Human Communication*. Belmont, CA: Wadsworth/ Thomson Learning.

Luhmann, N. (1984). *Soziale Systeme. Grund einer allgemeinen Theorie*. Frankfurt am Main: Suhrkamp.

Mabry, L., Elliot, D. L., MacKinnon, D. P., Thoemmes, F., & Kuehl, K. S. (2013). Understanding the durability of a fire department wellness program. *American journal of health behavior*, *37*(5), 693-702.

Macharia, J. K., & Pelser, T. G. (2014). Key factors that influence the diffusion and infusion of information and communication technologies in Kenyan higher education. *Studies in Higher Education*, *39*(4), 695-709.

Majharul, T. (2012). Factors affecting the adoption of technological innovation by individual employees: An Australian study. *Faculty of Business and Government, University of Canberra, ACT 2601, Australia. Social and Behavioural Sciences.* 40 (2012) 52 – 57.

Malcolm, G. (2010). Prediction of the probability of large fires in the Sydney region of south-eastern Australia using fire weather. *International Journal of Wildland Fire*, *18*(8), 932-943.

Malerba, F., (2004). Sectoral systems of innovation: basic concepts, in: Malerba, F. (Eds.), Sectoral systems of innovation: concepts, issues and analyses of six major sectors. Cambridge University Press, Cambridge, pp. 9-41.

Mansell, S. (2013) Capitalism, Corporations and the Social Contract: A Critique of Stakeholder Theory. Cambridge: *Cambridge University Press*.

Mark, G., and Poltrock, S. (2004). Groupware adoption in a distributed organization: transporting and transforming technology through social worlds. *Information and Organization.* Vol. 14, 297 – 327. doi: 10.1016/j.infoandorg.2004.06.001.

Markard, J., Truffer, B., (2008). Technological innovation systems and the multi-level perspective: towards an integrated framework. Research Policy, 37 (4), 596-615.

Mathew, D. (2005). Information technology and public health management of disasters—a model for South Asian countries. *Prehospital and disaster medicine*, *20*(01), 54-60.

Mazvimavi, K., Twomlow, S. J., Belder, P., & Hove, L. (2008). An assessment of the sustainable adoption of conservation farming in Zimbabwe: Global theme on agroecosystems report no. 39.

McEntire, T. A., (2004). The Implementation of PMIS in disaster management projects: issues, barriers, and recommendations for improved scholarship. *Paper presented at the FEMA High Education Conference, Emmitsburg, Md.,2004*). http://training.fema.gov/EMIWEB/downloads/David%20Mcentire%20%20f0emergency%20management%20theory.pdf (Accessed October 25, 2015)

McNamee S. *(1994). Research as relationally situated activity: Ethical implications. Journal of feminist family therapy, 6, 69-83.*

Mead, G.H. (1934). Mind, Self, & Society: From the Stand-point of a Social Behaviorist, Chicago, IL: The University of Chicago Press.

Meyer, J., W., (1983). Social environments and organizational accounting, accounting, organization and society. *Academic of management review.* Vol.21.

Midgley, G. (Ed.) (2003). *Systems thinking*. London: Sage.

Miles, S. (2011). Stakeholder Definitions: Profusion and Confusion. EIASM 1st interdisciplinary conference on stakeholder, resources and value creation. IESE Business School, *University of Navarra*, Barcelona.

Mileti, D. (1999). Disaster by design: A reassessment of Natural Hazards in the United States. *Joseph Henry Press.* Washington, D. C. Pp. 65-104.

Ministry of Local Governments. (2009). *The draft national fire safety policy: A safer environment for operations and service delivery.* Nairobi, Kenya.

Mintzberg, H. (1983). *Structure in fives: Designing effective organizations*. Englewood Cliffs, N.J: Prentice-Hall.

Mishra, A. and Mishra, D. (2013). Applications of Stakeholder Theory in Information Systems and Technology. Inzinerine Ekonomika – Engineering Economics Journal. 24 (3), 254-266. http://dx.doi.org/10.5755/j01.ee.24.3.4618

Molina, J., 1999. On the relational view. Academy of Management Review, Dialogue, 23 (2), 184-185.

Montgomery, D. C., Peck, E. A., & Vining, G. G. (2015). Introduction to linear regression analysis. John Wiley & Sons.

Mugenda. O., & Mugenda. A., (2003). *Research methods; qualitative and quantitative approaches*. Nairobi; acts press

Mullen, J.D., G., W., Norton., & Reaves D.W. (1997). An Economic Analysis of Environmental Benefits of Integrated Pest Management. *Journal of Agricultural and Applied Economics.* Southern Agricultural Economics Association. 29 (2) (December 1997):243-253.

Mwaura, A. T. W., Gathenya, J. W., & Kihoro, J. M. (2015). Dynamics of entrepreneurial orientation on the performance of women owned enterprises in Kenya. *International Journal of Academic Research in Business and Social Sciences*, *5*(9), 14-34.

Nairobi Metro 2030 (2008). *A World Class African Metropolis, Ministry of Nairobi Metropolitan Developmen*t, Government of the Republic of Kenya.

