UNIVERSITY OF NAIROBI

School of Computing and Informatics

DETERMINANTS OF GREEN INFORMATION TECHNOLOGY AWARENESS AMONG TOP 100 MID-SIZED FIRMS IN KENYA

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT FOR THE REQUIREMENTS OF THE DEGREE OF MASTERS OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

December 2015

DECLARATION

This research project being presented is my original work and to the best of my knowledge the work has not been submitted or presented for any other award in any university.

Signature _____Date_____

Ben N Karani

P54/72919/2014

This project has been submitted in partial fulfillment of the requirement of the Master of Science Degree in Information Technology Management of the University of Nairobi with my approval as the University Supervisor.

Signature_____Date_____

Dr. Robert Oboko

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DEDICATIONS

To my beloved wife Sarah Njoki, and my gracious daughters Jedida Wairimu and Patience Njeri: You have brought immeasurable joy to my life and enabled me develop patience to view each opportunity in life positively.

To my parents Erasto Karani and Jedida Karani for their unconditional love, patience and support throughout the course of this project.

ACKNOWLEDGEMENT

I would like to thank GOD for bringing me this far for health, strength and grace to complete this project.

I would like to extend my gratitude to my supervisor Dr. Robert Oboko, without whom the project would not be possible. He has guided me and walked with me through the project.

I would like to extend my gratitude to Lecturers and the entire staff of school of computing and Informatics for providing the perfect environment for conducting this project.

Lastly I wish to express my gratitude to my family for their constant encouragement and prayers.

To all the above and many others not mentioned who contributed to this project in one way or the other. I say thank you!

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ABSTRACT

This study sought to establish the determinants of Green IT awareness among Top 100 Mid-Sized Firms in Kenya. This study sought to achieve five specific research objectives: to establish the level of Green IT knowledge among Top 100 Mid-Sized Firms in Kenya; to identify the individual level determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya; to determine the firm level determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya; to establish external determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya; and to establish the relationship among determinants of Green IT awareness among Top 100 Mid-Sized Firms in Kenya.

This study used descriptive survey design. The target population was mid-sized companies in all sectors in Kenya. The target of this study was the Top 100 Mid-Sized Firms as rated in 2014 KPMG and Nation Media Group survey. This study targeted employees and IT managers in the Top 100 Mid-Sized Firms. Simple random sampling method was used to select 30 'Top 100 Mid-Sized Firms' from the Top 100 Mid-Sized Firms in Nairobi year 2014. Convenient sampling was used to obtain 3 employees from each Top 100 Mid-Sized Firms selected for the study. Purposive sampling was used to obtain 30 IT managers of the selected from Top 100 Mid-Sized Firms. The sample size for the study was therefore 120 respondents. Three key informants from UNEP, NEMA and the Ministry of Information and Communication Technology each was purposively selected as policy makers in the sector. The key informants were therefore nine (9). Primary data and secondary data were collected. Primary data was collected through semi-structured questionnaires with both open and closed ended questions. Questionnaires were administered to each Top 100 Mid-Sized Firm addressed to the IT manager and to three employees. Quantitative data was analyzed using inferential statistics and descriptive statistics. The results of quantitative data analysis were presented in tables and figures. The study also used factor analysis to establish the key determinants of Green IT awareness. Qualitative data on the other hand was analyzed using content analysis. Results of qualitative data analysis were presented in descriptive narrative.

The results have shown that level of green IT awareness was positively correlated to individual level determinants (r=.365), firm level determinants (r=.285), external determinants (r=.390) and government policy (r=.305) at 99% confidence level. Additionally, the results have shown that individual level determinants positively and significantly affected level of Green IT awareness (β=.220, p=.022). Firm level determinants were found to positively affect level of Green IT awareness (β=.140, p=.065) but this relationship was not statistically significant. The results have also shown that external determinants positively and significantly affect level of Green IT awareness (β=.294, p=.003). This study has revealed that green IT awareness is low among mid sized firms in Kenya.

This study concluded that individual level, firm level and external determinants are important predictors of the level of green IT awareness in mid sized firms in Kenya. Individual level and external determinants are especially significantly influencing green IT awareness. Firm level determinants are not significantly influencing level of green IT awareness. This study recommends that the government and other stakeholders should come together to increase the level of green IT awareness. The government in raising level of green IT awareness should focus on individual level, firm level and external determinants as they have been revealed to positively

influence level of green IT awareness. The mid sized firms in Kenya should give level of green IT awareness issue the priority and importance it deserves. Contrary, the situation as it is, level of green IT awareness issue is not a priority in mid sized firms in Kenya.

Keywords: Green IT, Carbon footprint, awareness, determinants

CHAPTER ONE

INTRODUCTION

1.1 The Background

Environmental issues such as global warming, energy and resource constraint have raised major concerns around the world and need to be resolved (Brooks *et al*., 2010). Information Technology (IT) has the potential to resolve these concerns through greater efficiency. This concept of energy conservation using IT and energy conservation of IT is known as Green IT (Widjaja *et al*., 2011). Green IT refers to the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems efficiently and effectively with minimal or no impact on the environment (Joumaa & Kadry, 2012). It also refers to IT with low environmental impacts. The IT sector is expected to innovate in order to reduce its use of toxic substances and consumption of natural resources especially energy resources throughout products and services lifecycle (Faucheux & Nicolai, 2011). Many countries such as United States of America, Australia and Indonesia have already started applying Green IT initiatives to reduce carbon emissions (Brooks *et al*., 2010).

There are two aspects of Green IT. They include IT as part of the problem and IT as part of the solution (Mariani & Imam, 2012). The aspect of IT as part of the problem relates to a strategy integrating green initiatives in each phase of the IT product life cycle. At the development phase the aim is to integrate green material in the design of IT products and processes to reduce energy consumption as well as minimize the waste. In the production phase the aim is to lower cost of the production process by reducing energy consumption as well as trying to use energy subsidies to reduce carbon dioxide (CO_2). At the usage phase the aim is to enhance the organizational behavior of the company in terms of users, strategy and infrastructure. In the disposal phase companies as well as governments play a critical role first by controlling the purchase and usage of the IT products and second by creating and implementing strict regulations. As noted by Molla *et al*. (2009), the aspect of IT as part of the solution for tackling environmental issues starts from enabling analysis of carbon footprints, monitoring and reporting capability to deploying IT solutions to increase energy efficiency and reduce carbon footprints.

Green IT offers the right component to connect both innovations by enterprises and environmental sustainability. However, green IT awareness remains a challenge (Mariani & Imam, 2012). European Commission in its Code of Conduct on Data Centers Energy Efficiency in 2008 noted that many data centers operators are simply not aware of the financial, environmental and infrastructure benefits to be gained from improving the energy efficiency of their facilities. In addition, the EU commission observed that even awareness does not necessarily lead to good decision making, simply because there is no framework in place for the operators to aspire to. According to the EU commission, making data centers more energy efficient is a multidimensional challenge that requires a concerted effort to optimize power distribution, cooling infrastructure, IT equipment and IT output (Widjaja *et al*., 2011).

The Environmental Protection Agency (EPA) in the United States has also been instrumental in stimulating market demand for green products and services by use of federal government's enormous buying power. EPA launched Environmentally Preferable Purchasing Program (EPP) in 1993 to help the federal government buy green. EPP therefore promotes IT equipment suppliers who have conformed to the green standards applied by EPA and supports Software to measure the energy consumption and efficiency of data centers and IT supplies (Joumaa & Kadry, 2012). Widjaja *et al*. (2011) underpinned the essence to analyze the awareness about Green IT in order to measure whether individuals and organizations are ready to implement a Green IT strategy.

1.2 Problem Statement

The realization of Green IT could generate great value for the society (Chou & Chou, 2012). As organizations realize that Green IT has positive impacts to our environment, they should have motivation to start Green IT initiatives. The Green IT practices will further create a better organizational image. Furthermore, better branding will bring in more revenues. Green IT initiatives therefore can greatly contribute to the three pillars of sustainability: economic, environmental, and social imperatives. Green IT has also become one of the latest considerations to improve the environmental sustainability of a business (Brooks *et al*., 2010).

The technological booms that have been witnessed throughout in the last decade have caused a massive quantity of unwanted electronic products referred to as e-waste. E-waste has been

increasing recently by 25-55 million tonnes every year and is especially severe in developing countries (Joumaa & Kadry, 2012). The developing countries are highly concerned about e-waste problem and Green IT offers opportunities and allows for economic, social and environmental benefits (Fatima, 2011). Designing green IT systems offers an opportunity to induce green behavior in both non-IT systems and society (Xu, 2012). Green IT has also a major benefit of saving energy and consequently reducing carbon emissions. This helps make financial saving and fulfill of the commitment made by developing countries, under the Copenhagen Accord for carbon emissions cuts (Fatima, 2011). However, without Green IT awareness these cannot be achieved.

Previous studies on Green IT awareness are rare especially in developing countries like Kenya. Studies on Green IT awareness are concentrated in relatively developed countries such as Europe, North America and Asia. Molla & Corbitt (2009) did an international comparison study on Green IT diffusion. The study assessed the Australian market, Europe, North America and Asia. Chou and Chou (2012) observed that combination of Green IT's awareness, translation, and comprehension will generate expected Green IT value. However, Chou and Chou (2012) recognized that there are risks embedded in awareness component of Green IT value model. These risks include lack of the knowledge of environmental sustainability, lack of the knowledge of green IT, profit-centered managerial philosophy, lack of individual behavioral change, lack of social responsibility, insufficient business ethics and insufficient effort from government. Locally, Wabwoba *et al*. (2013) did a study on the pervasiveness of green ICT awareness amongst Kenyan ICT personnel. Wabwoba *et al.* (2013) established that awareness level of green ICT in Kenya is low among ICT personnel. Their study however focused on ICT personnel and not business organizations. In addition, their study used findings from four cases to make their conclusion which cannot be adequate to generalize the situation in Kenya. This study sought to bridge these gaps by establishing the determinants of Green IT awareness among Top 100 Mid-Sized Firms in Kenya.

1.3 Research Outcomes

The increased uptake of ICT technologies has brought forth challenges to the organizations managing them. This has been complicated with the high rate at which the technologies are

changing more so for developing countries like Kenya. Small and Medium Enterprises (SMEs) are expected to play significant role in realizing Green IT value provided they are prepared, have developed or are developing necessary capabilities to lead and support sustainability initiatives. The SMEs must be aware of what it is, and how it is to be implemented to achieve its objective.

Use of information and communication technologies promises a lot of gains to business settings however it is not without its side effects especially, the environmental impact. ICT has both positive and negative impact in its use and production. It can also be used to realize reduction of carbon emissions that have strong negative impact on the climate in the business chain system. In order for ICT to be applied to minimize its negative impact and maximize its positive impact in manner that ensures achievement of sustainable resource utilization, the SMEs have to be aware of and how to employ ICT sustainably. To achieve sustainability, Green IT has emerged to be used in reducing the direct environmental impact of designing, manufacturing, using and disposing of computer, servers and associated sub-systems.

The findings of this study are expected to help Green IT stakeholders, business community, government and the society in general to reflect on the determinants of Green IT awareness and resolve concerns surrounding the same. The results of the study are expected to shed light on how SMEs can benefit from Green IT awareness to reduce cost and improve sustainability in business. The ICT sector will also benefit from the results of this study as it may form basis for further research and discussion on Green IT in Kenya. Future scholars and researchers may find the results of this study useful in their work.

1.4 Research Objectives

The general objective of this study was to establish the determinants of Green IT awareness among Top 100 Mid-Sized Firms in Kenya.

This study sought to achieve the following specific research objectives:

1. To establish the level of Green IT knowledge among Top 100 Mid-Sized Firms in Kenya
2. To identify the individual level determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

3. To determine the firm level determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

4. To establish external determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

5. To establish the relationship among determinants of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

1.5 Assumptions and Limitations of the Research

This study has a number of assumptions. The first assumption is that the individual responses of the respondents will reflect the views of the firms that they represent. The second assumption is that the Top 100 Mid-Sized Firms of 2014 in Kenya will form a good representative of Kenyan firms' Green IT awareness. Top 100 Mid-Sized Firms are obtained from a survey conducted by Nation Media Group and KPMG. The study also presupposes that each of the Top 100 Mid-Sized Firms of 2014 have IT managers and IT users who will be the respondents of this study.

The scope of this study will be limited to Green IT awareness. The study will examine firm level and individual level determinants of Green IT awareness in Kenya. The geographical scope of the study will be determined by the location of all the Top 100 Mid-Sized Firms of 2014 in Kenya.

1.6 Definitions of Important Terms

Information Technology: IT refers to both the hardware and software that are used to store, retrieve and manipulate information (Molla *et al*., 2009).

Information systems: Information systems are the combination of hardware, software, communications networks, data resources and trained personal that support data-intensive applications such as stores, retrieve, transforms and disseminates information in an organization. Information systems help businesses improve efficiency and effectiveness, as well as decision making (Ping, 2012).

Green Information Technology: This refers to environmentally sound IT. It is the study and practice of designing, manufacturing, using and disposing of computers, servers and associated subsystems efficiently and effectively with minimal or no impact on the environment (Murugesan, 2008).

Green Information System: This refers to products like software that help to handle organization's practices like dumping of end of usable life IT products in an environmentally friendly method. It aims to attain sustainable development goal by pollution prevention and product stewardship (Watson, 2010).

CHAPTER TWO

LITERATURE REVIEW AND THEORY

2.1 Introduction

This chapter covers review of relevant literature on Green IT and awareness of technology. The chapter presents the theoretical framework that guides the study and also provides a link between research framework and the defined problem in the conceptual framework.

2.2 Carbon Foot Print

Carbon footprint refers to greenhouse gas emissions caused by an organization, event, product or person (Molla *et al*., 2009). Analysis of carbon footprints, monitoring and capability to deploy IT solutions to increase energy efficiency are therefore critical. This can enhance the way to becoming a low-carbon society. According to Trimi (2013), cutting back in the use of fossil fuels and developing new and renewable sources of energy are important in reducing carbon emissions. Developing alternative sources of energy and having them replace fossil-based energy resources take time. The most immediate solution therefore is reduction in energy consumption by improving energy efficiency in all sectors of the economy and reducing energy waste, both of which also decrease carbon footprint simultaneously.

2.3 Green Information Technology

It is difficult to ignore the ongoing concerns about climate change and the environment. The Information Technology community can have a significant impact on the worldwide carbon footprint by adopting a 'greener' approach to computing. Energy to manufacture, store, operate, and cool computing systems has grown significantly in the recent years, primarily due to the volume of systems and computing that companies now heavily rely upon (Suman *et al*., 2012).

An increasing number of firms are undertaking actions to cut their environmental impact. As information technology and information systems have permeated most business activities, they offer an important opportunity to solve the ecological problems. According to Sarkar and Young (2009), organizations are increasingly being scrutinized and pressured by Government regulators and legitimate environmental watchdogs to align their business with environmental sustainability practices. Specifically, the advent of agreements like the Kyoto Protocol has meant that

organizations are now motivated more than ever to monitor their carbon emissions. This focus of carbon emissions has now moved into the area of IT infrastructure and governance where it is believed reductions of energy emissions can be made. Green information technology has become one of the latest considerations to reduce energy consuming of IT operation and business operation. Green IT therefore represents an important topic for information systems (IS) research (Elliot, 2011).

Green IT is used as a generic term for measures and activities of an enterprises' IT department which aim to contribute to the environmentally oriented objectives of corporate sustainability and corporate social responsibility. The environmental impact of IT is being discussed under the term of Green IT. Green IT has been driven primarily by business. Research has outlined that the importance of Green IT is related to IT business alignment and environmental initiatives while uncertainty potentially derives from missing standards, measurements, or missing internal support for Green IT (Schmidt *et al*., 2010).

Green IT can be seen as a holistic and systematic approach to address challenges of the IT infrastructure, the environmental impacts of business IT activities, IT's support for environmentally sustainable business practices, and IT's role in the low-carbon economy (Molla *et al*., 2008). This view does not solely comprise IT focused issues but also business related topics, in which IT is an enabler for environmental improvements on the corporate side. Boudreau *et al*. 2008) labeled this aspect as "Green IS".

Green IT is a plausible attempt for organizations to tackle the current environmental problem, and can also improve the economic performance of an organization (Lei & Ngai, 2014). They categorized Green IT initiatives into three groups. These Green IT initiatives include hardware reduction and reconfiguration, pro-environmental policies and practices in IT usages, and IT enabled practices.

Hardware reduction and reconfiguration entails virtualization (Bose & Luo, 2011), cloud computing (Harman *et al*., 2010; Marston *et al*., 2011), thin client computers and data center reconfiguration. According to Lei and Ngai (2014), IT enabled practices comprise of

Telecommuting and Teleconferencing (Hasan & Dwyer, 2010; Hasan *et al*., 2009) and paperless policy (Hasan *et al*., 2009).

Pro-environmental policies and practice in IT usage has five elements. The first element is extended desktop and laptop lifecycle (Iacobelli *et al*., 2010). Power and workload management software is the second element (Harman *et al*., 2010; Iacobelli *et al*., 2010; Molla *et al*., 2009) while the third element is policies that encourage purchasing products on an IT Vendors' End-of life/ Recycling Program (Molla *et al*., 2011). The fourth and fifth elements are policies that encourage disposing of IT equipment in an environmentally friendly manner (Molla *et al*., 2011) and policies that encourage employees' environmentally friendly behavior in using IT equipment (Erek *et al*., 2009; Mann *et al*., 2009).

Connection Research (2010) developed a framework for understanding the Green ICT. Their framework takes a holistic view of Green ICT and sustainability, across the enterprise, and then drills into individual technologies and business best practices. It contains four vertical components, or "pillars", each of which is broken further into specific areas of Green ICT; and five horizontal components, or "actions" which describe separate approaches to the verticals. Figure 2.1 shows Green ICT framework for conducting surveys into Green ICT usage patterns and in conducting Green ICT benchmarking as recommended by Connection Research (2010).

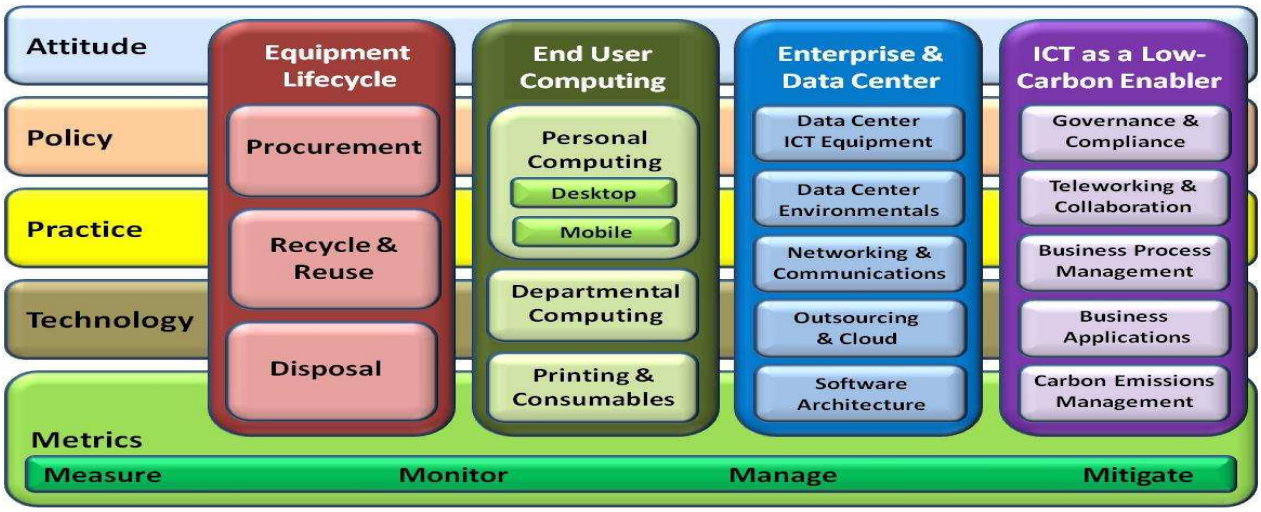


Figure 2. 1: Connection Research Green ICT Framework

The Framework in figure 2.1 above is used by many organizations to categorize the many aspects of Green ICT. It is also used extensively by Connection Research and its business partners to conduct surveys into Green ICT usage patterns and in conducting Green ICT benchmarking (Connection Research, 2010).

2.4 Awareness of Green Information Technology

There is an ever increasing need for both organizations and individuals to consider reducing their carbon footprint. This can only be possible when organizations have awareness on Green technology. Brown and Ryan (2003) defined awareness as the state of being conscious of ideas or events or the state of realizing that something exists. According to Ahmad, Bello and Nordin (2013), a person becomes aware of an idea or event as a result of having heard of it or having come into contact with it through various different means, such as through conversations, discussions, watching commercials, reading leaflets, listening to the news, and others (O'Collins, 2004).

Green computing has become a global phenomenon with the aim to reduce environmental decadence that emanates from abuse and the rising threat of global warming (Kiruthiga & Kumar, 2014). Taruna *et al*. (2014) concluded that the developing countries need to seriously think about their policies and strategies.