Nairobi Metro 2030 (2010). *Review*: *A World Class African Metropolis, Ministry of Nairobi Metropolitan Development,* Government of the Republic of Kenya.

Najeeb, A. (2014). Institutional theory and human resource management. In H. Hasan (Eds.), Being Practical with Theory: A Window into Business Research (pp. 25-30). Wollongong, Australia: THEORI. http://eurekaconnection.files.wordpress.com/2014/02/ p-25-30-institutional-theory-theori-ebook_finaljan2014v3.pdf

National Council for Law Reporting (Kenya), (2010). The Constitution of Kenya 2010.

National Council for Law Reporting (Kenya), (2012). The County Governments Act 2012.

National Council for Law Reporting (Kenya), (2012). The Intergovernmental relations Act 2012.

National Council for Law Reporting (Kenya), (2012). Transition to Devolved Government Act 2012.

National Fire Protection Association ([NFPA], 2007). Standard Practice for Assessment of Fire Risk by Occupancy Classification

National Institute of Standards and Technology ([NIST], 2010). *NIST General Information*. Retrieved from http://www.nist.gov/public_affairs/general_information.cfm.

NDOC (2015). National Disaster Operation Centre website http://www.nationaldisaster.go.ke

Neufeld, D., Dong, L. and Higgins, C. (2007) 'Charismatic leadership and user acceptance of information technology', *European Journal of Information Systems,* **16** (4), 494-510

Ngui, T., K. (2014). Effects on human resource management strategies on performance of organizations. *International Journal of Academic Research in Business and Social Sciences.* HR MARS, Vol.3, No.9, ISSN: 2222 – 6990

Njoki, M. N. (2013). The role of Project Management Information Systems towards the success of a Project: The case of Construction Projects in Nairobi Kenya. *International Journal of Academic Research in Business and Social Sciences.* HR MARS, Vol.3, No.9, ISSN: 2222 – 6990

Njoroge, K. (2013, November 7). Nairobi set to build two new fire stations. *The Business Daily*. http://www.businessdailyafrica.com/Nairobi-set-to-build-two-new-fire-stations-/-/539546/2064586/-/11plgp0z/-/index.html

Njoroge, K. (2015, July 2). World Bank to Build 480m Fire Stations in City. *The Business Daily*. http://www.businessdailyafrica.com/Corporate-News/World-Bank-to-build-Sh480m-fire-stations-in-city/-/539550/2773046/-/15aq2qg/-/index.html

Nowak, P. (1996). Practical Considerations in Assessing Barriers to IPM Adoption. Proceedings of the Third National IPM Symposium/Workshop. (Eds.) S. Lynch, C. Green, and C. Kramer-LeBlanc. Washington, DC, USDA-ERS Misc. Pub No. 1542.

Oeser, O.A., & Harary, F. (1964). A mathematical model for structural role theory, II. Human Relations, 17, 3-17.

Oh, S., Ahn, J., & Kim, B. (2003). Adoption of broadband Internet in Korea: the role of experience in building attitudes. *Journal of Information Technology*, *18*(4), 267-280.

Oliveira, G. H. M., & Welch, E. W. (2013). Social media use in local government: Linkage of technology, task, and organizational context. *Government Information Quarterly*, *30*(4), 397-405.

Oliveira, T., & Martins, M. F. (2011). Literature review of information technology adoption models at firm level. *The Electronic Journal Information Systems Evaluation*, *14*(1), 110-121.

Oreg, S., Nevo, O., Metzer, H., Leder, N. and Castro, D. (2009) 'Dispositional resistance to change and occupational interests and choices', *Journal of Career Assessment,* **17** (3), 312-323

Ortega, I., (2000). Systematic prevention of construction failure. *Quality Management and Technology* 2000, 9:1-13.

Otieno, K., O., Apida, M., Eric, O., N, Graca, A. (2010). Factors Influencing Fire Stations Response to Disasters: A case of Kenya. *International Journal of Disaster Management and Fire Engineering.* Vol. 3, Issue No.2, ISSN: 2221 – 6799.

Pacholok, S. (2013). *Into the fire: Disaster and the remaking of gender*. University of Toronto Press.

Pan, M. J., & Jang, W. Y. (2008). Determinants of the adoption of enterprise resource planning within the technology-organization-environment framework: Taiwan's communications industry. *Journal of Computer information systems*, *48*(3), 94-102.

Park, H. M. (2015). Univariate analysis and normality test using SAS, Stata, and SPSS.

Patricia, M., S., and Rangarjan, N. 2013. A Playbook for Research Methods: Integrating Conceptual Frameworks and Project Management. Stillwater, OK: New Forums Press

Patton, M., Q. (2002), *Qualitative Research & Evaluation Methods*. Thousand Oaks, London, New Delhi: Sage Publications, Inc.

Pearce, K. E., & Rice, R. E. (2013). Digital divides from access to activities: comparing mobile and personal computer internet users. *Journal of Communication*, *63*(4), 721-744.

Perrow, C., (1986). Complex organizations. *American journal of sociology.* New York, Random House.

Phillip, M. (2014). *Efficient allocation of fire department resources*. (3 ed., Vol. 7, pp. 237-247). california: Journal of Fire Technology.