Environmental consciousness is a form of social orientation that can be defined as the effort to concentrate on the long-run, well-being of individuals and society, through the reduction of negative consequences associated with a product (Kang & James, 2007). Mida (2009) and Gan *et al*. (2008) agree that environmental consciousness is directly linked to green purchasing behavior. Studies by Juwaheer *et al.* (2012), Rashid (2009) and Thorgersen (2002) have shown that awareness of sustainable environment has a positive correlation between knowledge of green product and consumers' intention to purchase ecological products.

Consumers must understand the general impact of a product on the environment and second, the consumer's knowledge of the product itself and how is it being produced in an environmentally friendly way. In addition, an individual's knowledge about the environment also plays an important role in influencing the pro-environmental behavior. Eco literacy can be used to

measure the consumers' ability to identify different ecologically related symbols, behaviors and concepts. It could be assumed that an individual's attitude towards the importance of Ecological problems generally may influence the willingness to purchase environmentally friendly products (Cheau & Phau, 2011).

The attention of researchers, practitioners, and policy makers has been focused on the topic of Green IT, and to the challenge of increase in energy consumption and its associated high costs (Vazquez *et al*., 2011). Rising energy consumption and a wide variation in fuel prices could lead to energy costs consuming a significant part of IT budgets. It would be wise therefore for the companies to start investigating short-term and long-term options to reduce the power consumption and associated carbon emissions of their data centers and equipment (CACM, 2007). Green-IT is therefore likely to become a priority to many businesses.

Green IT awareness among employees and top management are correlated with Green IT adoption (De Zoysa & Wijayanayake, 2013). The issues of production, pollution, energy consumption and corresponding economic impacts have led to an awareness of Green IT along with the implementation of government regulations to monitor the effects of e-waste. Edwards (2010) argued that the demonstration of effective strategies that allow for greener and more ecological awareness will gain the respect of customers, businesses, stockholders, and other concerned groups. The protection of the environment has also a major agenda of firms today.

2.5 Theoretical Framework

The theoretical framework gives the rationale for the approach used in this study. Three theories are reviewed to provide the theoretical rationale for this study. These theories are the diffusion theory of innovations, the institutional theory and technology, organization and environment framework.

2.5.1 Diffusion of Innovations Theory

Diffusion of innovations theory was developed by Rogers who argued that a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome (Sahin, 2006). Rogers further pointed out that technology is composed hardware and software. Hardware is the physical object while software

is the information base for the tool. Diffusion according to Rogers (2003) is the process in which an innovation is communicated thorough certain channels over time among the members of a social system. Therefore innovation, communication channels, time, and social system are the four key components of the diffusion of innovations.

Awareness in Green IT is related to what Rogers (2003) described as innovation-decision process. This is an information-seeking and information-processing activity where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation. This innovation-decision process involves five steps: knowledge, persuasion, decision, implementation, and confirmation. These stages typically follow each other in a time-ordered manner (Sahin, 2006). The innovation-diffusion process is therefore an uncertainty reduction process where attributes of innovations that help to decrease uncertainty about the innovation should be promoted (Sahin, 2006).

Since the early applications of DOI to IS research, the theory has been applied and adapted in various ways. Based on DOI theory at firm level (Rogers 1995), innovativeness is related to such independent variables as individual (leader) characteristics, internal organizational structural characteristics, and external characteristics of the organization (Figure 2.2). Individual characteristics describe the leader attitude toward change. Internal characteristics of organizational structure includes observations according to Rogers (1995) whereby: centralization is the degree to which power and control in a system are concentrated in the hands of a relatively few individuals; complexity is the degree to which an organization's members possess a relatively high level of knowledge and expertise; formalization is the degree to which an organization emphasizes its members' following rules and procedures; interconnectedness is the degree to which the units in a social system are linked by interpersonal networks; organizational slack is the degree to which uncommitted resources are available to an organization; size is the number of employees of the organization. External characteristics of organizational refer to system openness.

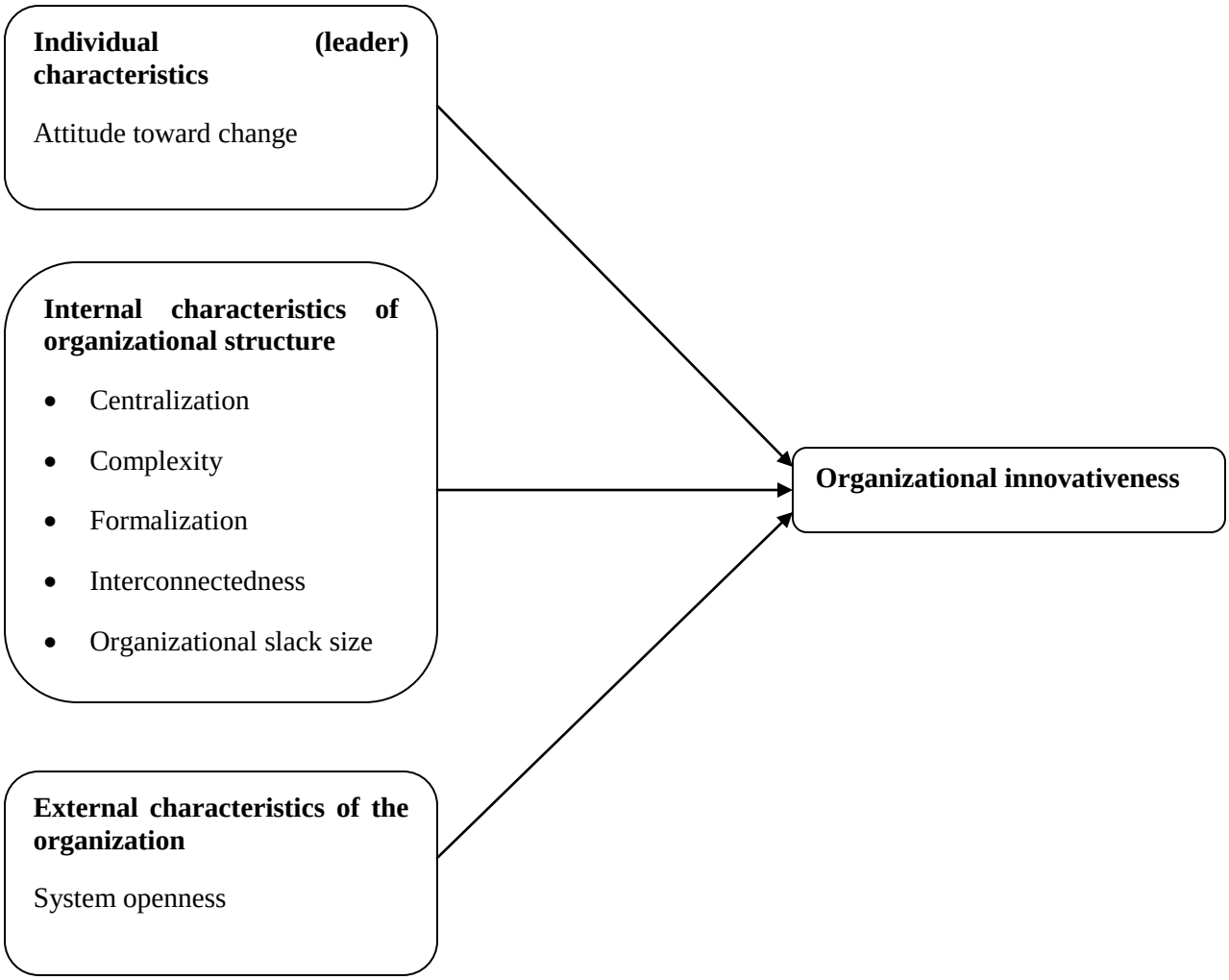


Figure 2. 2: Diffusion of innovations

Source: Rogers (1995)

2.5.2 Institutional Theory in Policy-Making

Institution theory suggests that organizations operate within a social network and their behaviors are not confined to dyadic relationship. It implies that a strong motivating force behind firm behavior is socially based and that it is embedded within institutions and interconnected organizational networks. Extensive non-economic motivations can shape the form and behavior of firms (such as culture, laws, and regulations) (Lin & Sheu, 2012).

Organizational researchers have used institutional arguments to explain patterns of innovation diffusion (Lin & Sheu, 2012). Premkumar *et al*. (1997) verified the diffusion process of information systems due to social pressures. Ketokivi and Schroeder (2004) found that institutional legitimacy explanations accounted for considerably more variance in the adoption of

several manufacturing practices than strategic or structural contingency theories. Roger *et al*. (2007) examined how operations managers reconcile potential conflicts between externally imposed institutional demands and internal operational efficiency constraints.

Organizations may imitate the behaviors of other organizations which are referred to by Lin & Sheu, (2012) as isomorphism. Isomorphism is a constraining process that forces an organization to resemble other organizations under the same environmental conditions. Imitation or isomorphism can occur consciously or unconsciously and has a socially transmissible quality. Therefore, firms in the same organizational environment may display similar behaviors in their interactions at the firm level. This study aims to establish the determinants of Green IT awareness among Top 100 Mid-Sized Firms in Kenya and, in turn, address the research questions. Institutional isomorphism as derived from institutional theory provides the theoretical rationale for developing the research questions in regards to firm level determinants of Green IT in this study.

2.5.3 Technology, Organization and Environment Framework

Technology, Organization and Environment (TOE) framework was developed by Tornatzky and Fleischer (1990) to examine firm level adoption of various Information System or Information Technology products and services. According to Tornatzky and Fleischer (1990), there are three types of contexts that may influence technological innovation adoption and implementation process. These three contexts of TOE framework include Technological context, Organizational context, and Environmental context.

Technological context is comprised of the variables that influence an individual, an organization, and an industry's adoption of innovations (Huang *et al*., 2008; Claycomb *et al*., 2005). Organizational context refers to descriptive measures related to organizations such as firm scope, firm size and managerial beliefs (Salwani *et al*., 2009). Adoption propensity is influenced by formal and informal intra-organizational mechanisms for communication and control; along with resources and innovativeness of the organization (Dedrick & West, 2003). The significant variables in organizational context include financial resources, firm structure, organizational slack, innovation capacity, knowledge capability, operational capability, strategic use of technology, trust, technological resources, top management support, support for innovation,

quality of human capital, organizational knowledge accumulation, expertise and infrastructure and organizational readiness (Musawa & Wahab, 2012; Hossain & Quaddus, 2011; Jang, 2010; Lee *et al*., 2010; Wang *et al*., 2010). Environmental context focuses on areas in which a firm conducts its business operations, with the priority given to external factors influencing the industry such as government incentives and regulations (Salwani *et al*., 2009). It includes variables related to industry characteristics such as rivalry, relations with buyers and suppliers, as well as the stages of the industry life cycle (DePietro *et al*., 1990). Significant variables in environmental context include customer mandate, competitive pressure, external pressure, internal pressure, trading partner pressure, vendor support, commercial dependence, environmental uncertainty, information intensity and network intensity (Musawa & Wahab, 2012; Hossain & Quaddus, 2011; Thiesse *et al*., 2011; Jang, 2010; Li *et al*., 2010; Wang *et al*., 2010). Thus, it presents a holistic picture of variables having impact on recent technologies.