PMBOK. (2010). Project management Information Systems (PMIS). *Project Management Body of Knowledge.* Retrieved 15/08/15, from http://goo.gl/u45gB

Phillips, B. D. (2005). "Disaster as a Discipline: The Status of Emergency Management Education in the US". International Journal of Mass-Emergencies and Disasters. Vol. 23 (1): 111–140

Pinkse, J., & Dommisse, M. (2009). Overcoming barriers to sustainability: an explanation of residential builders' reluctance to adopt clean technologies. *Business Strategy and the Environment*, *18*(8), 515-527.

PMBOK. (2004). Project management Information Systems (PMIS): Terms and Conepts. *Project Management Body of Knowledge.* Retrieved 15/08/15, from http://goo.gl/u45gB

PMBOK. (2008). Project management Information Systems (PMIS). *Project Management Body of Knowledge.* Retrieved 15/08/15, from http://goo.gl/u45gB

PMI (1996) A Guide to Project Management Body of Knowledge (PMBOK), (1st Ed.) PMI, Pennsylvania.

PMI (2003) Organisational Project Management Maturity Model OPM3 Knowledge Foundation, PMI, Pennsylvania.

PMI (2004) A Guide to the Project Management Body of Knowledge (PMBOK Guide), (4th Ed.), PMI, Pennsylvania.

PMI (2009) Project Management Institute, (accessed 5th November), available at http://www.pmi.org

Pokharel, S. (2005). Perception on information and communication technology perspectives in logistics: A study of transportation and warehouses sectors in Singapore. *Journal of Enterprise Information Management*, *18*(2), 136-149.

Poon, E. G., Jha, A. K., Christino, M., Honour, M. M., Fernandopulle, R., Middleton, B., ... & Kaushal, R. (2006). Assessing the level of healthcare information technology adoption in the United States: a snapshot. *BMC Medical Informatics and Decision Making*, *6*(1), 1.

Porter, M. E. (1985) *The Competitive Advantage: Creating and Sustaining Superior Performance*. NY: Free Press, 1985. (Republished with a new introduction, 1998.)

Poston, W. S., Haddock, C. K., Jahnke, S. A., Jitnarin, N., & Day, R. S. (2013). An examination of the benefits of health promotion programs for the national fire service. *BMC Public Health*, *13*(1), 805.

Pouloudi, A. (1999). Aspects of the Stakeholder Concept and their Implication for Information Systems Development. Proceedings of the 32nd Hawaii International Conference on System Sciences, Maui, Hawaii, 7030-7046.

Powell, W., W., (1988). Institutionalization effects on organizational structure and performance, in Zucker, I.G. (ed). *Institutional patterns and organizational.* Cambridge publication press, M.A.

Premkumar, G., & Roberts, M. (2009). Adoption of new information technologies in rural small businesses. *Omega*, *27*(4), 467-484.

Priem, R., L., and Butler, J., E. (2001). 'Is the Resource-Based "View" A Useful Perspective for Strategic Management Research?'. *The Academy of Management Review* 26.1 (2001): 22. Web.

Project Management Body of Knowledge. (2010). *Project management Information Systems* (PMIS). Retrieved 10/10/15, from http://goo.gl/u45gB Project Management Information System (PMIS). *Project-Management-Knowledge.com*. Retrieved 24 June 2015.

Purcell, J. (2004). *The HRM-Performance Link: Why, How and When Does People Management Impact on Organizational Performance?* John Lovett Memorial Lecture, University of Limerick.

Pykh, Y.A., Kennedy, E.T., and Grant, W.E., (2000). "An overview of systems analysis methods in delineating environmental quality indices," *Ecological Modelling*, 130:(1-3) 25-38, 2000.

Quazi, A. and Talukder, M. (2011). Demographic determinants of employees' perception and adoption of technological innovation. Journal of Computer Information Systems, 51(3), 38-46.

Raymond, L., and Bergeron, F. (2008). Project management information systems: An empirical study of their impact on project managers and project success. *International Journal of Project Management.* Vol.26, 213-220.

Rehman, T., McKemey, K., Yates, C. M., Cooke, R. J., Garforth, C. J., Tranter, R. B., ... & Dorward, P. T. (2007). Identifying and understanding factors influencing the adoption of new technologies on dairy farms in SW England using the theory of reasoned action. *Agricultural Systems*, *94*(2), 281-293.

Richardson, J. (2009). Diffusion of technology adoption in Cambodia: The test of a theory. *International Journal of Education and Development using Information and Communication Technology*, *5*(3), H1.

Riddel, M., & Schwer, R. K. (2003). Regional innovative capacity with endogenous employment: empirical evidence from the US. *The Review of Regional Studies*, *33*(1), 73.

Robinson, R. Jr., & Pearce, J. (2007). Planned patterns of strategic behavior and their relationship to business-unit performance. *Strategic Management Journal,* 9 (1).

Rogers, P. L. (2000). Barriers to adopting emerging technologies in education. *Journal of educational computing research*, *22*(4), 455-472.

Rothaermel, F. T., & Alexandre, M. T. (2009). Ambidexterity in technology sourcing: The moderating role of absorptive capacity. *Organization science*, *20*(4), 759-780.