TOE has emerged as a widespread theoretical perspective on IT adoption (Zhu *et al*., 2004). Inclusion of technological, organizational and environmental variables has made TOE advantageous over other adoption models in studying technology adoption, technology use and value creation from technology innovation (Hossain & Quaddus, 2011; Oliveira & Martins, 2010). TOE framework is free from industry and firm size restrictions (Wen & Chen, 2010). Hence, it provides a holistic picture for user adoption of technology, its implementation, foreseeing challenges, its impact on value chain activities, the post-adoption diffusion among firms, factors influencing business innovation-adoption decisions and to develop better organizational capabilities using the technology (Wang *et al*., 2010; Salwani *et al*., 2009).

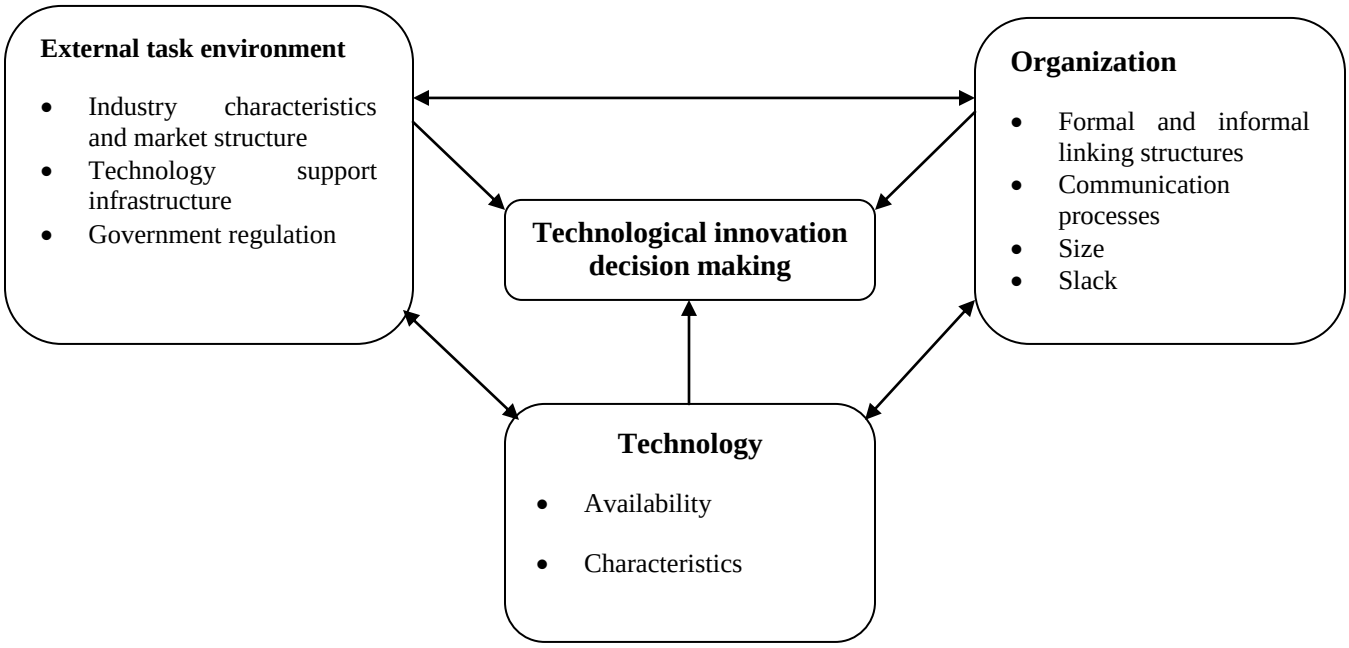


Figure 2. 3: Technology, organization, and environment framework

Source: Tornatzky and Fleischer (1990)

2.6 Empirical Literature

A study done by Molla, Abareshi and Cooper (2013) in Australia analyzed the beliefs and attitudinal factors that affect the private sphere pro-environmental behavior of information technology (IT) professionals in using personal computers. They used a research framework that draws from the belief-action-outcome (BAO) framework. Data were collected from a sample of 322 IT professionals and analyzed using structural equation modeling. The results of their study identified the pro-environmental personal computing actions that IT professionals are taking and how their Green IT beliefs, attitudes, information acquisition capability, and organizational fields influence their behavior.

In Kenya, a study by Wabwoba *et al*. (2012) sought to establish barriers to implementation of Green ICT. The study used multiple case study approach. The study population included ICT managerial, technical and end user human resource and public university ICT graduate students. The multiple case study was conducted in one leading sugar manufacturing industry, a communication commission regulatory body and one public university offering ICT from

certificate to PhD level. Respondents were either interviewed or responded to a questionnaire. The study established that green ICT technologies are available in Kenya and are not barriers to its implementation.

A study by Suryawanshi and Narkhede (2014) analyzed the rational of Green ICT in education and finds critical success factors for Green ICT implementation based on survey of selected educational institutes and interviews with academic key experts in India. The study presented the national mission for Green India derived from detailed analysis of the pertinent literature. Their study identified seven critical success factors which are essential for sustainability of ICT in future. They include: optimum utilization of resources, stakeholder's involvement, renewable energy, energy conservation, institutional policy, Green ICT committee activities and legislation.

A study on Green IT adoption by Chen and Chang (2014) examined the leading factors of Green IT adoption decisions. More specifically, they were interested in the issue of whether government support is playing a key factor on determining Green IT adoption in developing countries. Based upon a survey of 64 organizations in Taiwan, the results indicated that environmental compliance (responding to the environmental regulation changes and citizenships), instead of economic consideration, was the driving force for organizations to adopt Green IT. Chen and Chang (2014) observed that government support played an important role for leading organizations to pursuit their social responsibilities. Technological resources and governance toward green IT were also important factors for organizations to be ready to exercise their social responsibilities.

2.7 Conceptual Framework

The conceptual framework of this study has three independent variables namely individual level determinants, firm level determinants and external determinants. These independent variables are expected to affect or predict the level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya. Government policy is expected to be the moderating variables of this relationship.

The conceptual framework is presented in figure 2.4.

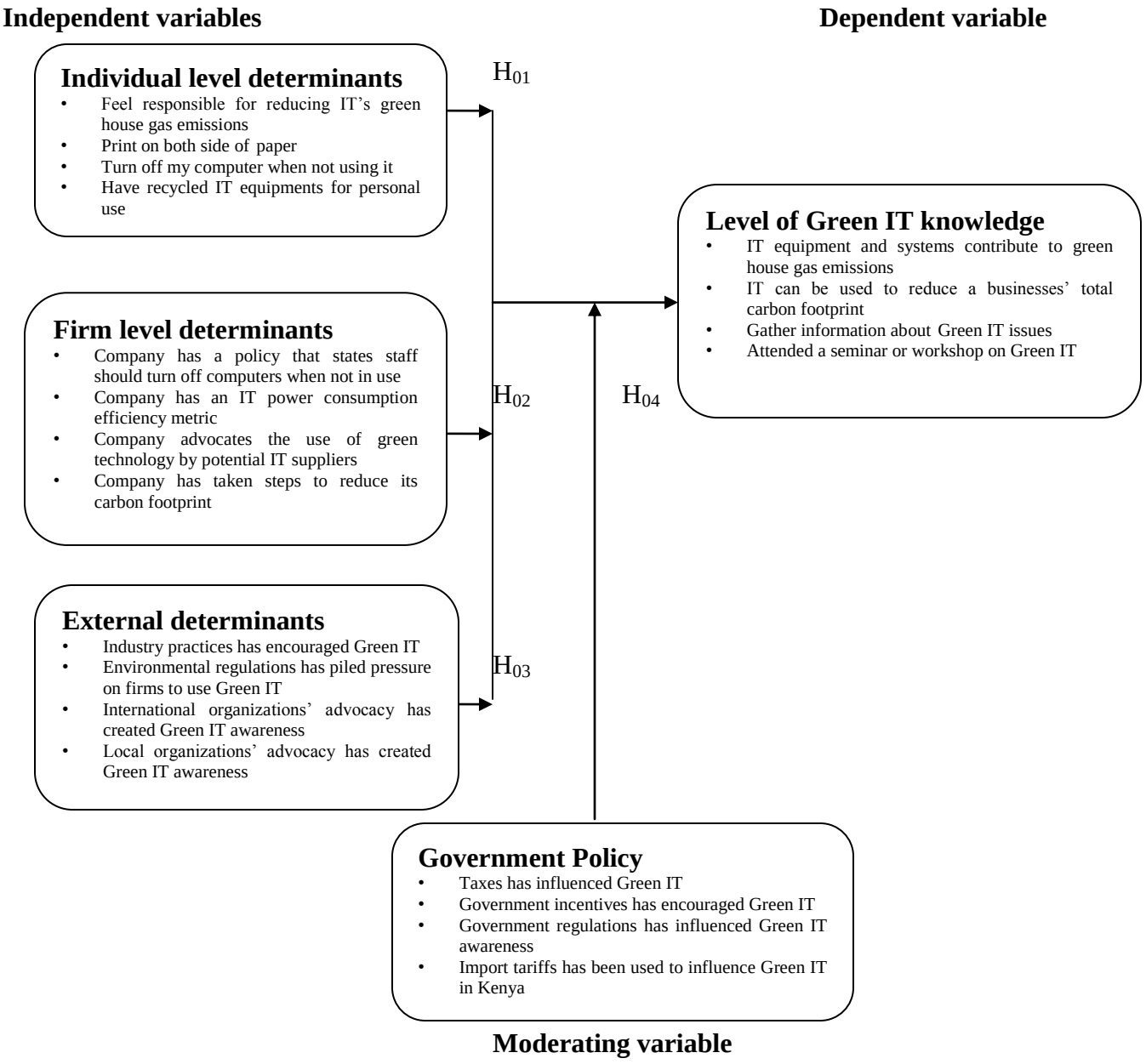


Figure 2. 4: Conceptual Framework

2.8 Operationalization of the Variables

Level of Green IT knowledge:

- IT equipment and systems contribute to green house gas emissions
- IT can be used to reduce a businesses' total carbon footprint

- Gather information about Green IT issues
- Attended a seminar or workshop on Green IT

Individual level determinants:

- Feel responsible for reducing IT's green house gas emissions
- Print on both side of paper
- Turn off my computer when not using it
- Have recycled IT equipments for personal use

Firm level determinants:

- Company has a policy that states staff should turn off computers when not in use
- Company has an IT power consumption efficiency metric
- Company advocates the use of green technology by potential IT suppliers
- Company has taken steps to reduce its carbon footprint

External determinants:

- Industry practices has encouraged Green IT
- Environmental regulations has piled pressure on firms to use Green IT
- International organizations' advocacy has created Green IT awareness
- Local organizations' advocacy has created Green IT awareness

Government Policy:

- Taxes has influenced Green IT
- Government incentives has encouraged Green IT
- Government regulations has influenced Green IT awareness
- Import tariffs has been used to influence Green IT in Kenya

2.9 Study Hypothesis

This study tested the following hypothesis:

H_{01} Individual level determinants have a significant effect on level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

H_{02} Firm level determinants have a significant effect on level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

H_{03} External determinants have a significant effect on level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

H_{04} Government policy has moderating effect the relationship between determinants of green IT awareness and level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methods and procedures that were employed to achieve the set objectives of the study. These include the research design that will be used, a description of the study population and the sampling procedures that were used to obtain the study sample. The chapter also covers how data was collected, analyzed and presented.