Rowley, J. (2010). E-Government Stakeholders—Who are they and what do they want? *International Journal of Information Management*; doi:10.1016/j.ijinfomgt.2010.05.005 http://dx.doi.org/10.1016/j.ijinfomgt.2010.05.005

Rumelt, D.P., (1984), Towards a Strategic Theory of the Firm. Alternative theories of the firm; 2002, (2) pp. 286–300, Elgar Reference Collection. *International Library of Critical Writings in Economics*, vol. 154. Cheltenham, U.K. and Northampton, Mass.: Elgar; distributed by American International Distribution Corporation, Williston, Vt.,

Rwelamila, P.D., Talukhaba, A.A. and Ngowi, A. B. (1999), Tracing the African project failure syndrome: the significance of 'ubuntu', Engineering Construction and Architectural Management, 6, 335-346.

Sahin, I., & Thompson, A. (2007). Analysis of predictive factors that influence faculty members' technology adoption level. *Journal of Technology and Teacher Education*, *15*(2), 167.

Sanchez-Franco, M., &Roldan, J. (2005). "Web acceptance and usage model: A comparison between goal-directed and experiential web users". Internet Research, 15 (1), 21-48.

Sanford, C., & Rose, J. (2007). Characterizing eparticipation. *International Journal of Information Management*, *27*(6), 406-421.

Sargent, K et al. (2012) 'Factors influencing the adoption of information technology in a construction business'*, Australasian Journal of Construction Economics and Building,* 12 (2) 72-86

Sarkis, J., Gonzalez-Torre, P., & Adenso-Diaz, B. (2010). Stakeholder pressure and the adoption of environmental practices: The mediating effect of training. *Journal of Operations Management*, *28*(2), 163-176.

Selvaragm,T.(2007). The role of Human Capital in Promoting firm Innovativeness and Performance. Test of a causal model. *International Journal of Human Resource Management*. 18(8), 1456-1470.

Sesan, T. (2014). What's cooking? Evaluating context-responsive approaches to stove technology development in Nigeria and Kenya. *Technology in Society*, *39*, 142-150.

Shakya, P. B. and Flinn J. C. (1985). Adoption of Modern Varieties and Fertilizer Use on Rice in the Eastern Tarai of Nepal. *Journal of Agricultural Economics.* 36(3) (September 1985):409-419.

Sipsma, K., Stubbs, B. A., & Plorde, M. (2011). Training rates and willingness to perform CPR in King County, Washington: a community survey. *Resuscitation*, *82*(5), 564-567.

Smith, H. J., & Hasnas, J. (1999). Ethics and Information Systems: The Corporate Domain. MIS Quarterly, 23(1), 109- 128. http://dx.doi.org/10.2307/249412

Soderlund, J. (2004). Building theories of project management: past research, questions for the future. *International Journal of Project Management.* Vol. 22 (3), Pp. 183-191

Stephens, S. L., & Ruth, L. W. (2005). FEDERAL FOREST-FIRE POLICY IN THE UNITED STATES. *Ecological applications*, *15*(2), 532-542.

Straub, E. T. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of educational research*, *79*(2), 625-649.

Strauss, A. & Corbin, J. (1994). "Grounded Theory Methodology." In NK Denzin & YS Lincoln (Eds.) Handbook of Qualitative Research (pp. 217-285). Thousand Oaks, Sage Publications.

Suardin, J. A., McPhate, A. J., Sipkema, A., Childs, M., & Mannan, M. S. (2009). Fire and explosion assessment on oil and gas floating production storage offloading (FPSO): an effective screening and comparison tool. *Process safety and environmental protection*, *87*(3), 147-160.

Terpstra, D., & Rozell, E. (1993). The Relations hip of Staffing Practices to Organizational Level Measures of Performance, *Personnel Psychology*, 46(1) 27–48.

Tollbert, P., S., (1988). Institutional sources of organizational culture in major law firm in Zucker, I.G. (ed). *Institutional patterns and organizational.* Cambridge publication press, M.A.

Tripathi, K., P. (2011). Role of management information systems in human resource. *International Journal of Computer Science and Technology.* Vol. 2, Issue 1, ISSN: 2229-4333.

Tsai, C., J., (2010). 'HRM in SMEs: homogeneity or heterogeneity? A study of Taiwanese high-tech firms', *The International Journal of Human Resource Management*, vol. 21, no. 10

Turner, R.H. (1978). The role and the person. American Journal of Sociology, 84(1), 1-23.

UNDP (2013). *Sustainable Development Networking Programme, Report of an independent external assessment* [online]. Available from: <www.sdnp.undp.org

Venkatesh, V., Davis, F. D., & Morris, M. G. (2007). Dead or alive? The development, trajectory and future of technology adoption research. *Journal of the Association for Information Systems, 8*, 267-286.

Wachira, C. M. (2014). *Factors influencing implementation of strategic plan at the Kenya revenue authority* (Doctoral dissertation, University of Nairobi).

Waiganjo, W., E., Mukulu, E., and Kahiri, J. (2012). Relationship between strategic human resource management and firm performance of Kenya's corporate organizations. *International Journal of Humanities and Social Sciences*. Vol. 2. No.10 [Special Issue – May 2012], 62-70.