3.2 Research Design

This study used descriptive survey design. This method involved asking participants questions on how they feel, what their views are, and what they have experienced (Babbie, 2002). Survey method is useful when a researcher wants to collect data on phenomena that cannot be observed directly. Its advantage is that, it allows the collection of large amounts of data from a sizeable population in a highly effective, easily and in an economical way, often using questionnaires.

3.2 Sources of Data

The target population was mid-sized companies in all sectors in Kenya. SMEs account for approximately 99% of all enterprises and two thirds of employment across the OECD countries such as Kenya (OECD, 2010). Their transition to sustainable practices, in both manufacturing and services is key to the large scale uptake of a green growth model. Due to the huge number of SMEs in the country, this study focused on the Top 100 Mid-Sized Firms in 2014 as surveyed by Nation Media Group and KPMG. The survey attracts a number of SMEs who competes and 100 top rated Mid-Sized Firms emerges winners. The target of this study was the Top 100 Mid-Sized Firms as rated in 2014 KPMG and Nation Media Group survey.

3.3 Population, Sampling Method and Sample Size

This study targeted employees and IT managers in the Top 100 Mid-Sized Firms. Multi-stage sampling was used to obtain the sample size (simple random sampling and purposive sampling). Simple random sampling method was used to select 30 ‘Top 100 Mid-Sized Firms’ from the Top 100 Mid-Sized Firms in Nairobi year 2014. Convenient sampling was used to obtain 3

employees from each Top 100 Mid-Sized Firms selected for the study. Purposive sampling was used to obtain 30 IT managers of the selected from Top 100 Mid-Sized Firms. The sample size for the study was therefore 120 respondents. Three key informants from UNEP, NEMA and the Ministry of Information and Communication Technology each was purposively selected as policy makers in the sector. The key informants were therefore were nine (9).

3.4 Tools Procedures and Methods for Data Collection

3.4.1 Data Collection Tools

Primary data was collected through semi-structured questionnaires with both open and closed ended questions. The questionnaire was divided in sections where each section sought information on a specific objective of the study. Interview schedule were used to obtain data from key informants.

3.4.2 Data Collection Procedures

Questionnaires were administered to each Top 100 Mid-Sized Firm addressed to the IT manager and to three employees. This ensured a high response rate given that the targeted respondents were busy and needed to respond to the questionnaires at their convenient time. Interviews were booked in advance to ensure convenience.

3.4.3 Methods of Data Collection

Primary data and secondary data were collected. Secondary data was collected from publications and relevant records. Drop-and-pick later method was used to administer the questionnaires. Face-to-face method was used to collect data from key informants.

3.5 Data Analysis Methods

Data collection yielded both quantitative and qualitative data. Triangulation method of analysis was therefore necessary to ensure that data from IT managers, staff and key informants complement each other. Quantitative data was analyzed using inferential statistics and descriptive statistics such as frequencies, percentages and mean standard scores. The results of quantitative data analysis were presented in tables and figures. The study also used factor analysis to establish the key determinants of Green IT awareness. Multiple linear regression was

used to establish the relationship between independent, dependent and moderating variables in the study. The following multiple regression analysis model was used: $Y= \beta_0 + X_1 \beta_1 + X_2 \beta_2 + X_3 \beta_3 + \varepsilon$.

Qualitative data on the other hand was analyzed using content analysis. Responses were analyzed based on objectives and running themes were identified and grouped according to categories and themes. Conclusions were made from the most cited themes. Results of qualitative data analysis were presented in descriptive narrative.

Table 3. 1: Data Analysis Summary

Objective	Data source	Instrument	Scale	Number of respondents	Data analysis technique	Test of normality
To establish the level of Green IT knowledge among Top 100 Mid-Sized Firms in Kenya	IT managers Employees	Questionnaire	Ordinal Nominal	120	Descriptive statistics	Kolmogorov-Smirnova and Shapiro-Wilk
To determine the firm level determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya	IT managers Employees	Questionnaire	Ordinal Nominal	120	Inferential statistics	Kolmogorov-Smirnova and Shapiro-Wilk
To identify the individual level determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya	IT managers Employees	Questionnaire	Ordinal Nominal	120	Inferential statistics	Kolmogorov-Smirnova and Shapiro-Wilk
To establish external determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya	IT managers Employees	Questionnaire	Ordinal Nominal	120	Inferential statistics	Kolmogorov-Smirnova and Shapiro-Wilk
To establish the relationship among determinants of Green IT awareness among Top 100 Mid-Sized Firms in Kenya	IT managers Employees	Questionnaire	Ordinal Nominal	120	Inferential statistics	Kolmogorov-Smirnova and Shapiro-Wilk

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents data analysis and interpretation of the study findings. The chapter first presents the general information of the respondents. Analysis and interpretation of the variables according to objectives of the study are presented.

4.1.1 Reliability Test Results

Cronbach's Alpha was used to test for reliability. This measure indicates the consistency of a multiple item scale. Alpha is typically used when you have several Likert type items that are summed to make a composite score or sum mated scale. Alpha is based on the mean or average correlation of each item in the scale with every other item. The results show that an overall Cronbach's Alpha value of 0.848 was realized. The research instrument was therefore considered reliable. Table 4.1 shows reliability test results.

Table 4. 1: Reliability Test Results

Cronbach's Alpha	N of Items
.848	20

Specific Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IT equipment and systems in our firm contribute to green house gas emissions	59.38	58.139	.410	.843
IT can be used to reduce firm's total carbon footprint	58.56	59.780	.386	.843
I have gathered information about Green IT issues in our firm	60.52	58.845	.282	.850
I have attended a seminar or workshop on Green IT	60.61	59.451	.273	.850
I feel responsible for reducing IT's green house gas emissions	59.07	60.291	.261	.849
I print on both side of paper	58.24	59.693	.396	.843
I turn off my computer when not using it	58.07	57.204	.476	.839
I have recycled IT equipments for personal use	58.71	58.802	.330	.847
Company has a policy that states staff should turn off computers when not in use	58.80	59.591	.359	.844
Company has an IT power consumption efficiency metric	58.99	56.901	.478	.839
Company advocates the use of green technology by potential IT suppliers	59.17	56.588	.482	.839
Company has taken steps to reduce its carbon footprint	59.15	56.349	.576	.835
Environmental regulators has piled pressure on firms to know and adopt Green IT	59.45	59.189	.444	.841
Industry pressure has made firms aware of Green IT	59.32	58.812	.439	.841
International organizations' advocacy has created Green IT awareness	59.40	58.194	.507	.839
Local organizations' advocacy has created Green IT awareness	59.39	59.525	.425	.842
Government subsidies has influenced Green IT awareness	59.48	58.178	.504	.839
Taxes has influenced Green IT awareness determinants	59.39	58.512	.549	.838
Government regulations has influenced Green IT awareness	59.28	57.291	.609	.835
Import tariffs has been used to influence Green IT in Kenya	59.27	57.606	.647	.834

4.1.2 Tests of Normality

Kolmogorov-Smirnova and Shapiro-Wilk tests were used to test for normality. The *p values* of Level of Green IT Awareness, Individual level determinants, Firm level determinants, External determinants, and Government policy were found to be statistically significant. This shows that data on the five variables was normally distributed. Table 4.2 shows tests of normality results.

Table 4. 2: Tests of Normality Results

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Level of Green IT Awareness	.148	82	.000	.952	82	.004
Individual level determinants	.135	82	.001	.937	82	.001
Firm level determinants	.204	82	.000	.932	82	.000
External determinants	.273	82	.000	.874	82	.000
Government policy	.248	82	.000	.896	82	.000

a. Lilliefors Significance Correction

4.1.3 Response Rate

The researcher targeted 120 respondents but managed to get 101 questionnaires filled and returned. This translates to 84.2% response rate which was considered adequate for analysis and making conclusions. Figure 4.1 shows the study response rate.

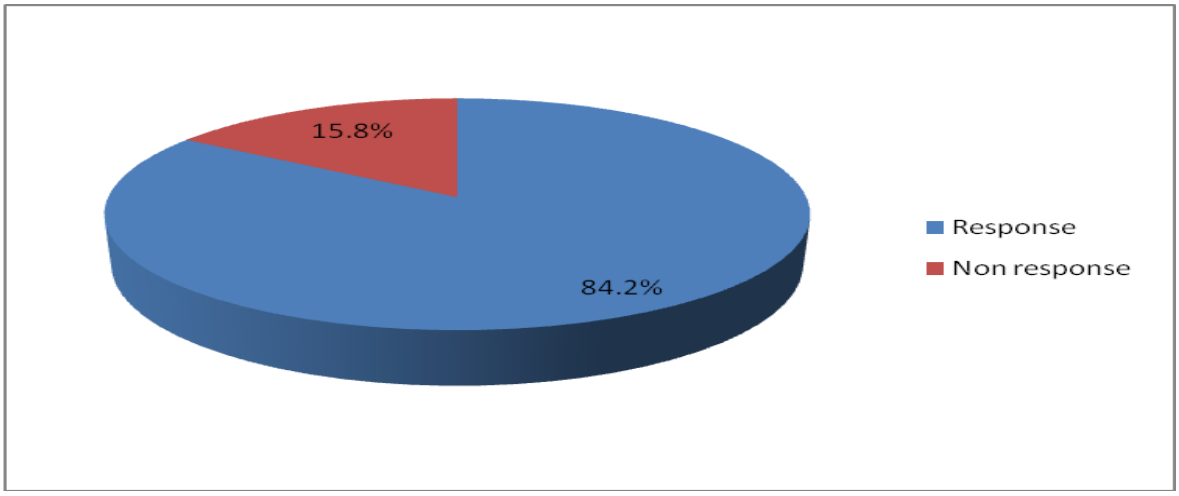


Figure 4. 1: Study Response Rate

4.1.4 Background Information

Respondents were asked to indicate their position in their respective firms. Majority of the respondents (84.8%) indicated their position as staff while 11.1% of the respondents indicated their position as IT managers. Only 4% of the respondents indicated their position as other. Figure 4.2 shows the results on respondents' distribution by position.

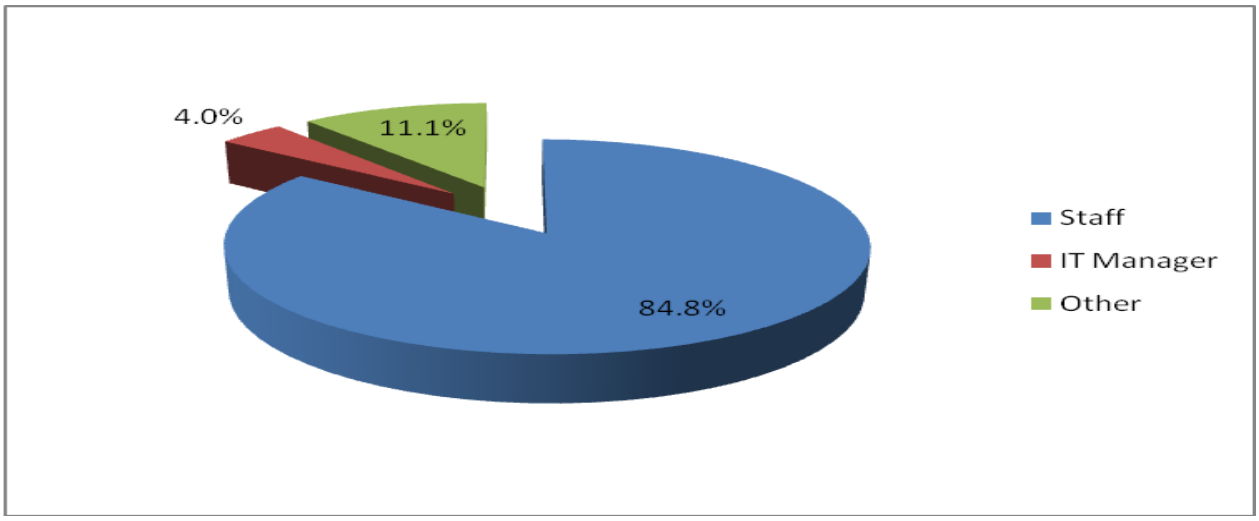


Figure 4. 2: Respondents' Distribution by Position

The researcher wanted to know the duration that the respondents had worked in their respective firms. Respondents who had worked in their respective firms for 4-7 years were 49% while those who had worked for 3 years and below were 28.6%. Only 1% of the respondents indicated that they had worked in their respective firm for 12 years and above while 21.4% indicated that they had worked in their respective firms for 8-11 years. Table 4.3 shows results on duration worked in respective firms.

Table 4. 3: Duration worked in Respective Firms

	Frequency	Percent	Cumulative Percent
'3 years and below'	28	28.6	28.6
'4-7 years'	48	49.0	77.6
'8-11 years'	21	21.4	99.0
'12 years and above'	1	1.0	100.0
Total	98	100.0	

The researcher wanted to know the nature of business of the firms that respondents worked for. The results show that respondents were drawn from firms dealing in various businesses such as telecommunication and IT (27.7%), financial services (9.9%), construction and real estate (8.9%), healthcare (6.9%), manufacturing (3%), energy and petroleum (3%) and others (33.7%). Table 4.4 shows results on nature of business.

Table 4. 4: Nature of business

	Frequency	Percent	Cumulative Percent
Manufacturing	3	3.0	3.0
Financial services	10	9.9	12.9
Telecommunication and IT	28	27.7	40.6
Wholesale and Retail	7	6.9	47.5
Energy and petroleum	3	3.0	50.5
Construction and Real estate	9	8.9	59.4
Healthcare	7	6.9	66.3
Other	34	33.7	100.0
Total	101	100.0	

4.1.5 Descriptive Results

The mean score of data on individual level determinants of green IT awareness was 3.8049 while the standard deviation was 0.61240. The results show that data on individual level determinants of green IT awareness had a skeweness of -0.896. This shows that data on individual level determinants of green IT awareness had a distribution with a symmetric tail extending towards the left of the mean values. The results show that data on individual level determinants of green IT awareness had a kurtosis of 1.273 which indicates a relatively peaked distribution since (Kurtosis > 0).

Table 4. 5: Descriptive Results for Individual level determinants

			Statistic	Std. Error
Individual level determinants	Mean		3.8049	.06763
	95% Confidence Interval for Mean	Lower Bound	3.6703	
		Upper Bound	3.9394	
	5% Trimmed Mean		3.8415	
	Median		3.7500	
	Variance		.375	
	Std. Deviation		.61240	
	Minimum		1.75	
	Maximum		4.75	
	Range		3.00	
	Interquartile Range		.75	
	Skewness		-.896	.266
	Kurtosis		1.273	.526

The descriptive results for firm level determinants show that it had a mean score of 3.3018 and a standard deviation of 0.757741. The data on firm level determinants had a skewness of 0.537 and a kurtosis of -0.380. The descriptive results for data on firm level determinants are shown in table 4.6.

Table 4. 6: Descriptive Results for Firm Level Determinants

			Statistic	Std. Error
Firm level determinants	Mean		3.3018	.08364
	95% Confidence Interval for Mean	Lower Bound	3.1354	
		Upper Bound	3.4683	
	5% Trimmed Mean		3.2693	
	Median		3.0000	
	Variance		.574	
	Std. Deviation		.75741	
	Minimum		2.00	
	Maximum		5.00	
	Range		3.00	
	Interquartile Range		1.25	
	Skewness		.537	.266
	Kurtosis		-.380	.526

The descriptive results for data on external determinants show that it had a mean score of 2.9390 and a standard deviation of 0.58737. The results also show that the data had a skewness of -1.116 and a kurtosis of 2.076. Table 4.7 shows the descriptive results for data on external determinants.

Table 4. 7: Descriptive Results for External Determinants

			Statistic	Std. Error
External determinants	Mean		2.9390	.06486
	95% Confidence Interval for Mean	Lower Bound	2.8100	
		Upper Bound	3.0681	
	5% Trimmed Mean		2.9770	
	Median		3.0000	
	Variance		.345	
	Std. Deviation		.58737	
	Minimum		1.00	
	Maximum		4.00	
	Range		3.00	
	Interquartile Range		.50	
	Skewness		-1.116	.266
	Kurtosis		2.076	.526

The descriptive results for data on government policy show that it had a mean score of 2.9756 and a mean score of 0.58348. The results also show that data on government policy had a skewness of -0.256 and a kurtosis of 0.377. These results are shown in table 4.8.

Table 4. 8: Descriptive Results for Government Policy

			Statistic	Std. Error
Government policy	Mean		2.9756	.06443
	95% Confidence Interval for Mean	Lower Bound	2.8474	
		Upper Bound	3.1038	
	5% Trimmed Mean		2.9898	
	Median		3.0000	
	Variance		.340	
	Std. Deviation		.58348	
	Minimum		1.50	
	Maximum		4.00	
	Range		2.50	
	Interquartile Range		.50	
	Skewness		-.256	.266
	Kurtosis		.377	.526

4.2 Individual Level Determinants

The respondents were asked to indicate their level of agreement or disagreement with four statements in regards to individual level determinants of Green IT awareness in their firms. They were asked to use a five point likert scale of 1-5 where 1 was strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree. The results show that respondents agreed with the

statements that they print on both side of paper (M=4.08, SD=.646) and that they turn off their computer when not using it (M=4.18, SD=.850). The respondents were neutral on the statements that they feel responsible for reducing IT's green house gas emissions (M=3.21, SD=.872) and that they have recycled IT equipments for personal use (M=3.57, SD=.885). These results are presented in table 4.9.

Table 4. 9: Individual Level Determinants

Statements	Strongly disagreed	Disagree	Neutral	Agree	Strongly agree	Total	Mean	Std. Deviation
I feel responsible for reducing IT's green house gas emissions	5.1%	14.1%	35.4%	45.5%	0.0%	100.0%	3.21	.872
I print on both side of paper	0.0%	1.0%	14.0%	61.0%	24.0%	100.0%	4.08	.646
I turn off my computer when not using it	2.0%	2.0%	10.1%	47.5%	38.4%	100.0%	4.18	.850
I have recycled IT equipments for personal use	3.1%	8.2%	26.5%	53.1%	9.2%	100.0%	3.57	.885

According to the key informants, exposure to information, education and training and rising power bills determines Green IT awareness in Kenya at individual level. Some of the key informants indicated that agencies such as NEMA should be proactive in creating green IT awareness.

4.3 Firm Level Determinants

Respondents were asked to indicate their level of agreement or disagreement with four statements in regards to firm level determinants of Green IT awareness. They were asked to use a five point likert scale of 1-5 where 1 was strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree. The results show that respondents neutral on the statements that company has a policy that states staff should turn off computers when not in use (M=3.49, SD=.725) and that company has an IT power consumption efficiency metric (M=3.26, SD=.878). The results also show that respondents were neutral on statements that company advocates the use of green

technology by potential IT suppliers (M=3.16, SD=.903) and that company has taken steps to reduce its carbon footprint (M=3.16, SD=.825). These findings are summarized in table 4.10.

Table 4. 10: Firm Level Determinants

Statements	Strongly disagreed	Disagree	Neutral	Agree	Strongly agree	Total	Mean	Std. Deviation
Company has a policy that states staff should turn off computers when not in use	0%	4.2%	52.1%	34.4%	9.4%	100.0%	3.49	.725
Company has an IT power consumption efficiency metric	0.0%	17.9%	48.4%	23.2%	10.5%	100.0%	3.26	.878
Company advocates the use of green technology by potential IT suppliers	3.2%	18.9%	42.1%	30.5%	5.3%	100.0%	3.16	.903
Company has taken steps to reduce its carbon footprint	1.0%	18.8%	49.0%	26.0%	5.2%	100.0%	3.16	.825

Key informants indicated that company policy and internal mechanisms such as procurement policies determine green IT awareness at the firm level. Management policies and IT governance therefore plays a critical role in green IT awareness.