Wang, X., Brown, A. R., Cheng, B., & Asenov, A. (2011, December). Statistical variability and reliability in nanoscale FinFETs. In *Electron Devices Meeting (IEDM), 2011 IEEE International* (pp. 5-4). IEEE.

Warden, C. R., Daya, M., & LeGrady, L. A. (2007). Using geographic information systems to evaluate cardiac arrest survival. *Prehospital Emergency Care*, *11*(1), 19-24.

Wekesa, C. (2014, June 14). Kenya: MCA Request on Grabbed Gigiri Land. *The Star*. http://allafrica.com/stories/201406160638.html

Welbourne, T. M., Johnson, D. E. & Erez, A. (1997). *The role-based performance scale: Validity analysis of a theory-based measure* (CAHRS Working Paper #97-05). Ithaca, NY: Cornell University, School of Industrial and Labor Relations, Center for Advanced Human Resource Studies. http://digitalcommons.ilr.cornell.edu/cahrswp/147

Wennekers, S., Van Wennekers, A., Thurik, R., & Reynolds, P. (2005). Nascent entrepreneurship and the level of economic development. *Small business economics*, *24*(3), 293-309.

World Health Organization (WHO, 2002). Environmental Health in Emergencies and Disasters. A practical guide. *The global development research centre.* Available online: http://www.gdrc.org/uem/disasters/1-dm_cycle.html

Young K and Lettice F. (2002). The Impact of Graphic and Metaphor Tools on Organisational Dynamics, British Academy of Management Annual Conference: Fast Tracking Performance Through Partnerships, London, September.

Young, R. and Jordan, E. (2008) 'Top management support: mantra or necessity?', *International Journal of Project Management,* **26** (7), 713-725

Zhang, J., Dawes, S. S., & Sarkis, J. (2005). Exploring stakeholders' expectations of the benefits and barriers of e-government knowledge sharing. *Journal of Enterprise Information Management*, 18(5/6), 548–567

Zikmund, W. (2003). *Business Research Methods*, (7th Ed.). Oklahoma City: Oklahoma State University.

Zook, M., Graham, M., Shelton, T., & Gorman, S. (2010). Volunteered geographic information and crowdsourcing disaster relief: a case study of the Haitian earthquake. *World Medical & Health Policy*, *2*(2), 7-33.

Zorn, T. E., Flanagin, A. J., & Shoham, M. D. (2011). Institutional and noninstitutional influences on information and communication technology adoption and use among nonprofit organizations. *Human Communication Research*, *37*(1), 1-33.

Zwikael, O. (2008). Top management involvement in project management: Exclusive support practices for different project scenarios. *International Journal of Managing Projects in Business*, *1*(3), 387-403.

APPENDICES

APPENDIX 1: CENSUS SURVEY QUESTIONNAIRE

Where options are given, indicate your selection by marking "X" in the space [] provided. Otherwise, write out your full response after each query.

SECTION I. PERSONAL AND STATION DETAILS:

1. Your Station: Nairobi ☐ Thika ☐
Kiambu ☐ Ruiru ☐
Limuru ☐ Kikuyu ☐

2. Job title: Director ☐ Fire Station Commander ☐
Head of Department ☐ Ambulance Attendant ☐
First Aider ☐ Lead Firemen ☐
Any other specify: ………………………………………………….

3. Number of years worked with the station.
Below 5 ☐ 5 – 10 ☐ 16 – 20 ☐
Over 20yrs ☐

4. Where are your disaster management projects implemented?
Nairobi County ☐ Kiambu ☐
Any other specify: …………………………………………………..

5. Which Project Management Information System (PMIS) has been implemented by the station?
Electronic Project Management Information System (e-ProMIS) ☐
Excel Project Management Information System (Excel PMIS) ☐
Fire Department Management System ☐
Any other specify:……………………………..........…………………

SECTION II. TOP MANAGEMENT SUPPORT

6. Does the fire station have a contractual agreement with the service provider of the form PMIS in place? YES ☐ NO ☐
DON'T KNOW ☐

7. If YES in (6) above, how has this contract contributed to the overall usage of the form of PMIS at the station? ……………………………………………………
……………………….…………………………………………………………

8. If NO in (6) above, in what way(s) do you envisage that such a contract should contribute to the usage of PMIS at the station? ……………………………………
....
9. Without the application of any form of PMIS technology, how many disaster management response projects can the station handle in a year? ………………..
………………………………………………………………………………………
10. With the PMIS technology application, how many disaster management response projects has the station handle in a year? ………………………………..
………………………………………………………………………………………
11. Which communication channels do top management use to communicate with the fire station team involved in disaster management projects?

☐ Telephone ☐ E-mails ☐ Memos ☐ Meetings ☐ Letters

12. Is the communication in (11) as part of the requirement for reporting standards?

☐ Yes ☐ No ☐ Don't Know

13. How would you rate the factors of top management support influence on the level of IT adoption at the station on 1 to 5-point Likert scale, (1=strongly disagree, 2=Disagree, 3=Indifferent, 4=Agree and 5=strongly Agree).