4.4 External Determinants

The respondents were asked to indicate their level of agreement or disagreement with four statements in regards to external determinants of Green IT awareness in their firms. They were asked to use a five point likert scale of 1-5 where 1 was strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree. The results show that respondents were neutral on the statement that industry pressure has made firms aware of Green IT (M=3.02, SD=.745). Respondents disagreed with statements that environmental regulators has piled pressure on firms to know and adopt Green IT (M=2.89, SD=.661), international organizations' advocacy has created Green IT awareness (M=2.93, SD=.700) and local organizations' advocacy has created Green IT awareness (M=2.96, SD=.656). These results are presented in table 4.11.

Table 4. 11: External Determinants

Statements	Strongly disagreed	Disagree	Neutral	Agree	Strongly agree	Total	Mean	Std. Deviation
Environmental regulators has piled pressure on firms to know and adopt Green IT	3.3%	17.8%	65.6%	13.3%	0%	100.0%	2.89	.661
Industry pressure has made firms aware of Green IT	5.5%	9.9%	61.5%	23.1%	0%	100.0%	3.02	.745
International organizations' advocacy has created Green IT awareness	3.3%	17.8%	61.1%	17.8%	0%	100.0%	2.93	.700
Local organizations' advocacy has created Green IT awareness	3.4%	13.5%	67.4%	15.7%	0%	100.0%	2.96	.656

Key informants cited government policy, power usage audit, and compliance with international standards as significant external determinants to level of green IT awareness. These include energy star as well as white versus grey products. This according to key informants has been made possible by articulation and stressing about green IT by government as well as advocacy and education of the masses by government and other agencies that make people aware. Manufacturers and suppliers of IT equipments, benchmarking with international standards and carbon foot prints audit by the government are some of important green IT awareness external determinants.

4.5 Government Policy

Respondents were asked to indicate their level of agreement or disagreement with four statements in regards to government policy and its influence on Green IT awareness in their firms. They were asked to use a five point likert scale of 1-5 where 1 was strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree. The results show that respondents were neutral on the statements that government regulations have influenced Green IT awareness (M=3.06, SD=.693) and import tariffs has been used to influence Green IT in Kenya (M=3.04, SD=.652).

The respondents disagreed with the statements that government subsidies has influenced Green IT awareness (M=2.86, SD=.708) and taxes has influenced Green IT awareness determinants (M=2.91, SD=.651). Table 4.12 shows the results.

Table 4. 12: Government Policy

Statements	Strongly disagreed	Disagree	Neutral	Agree	Strongly agree	Total	Mean	Std. Deviation
Government subsidies has influenced Green IT awareness	3.3%	23.1%	58.2%	15.4%	0%	100.0%	2.86	.708
Taxes has influenced Green IT awareness determinants	2.2%	19.1%	64.0%	14.6%	0%	100.0%	2.91	.651
Government regulations have influenced Green IT awareness	2.2%	14.4%	58.9%	24.4%	0%	100.0%	3.06	.693
Import tariffs has been used to influence Green IT in Kenya	1.1%	15.6%	61.1%	22.2%	0%	100.0%	3.04	.652

Key informants indicated that taxes can influence determinants of Green IT where taxation is raised if there are more carbon emissions and taxation is lowered where there are less carbon emissions. The key informants however noted that this has not happened. If high taxes are enforced to high carbon footprints then taxes would influence Green IT determinants.

4.6 Level of Green IT Awareness

The respondents were asked to indicate their level of agreement or disagreement with four statements in regards to level of Green IT awareness. They were asked to use a five point likert scale of 1-5 where 1 was strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree. The results show that respondents strongly disagreed with the statements that they have gathered information about Green IT issues in their firm (M=1.82, SD=1.029) and that they have attended a seminar or workshop on Green IT (M=175, SD=.968). The respondents also disagreed with the statement that IT equipment and systems in their firm contributed to green house gas emissions (M=2.90, SD=.831). The respondents were neutral on the statement that IT can be used to reduce firm's total carbon footprint (M=3.69, SD=.703). On average, the results show that level of green

IT awareness was low in mid sized firms as shown by a mean score of 2.54. Table 4.13 shows results on the level of Green IT awareness.

Table 4. 13: Level of Green IT Awareness

	Strongly disagreed	Disagree	Neutral	Agree	Strongly agree	Total	Mean	Std. Deviation
IT equipment and systems in our firm contribute to green house gas emissions	3.0%	29.7%	42.6%	23.8%	1.0%	100.0%	2.90	.831
IT can be used to reduce firm's total carbon footprint	0%	5.9%	26.7%	59.4%	7.9%	100.0%	3.69	.703
I have gathered information about Green IT issues in our firm	51.0%	27.0%	12.0%	9.0%	1.0%	100.0%	1.82	1.029
I have attended a seminar or workshop on Green IT	52.0%	31.0%	7.0%	10.0%	0%	100.0%	1.75	.968
Average							2.54	

Key informants noted that only few organizations in Kenya are going green. According to the key informants, few people understand Green IT and very few people have adopted it. There is therefore low awareness and also a lack of disposal policy. One of the key informants indicated that Green IT awareness is consciously and unconsciously. Some of the key informants attributed this to lack of knowledge. Others attributed this low level of green IT awareness to lack of standards.

Correlation analysis was done to establish the relationship between level of green IT awareness and the determinants. The results show that level of green IT awareness was positively correlated to individual level determinants (r=.365), firm level determinants (r=.285), external determinants (r=.390) and government policy (r=.305). These relationships were significant at 99% confidence level. Table 4.14 shows correlation analysis results.

Table 4. 14: Level of Green IT Awareness and Determinants Correlation

		Level of Green IT Awareness	Individual level determinants	Firm level determinants	External determinants	Government policy
Level of Green IT Awareness	Pearson Correlation	1	.365**	.285**	.390**	.305**
	Sig. (2-tailed)		.000	.006	.000	.004
	N	100	97	93	89	89
Individual level determinants	Pearson Correlation	.365**	1	.232*	.202	.234*
	Sig. (2-tailed)	.000		.025	.062	.029
	N	97	97	93	86	87
Firm level determinants	Pearson Correlation	.285**	.232*	1	.037	.380**
	Sig. (2-tailed)	.006	.025		.735	.000
	N	93	93	94	84	84
External determinants	Pearson Correlation	.390**	.202	.037	1	.514**
	Sig. (2-tailed)	.000	.062	.735		.000
	N	89	86	84	89	86
Government policy	Pearson Correlation	.305**	.234*	.380**	.514**	1
	Sig. (2-tailed)	.004	.029	.000	.000	
	N	89	87	84	86	89

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

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

4.7 Regression Analysis Results

A multiple linear regression analysis was done to establish the relationship between the independent variables; individual level determinants, firm level determinants and external determinants on the dependent variable which in this case was level of Green IT awareness. The multiple correlation coefficient (R) is a measure of the strength of the relationship between Y (dependent variable) and the predictor or independent variables selected for inclusion in the equation. In this case, R=.486 which tells us there is a moderate-to-strong relationship. By squaring R, we identify the value of the coefficient of multiple determination (R^2). Adjusted R^2

(.208) is used when there are many independent variables as in this case where we have three independent variables. This statistic enables us to determine the amount of explained variation (variance) in Y from the three predictors on a range from 0-100 percent. Thus, we are able to say that 20.8% of the variation in Y (dependent) is accounted for through the combined linear effects of the predictor variables. The model summary results show that the independent variables explain 20.8% (R^2=.208) of the change in dependent variable. Table 4.15 presents model summary results.

Table 4. 15: Model Summary Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.486[a]	.236	.208	.50358

a. Predictors: (Constant), External determinants, Firm level determinants, Individual level determinants

Analysis of variance (ANOVA) was used to check the fitness of the regression model used. P value was used to test significance whereby if p value is above 0.05, it was considered statistically significant while a p value below 0.05 was considered not statistically significant. F-ratio (F=8.245, *p*=.000) was found to be statistically significant since its p value was lower than 0.05. This shows that the model used was fit and the relationship of the variables established could not have occurred by chance. Table 4.16 shows ANOVA results.

Table 4. 16: Analysis of variance (ANOVA) Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.272	3	2.091	8.245	.000[b]
	Residual	20.287	80	.254		
	Total	26.560	83			

a. Dependent Variable: Level of Green IT Awareness
b. Predictors: (Constant), External determinants, Firm level determinants, Individual level determinants

The coefficients table shows the contribution of each variable to the change in the dependent variable. The results in table 4.18 show that individual level determinants positively and

significantly affected level of Green IT awareness (β=.220, *p*=.022). Firm level determinants were found to positively affect level of Green IT awareness (β=.140, *p*=.065) but this relationship was not statistically significant. The results also show that external determinants positively and significantly affect level of Green IT awareness (β=.294, *p*=.003). Table 4.17 summarizes these results.

Table 4. 17: Coefficients of Determination Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.392	.441		.888	.377
	Individual level determinants	.220	.094	.239	2.334	.022
	Firm level determinants	.140	.075	.187	1.870	.065
	External determinants	.294	.097	.301	3.019	.003

a. Dependent Variable: Level of Green IT Awareness

The researcher wanted to establish the moderating effect of government policy on the relationship between determinants of green IT awareness and level of green IT awareness. The results in model summary table show R^2 changed from .198 in model 1 to .187 in model 2. This change however was not statistically significant (*p*=.954). Table 4.19 shows results for model change summary results.

Table 4. 18: Model Change Summary Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.477[a]	.227	.198	.50697	.227	7.649	3	78	.000
2	.477[b]	.227	.187	.51024	.000	.003	1	77	.954

a. Predictors: (Constant), External determinants, Firm level determinants, Individual level determinants

b. Predictors: (Constant), External determinants, Firm level determinants, Individual level determinants, Government policy

The results have shown that government policy did not have a moderating effect on the relationship between determinants of green IT awareness and level of green IT awareness (β=.007, *p*= .954). Table 4.19 shows results on coefficients of determination for the moderating effect of government policy.

Table 4. 19: Coefficients Table

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.457	.451		1.014	.314
	Individual level determinants	.206	.096	.223	2.151	.035
	Firm level determinants	.134	.076	.179	1.761	.082
	External determinants	.299	.098	.310	3.043	.003
2	(Constant)	.454	.458		.991	.325
	Individual level determinants	.206	.097	.223	2.124	.037
	Firm level determinants	.132	.083	.176	1.584	.117
	External determinants	.295	.113	.307	2.614	.011
	Government policy	.007	.122	.007	.058	.954

a. Dependent Variable: Level of Green IT Awareness

4.8 Factor Analysis Results

A Principal Component Analysis with a Varimax (orthogonal) rotation of 25 of the 16 Likert scale questions from the survey questionnaire was conducted on data gathered from 101 participants. The Kaiser-Meyer-OIkin (KMO) measure should be greater than .70, and is inadequate if less than .50. The KMO test tells one whether or not enough items are predicted by each factor. The Bartlett test should be significant (i.e., a significance value of less than .05); this means that the variables are correlated highly enough to provide a reasonable basis for factor analysis. An examination of the Kaiser-Meyer Olkin measure of sampling adequacy suggested that the sample was factorable (KMO=.766). These results are shown in table 4.20.