Top Management Support Variables	**Level of Agreement**
Station management has a solid contract with the PMIS software providers.	1 2 3 4 5
Station management has involved key staff to handle the processes, schedules and reporting of PMIS in disaster management projects implementation.	1 2 3 4 5
Station management involves PMIS in all the phases of fire station projects.	1 2 3 4 5
Station management keeps pressure on the fire station team to use IT in all the phases of disaster management project.	1 2 3 4 5
Fire station management considers PMIS as a strategic resource.	1 2 3 4 5
Reports are generated using PMIS for presentation to the station management at the county office.	1 2 3 4 5

Top Management Support Variables	Level of Agreement
Station chief officer is involved as key authorization officer during the start of any project and PMIS use is part of the authorization.	1 2 3 4 5
Station management organizes on-going training on the use of the indicated PMIS.	1 2 3 4 5
The PMIS reporting requirement has enabled the station managers to put in place communication plan.	1 2 3 4 5
The performance contracts are based on progress reports generated using PMIS in every phase of the disaster management project.	1 2 3 4 5
Top management has supported new PMIS systems and technologies in disaster project management to enhance fire service delivery.	1 2 3 4 5
The most important phases of disaster project management supported by top management includes: conception; design; response operation; and recovery & reporting.	1 2 3 4 5

SECTION III: CAPACITY AVAILABILITY

14. With the introduction of PMIS, does the fire station have dedicated PMIS personnel to handle the PMIS side of reporting?

    YES ☐ NO ☐

15 If YES in (14) above, how has this improved the level of PMIS use in disaster management projects? …………………………………………………………..

……...

16 If NO in (14) above, does the fire station ensures that every employee in disaster management project at the station goes through extensive training on PMIS?

YES ☐ NO ☐

17. How many trainings related to PMIS or on PMIS has the fire station conducted in the last 3 years? …………………………………………………………..

………………………………………………………………………………………

18. Is there a formal training programme to familiarize new recruits with the station's PMIS system in place? YES ☐ NO ☐

19. If NO in (18) above, is there a pre-requisite knowledge and skills requirement on the PMIS system in use before one is recruited at the station?

YES ☐ NO ☐

20. What kinds of additional support do your department need from management to enhance use of PMIS at the station? ....
…………………………………………………………………………………...

21. What are some of the challenges or opportunities would you identify for top management to ensure PMIS implementation is supported at the station. ……..
….…………………………………………………………………………….
………………………………………………………………………………….

22. How would you rate the factors of capacity availability influence on the level of PMIS adoption at the station on 1 to 5-point Likert scale, (1=strongly disagree, 2=Disagree, 3=Indifferent, 4=Agree and 5=strongly Agree).

Capacity Availability Variables	**Level of Agreement**
The station conducts extensive training on PMIS for all its employees in all aspects of the phases of disaster management project.	1 2 3 4 5
Employees in every job category will go through training programs related to PMIS every year.	1 2 3 4 5
Personnel requirement for the disaster management projects at the station are identified through formal appraisal mechanisms supported by PMIS.	1 2 3 4 5
There are formal training programmes to teach new employees on the use of the PMIS in place.	1 2 3 4 5
The IT in place encourages new knowledge and skills in implementing disaster management projects	1 2 3 4 5
Capacity needs identified through the use PMIS at the station are realistic, useful and based on the business strategy of the organization.	1 2 3 4 5

Capacity Availability Variables	Level of Agreement
The station is allocated capacity and training budget every year.	1 2 3 4 5
Capacity availability influences the use PMIS in disaster management projects at the station	1 2 3 4 5
Capacity availability affects the attitude of employees on the use of PMIS in disaster management projects.	1 2 3 4 5
Capacity availability on PMIS affects the number of disaster management projects implemented by the fire station.	1 2 3 4 5

SECTION IV: TEAMWORK POLICIES

23. Does the fire station have a standard policy on the formation teams within the various departments? YES ☐ NO ☐

24. If **YES** in (21) above, is there a team that is specifically formed to handle PMIS implementation in disaster management projects undertaken by the station?

YES ☐ NO ☐

25. If **NO** in (21) above, what would you say about usefulness of the station policies on formation of teams with regards to PMIS adoption in disaster management projects at the station?...

....

26. Is the station committed to formulating teamwork policies that responds to the continuous use of PMIS in disaster management projects at the station?

YES ☐ NO ☐

27. Does the station organize team building for the station either for the week, month, quarterly or yearly? YES ☐ NO ☐

28. How would you rate the factors of teamwork policies influence on the level of PMIS adoption at the station on 1 to 5-point Likert scale, (1=strongly disagree, 2=Disagree, 3=Indifferent, 4=Agree and 5=strongly Agree).

Teamwork Policy Variables	Level of Agreement
PMIS is used to ensure appropriate team composition for the disaster project phases.	1 2 3 4 5
Disaster projects management using PMIS ensure the team assigned to various phases are committed to team processes, leadership & accountability.	1 2 3 4 5
Team interdepend on each other within the phases of the project to ensure successful project delivery.	1 2 3 4 5
A team's commitment to a project stage at the fire station is captured by PMIS.	1 2 3 4 5
Teamwork success at the station depends on open communication and positive feedback aided by PMIS in all stages of the project and the environment.	1 2 3 4 5
Teamwork reward to shared goals defined by success indicators in PMIS motivates members in achieving project success.	1 2 3 4 5
PMIS enables team members in disaster projects to define the project implementation strategies at the fire station.	1 2 3 4 5
The station always organizes for teambuilding training for the station.	1 2 3 4 5
All potential conflicts within the team arising as a result of conflict in PMIS processes are addressed by the station manager promptly.	1 2 3 4 5
The fire station usually forms a team for every job to be undertaken during a major project.	1 2 3 4 5
Team duties are organized as per schedules produced by PMIS software.	1 2 3 4 5
PMIS software used in disaster project management produces schedules and reports that are applied by the station management in annual review of teamwork policies.	1 2 3 4 5

SECTION V: STAKEHOLDERS INVOLVEMENT

29. In the last 3 years has the fire station organized a stakeholder's consultation forum on the use of PMIS system in disaster management projects?

YES ☐ NO ☐

30. If YES in (27) above, are there documentation to show the engagement process with stakeholders on the PMIS implementation at the station?

YES ☐ NO ☐

31. Does the fire station management take into consideration grievances from the stakeholders including the fire station members who are using the IT in disaster management projects? YES ☐ NO ☐

32. Is the fire station required either by law, regulations or voluntarily to engage stakeholders in PMIS implementation in disaster projects either internally or externally? YES ☐ NO ☐

33. Indicate your level of agreement with the following statements on stakeholder training in PMIS use at the station on 1 to 5-point Likert scale, (1=strongly disagree, 2=Disagree, 3=Indifferent, 4=Agree and 5=strongly Agree).

Fire station management believe that continuous training of stakeholders on use of PMIS is important.	1 2 3 4 5
Fire station members receive workplace training relation to technology implementation in disaster management projects regularly	1 2 3 4 5
Fire station members have skills that are considered above average in the industry	1 2 3 4 5
Fire station members usually lack important trainings on the use of PMIS in disaster projects management at the station	1 2 3 4 5
Fire station technical training is usually supported by technology-based application	1 2 3 4 5

34. How would you rank the factors of Stakeholders' Involvement influence on the level of PMIS adoption at the station on 1 to 5-point Likert scale, (1=strongly disagree, 2=Disagree, 3=Indifferent, 4=Agree and 5=strongly Agree).

Stakeholder Involvement Variables	Level of Agreement
The PMIS software has been applied to manage stakeholders with social responsibilities which includes economic, legal, environmental and ethical.	1 2 3 4 5
PMIS software has enabled the exploration of stakeholders' needs and constrains to the disaster management projects.	1 2 3 4 5
Communication with stakeholders involved in disaster management project is captured by PMIS system.	1 2 3 4 5
The fire station understands the areas of stakeholders' interests	1 2 3 4 5
The PMIS software in use identifies the stakeholders of interest in every disaster management project undertaken.	1 2 3 4 5
PMIS reports promote a good relationship between the fire station and the stakeholders	1 2 3 4 5
PMIS software analyses conflicts and coalitions among stakeholders in disaster management projects within the station.	1 2 3 4 5
The PMIS software predicts the influence of stakeholders accurately during disaster management projects implementation.	1 2 3 4 5
From PMIS modules, schedules and reports the fire station is able to appropriately formulate strategies to manage stakeholders at the various phases of disaster management project.	1 2 3 4 5
PMIS software in use allows for the assessment of power, attributes, and proximity of stakeholders within the project at the fire station.	1 2 3 4 5
PMIS software ranks allow easy compromise of stakeholder conflicts within the disaster management	1 2 3 4 5

Stakeholder Involvement Variables	Level of Agreement
projects effectively.	
PMIS software gives a clear picture in formulation of a statement of project mission.	1 2 3 4 5
PMIS software in place allows predicting the stakeholders' reactions during the disaster management project phase's implementation for immediate re-strategizing.	1 2 3 4 5
PMIS software enables in assessing the stakeholder behaviours.	1 2 3 4 5

35. Considering technology application in disaster management project, how would you rate the level of PMIS adoption?

1 High Level Adoption

2 Low Level Adoption

3 No Adoption

36. Are there any factors you consider has contributed to the observed rating of PMIS levels of adoption at the fire station. ……………………………………….
…………………………………………………………………………………….
…………………………………………………………………………………….

APPENDIX 2: INTERVIEW GUIDE

1. Your Station:
2. Job title:
3. Number of years worked with the station.
4. Where are your disaster management projects implemented?
5. Which Project Management Information System (PMIS) has been implemented by the station?
6. Does the fire station have a contractual agreement with the service provider of the form PMIS in place?
7. Using PMIS technology, how many disaster management response projects can the station handle in a year?
8. Which communication channels do top management use to communicate with the fire station team involved in disaster management projects?
9. In your opinion what factors would you consider as top management support to adoption of PMIS?
10. With the introduction of IT, does the fire station have dedicated PMIS personnel to handle the PMIS side of reporting?
11. In your opinion, what kinds of additional support do your department need from management to enhance use of PMIS at the station.
12. Does the fire station have a standard policy on the formation teams within the various departments?
13. How would you rate the level of PMIS adoption in disaster project management at the station?
14. Are there any factors you consider has contributed to observed rating of PMIS adoption level?

APPENDIX 3: LETTER OF INTRODUCTION

Dear Prospective Respondents,

I am a PhD student at Jomo Kenyatta University of Agriculture and Technology (JKUAT), department of Entrepreneurship, Technology, Leadership and Management (ETLM). The title of my study is: *Factors influencing the levels of Project Management Information Systems (PMIS) adoption in Disaster Management Projects in Fire Stations in Nairobi Metropolis, Kenya.* The study seeks to investigate the influence of top management support, capacity availabilities, teamwork policies, and stakeholders' involvements on the levels of PMIS adoption.

As part of the PhD programme requirement am required to collect data for analysis and would be grateful if you could consent to participate in this census study through filling the provided questionnaire. The information provided will be only be used for academic purposes and will be treated with high level of confidentiality.

The information you provide will be useful in helping the study come up with appropriate proposals that can improve the levels of PMIS adoption in fire stations and consequently help in achieving the Kenya vision 2030 of a safe environment from disasters for all.

This survey will take approximately 20 minutes to complete. Please be free to complete the questionnaire and make additional notes where necessary.

Thank you for consenting to participate in this study.

Yours faithfully

Benard Onyango Lango

HD417 – 6097/2014

Jomo Kenyatta University of Agriculture and Technology

College of Human Resources and Development Studies

School of Entrepreneurship, Procurement and Management

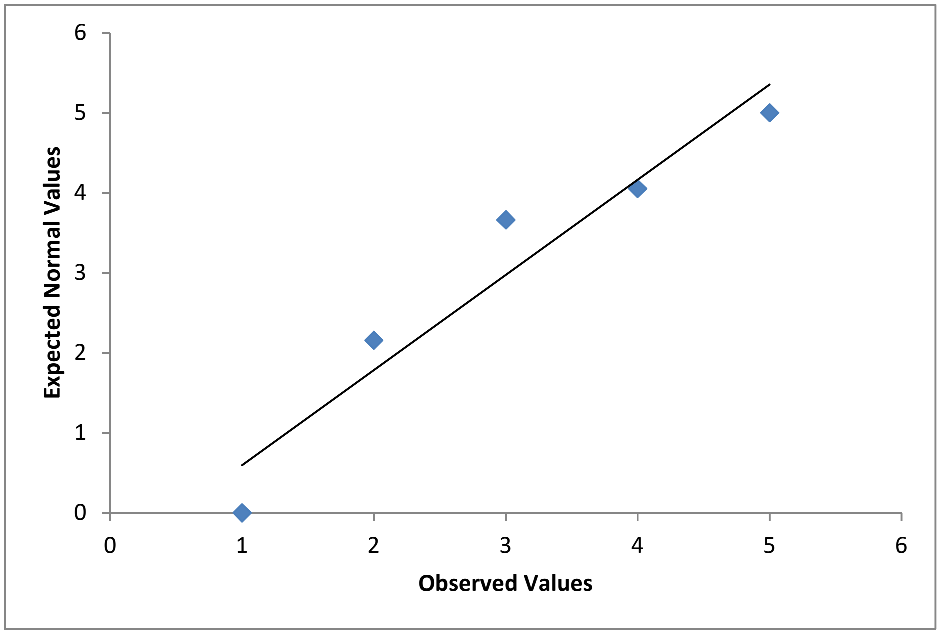
Department of Entrepreneurship, Technology, Leadership and Management

APPENDIX 4: LIST OF FIRE STATIONS IN NAIROBI METROPOLIS, KENYA

No.	Station Name	Station Location
1.	Kiambu Sub-County Fire Station	Kiambu
2.	Olkejuado Sub-County Fire Station	Kajiado
3.	Thika Sub-County Fire Station	Kiambu
4.	Machakos Sub-County Fire Station	Machakos
5.	Ruiru Sub-County Fire Station	Kiambu
6.	Limuru Sub-County Fire Station	Kiambu
7.	Masaku Sub-County Fire Station	Machakos
8.	Kikuyu Sub-County Fire Station	Kiambu
9.	Githunguri Sub-County Fire Station	Kiambu
10.	Kiambaa Sub-County Fire Station	Kiambu
11.	Kajiado Sub-County Fire Station	Kajiado
12.	Mavoko Sub-County Fire Station	Machakos
13.	Kagundo Sub-County Fire Station	Machakos
14.	Nairobi County Fire Brigade	Nairobi

*(**Source**: Kenya Fire Brigade Association KENFIBA, Annual report, 2015)*

APPENDIX 5: NORMAL Q – Q PLOT ON LEVELS OF PMIS ADOPTION



APPENDIX 5: MODEL PERCEIVED LEVEL OF PMIS ADOPTION IN FIRE STATIONS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High Level Adoption	47	20.0	20.6	20.6
	Low Level Adoption	171	73.1	75.0	95.6
	No Adoption	10	4.3	4.4	**100.0**
	Total	**228**	**97.4**	**100.0**	
Missing	0	6	2.6		
Total		**234**	**100.0**		