Table 4. 20: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.766
Bartlett's Test of Sphericity	Approx. Chi-Square	787.440
	df	120
	Sig.	.000

Eigenvalues are measures of explained variance. Eigenvalues of greater than 1.0 is a common criterion for a factor to be useful. When the eigenvalue is less than 1.0, this means that the factor explains less information than a single item would have explained. Most researchers would not consider the information gained from such a factor to be sufficient to justify keeping that factor. The results of factor analysis show that four components explained 72.3% of variance. This was obtained by considering Eigenvalues that were above 1. Table 4.21 shows the results.

Table 4. 21: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.284	33.025	33.025	5.284	33.025	33.025	3.209	20.058	20.058
2	2.946	18.411	51.435	2.946	18.411	51.435	3.024	18.898	38.957
3	2.022	12.637	64.072	2.022	12.637	64.072	2.956	18.478	57.435
4	1.310	8.185	72.257	1.310	8.185	72.257	2.372	14.822	72.257
5	.949	5.929	78.186						
6	.627	3.921	82.108						
7	.518	3.237	85.344						
8	.430	2.690	88.035						
9	.414	2.585	90.620						
10	.361	2.258	92.878						
11	.278	1.735	94.613						
12	.247	1.543	96.156						
13	.200	1.250	97.406						
14	.173	1.080	98.486						
15	.149	.929	99.415						
16	.094	.585	100.000						

Extraction Method: Principal Component Analysis.

Orthogonal rotation (varimax) means that the final factors will be as uncorrelated as possible with each other. As a result, we can assume that the information explained by one factor is independent of the information in the other factors. We rotate the factors so that they are easier to interpret. Rotation makes it so that, as much as possible, different items are explained or predicted by different underlying factors, and each factor explains more than one item. The Rotated Factor Matrix table, which contains these loadings, is key for understanding the results of the analysis. The results of an orthogonal rotation of the solution are shown in Table 4.23. When loadings less than 0.30 were excluded, the analysis yielded a four-factor solution with a simple structure (factor loadings =>.30). Four items loaded to factor 1. The four items that load to factor 1 were related to firm level determinants of green IT. Four items loaded to factor 2 and they were related to external determinants of green IT. Four items loaded to factor 3. These items were related to government policy. Four items loaded to factor 4 which were related to individual determinants of green IT. Table 4.22 presents these results.

Table 4. 22: Rotated Component Matrix

Principal Component Factor Analysis	Component			
	1	2	3	4
I feel responsible for reducing IT's green house gas emissions				.458
I print on both side of paper				.825
I turn off my computer when not using it				.810
I have recycled IT equipments for personal use				.825
Company has a policy that states staff should turn off computers when not in use	.870			
Company has an IT power consumption efficiency metric	.867			
Company advocates the use of green technology by potential IT suppliers	.912			
Company has taken steps to reduce its carbon footprint	.814			
Environmental regulators has piled pressure on firms to know and adopt Green IT		.837		
Industry pressure has made firms aware of Green IT		.854		
International organizations' advocacy has created Green IT awareness		.764		
Local organizations' advocacy has created Green IT awareness		.798		
Government subsidies has influenced Green IT awareness			.808	
Taxes has influenced Green IT awareness determinants			.869	
Government regulations has influenced Green IT awareness		.326	.795	
Import tariffs has been used to influence Green IT in Kenya		.369	.706	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

4.9 Results of Hypothesis Testing

This study tested the following hypothesis:

H_{01} Individual level determinants have a significant effect on level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

The results have shown individual level determinants positively and significantly affected level of Green IT awareness (β=.220, *p*=.022). Since the results show that β≠0 and p< 0.05, the researcher failed to reject H_{01} that individual level determinants have a significant effect on level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya.

H_{02} Firm level determinants have a significant effect on level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

Firm level determinants were found to positively affect level of Green IT awareness but this relationship was not statistically significant (β=.140, *p*=.065). β≠0 but p> 0.05 hence the researcher rejected H_{02} that firm level determinants have a significant effect on level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya.

H_{03} External determinants have a significant effect on level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

The results have shown that external determinants positively and significantly affect level of Green IT awareness (β=.294, p=.003). β≠0 and p< 0.05 hence the researcher failed to reject H_{03} that external determinants have a significant effect on level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya.

H_{04} Government policy has moderating effect on the relationship between determinants of green IT awareness and level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya

The results have shown that when government policy was added to the equation its contribution to the level of green IT awareness was not statistically significant (β=.007, *p*= .954). β≠0 but p> 0.05 hence the researcher rejected H_{04} that government policy has moderating effect on level of

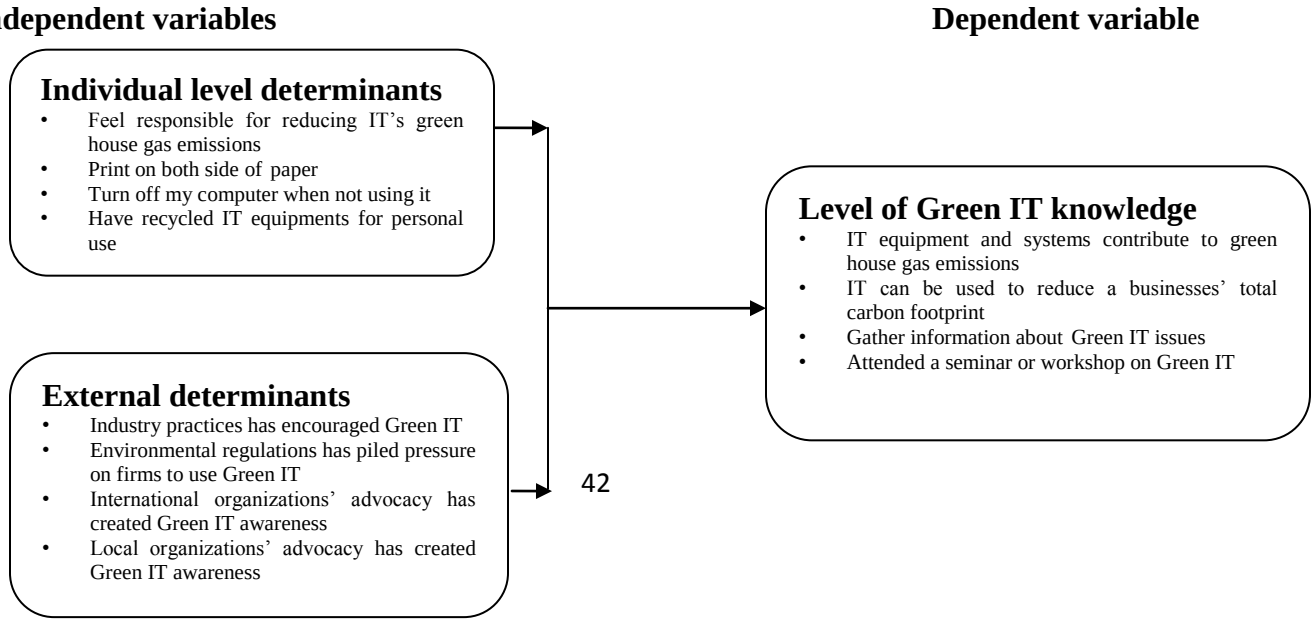
Green IT awareness among Top 100 Mid-Sized Firms in Kenya. Therefore, government policy did not have a moderating effect on the relationship between determinants of green IT awareness and level of green IT awareness. Table 4.23 summarizes results of hypothesis testing.

Table 4. 23: Results of Hypothesis Testing

Hypothesis Number	Variables	Hypotheses Results	Explanation
H_1	Individual level determinants	Failed to reject	Individual level determinants positively and significantly affected level of Green IT awareness
H_2	Firm level determinants	Rejected	Firm level determinants were found to positively affect level of Green IT awareness but this relationship was not statistically significant
H_3	External determinants	Failed to reject	External determinants positively and significantly affect level of Green IT awareness
H_4	Government policy	Rejected	Government policy did not have a moderating effect on the relationship between determinants of green IT awareness and level of green IT awareness

4.10 Summary

The redrawn conceptual framework shows that independent variables comprising of individual level determinants and external determinants significantly influence the dependent variable (level of Green IT knowledge).



CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of study findings, conclusions made based on these findings and recommendations of the study.

5.2 Summary of Findings

This study sought to establish the determinants of Green IT awareness among Top 100 Mid-Sized Firms in Kenya. This study sought to achieve five specific research objectives: to establish the level of Green IT knowledge among Top 100 Mid-Sized Firms in Kenya; to identify the individual level determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya; to determine the firm level determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya; to establish external determinants of level of Green IT awareness among Top 100 Mid-Sized Firms in Kenya; and to establish the relationship among determinants of Green IT awareness among Top 100 Mid-Sized Firms in Kenya.

This study used descriptive survey design. The target population was mid-sized companies in all sectors in Kenya. The target of this study was the Top 100 Mid-Sized Firms as rated in 2014 KPMG and Nation Media Group survey. This study targeted employees and IT managers in the Top 100 Mid-Sized Firms. Simple random sampling method was used to select 30 'Top 100 Mid-Sized Firms' from the Top 100 Mid-Sized Firms in Nairobi year 2014. Convenient sampling was used to obtain 3 employees from each Top 100 Mid-Sized Firms selected for the study. Purposive sampling was used to obtain 30 IT managers of the selected from Top 100 Mid-Sized Firms. The sample size for the study was therefore 120 respondents. Three key informants from UNEP, NEMA and the Ministry of Information and Communication Technology each was purposively selected as policy makers in the sector. The key informants were therefore nine (9). Primary data and secondary data were collected.

Primary data was collected through semi-structured questionnaires with both open and closed ended questions. The questionnaire was divided in sections where each section sought information on a specific objective of the study. Questionnaires were administered to each Top

100 Mid-Sized Firm addressed to the IT manager and to three employees. Drop-and-pick later method was used to administer the questionnaires. Data collection yielded both quantitative and qualitative data. Triangulation method of analysis was therefore necessary to ensure that data from IT managers, staff and key informants complement each other.

Quantitative data was analyzed using inferential statistics and descriptive statistics such as frequencies, percentages and mean standard scores. The results of quantitative data analysis were presented in tables and figures. The study also used factor analysis to establish the key determinants of Green IT awareness. Multiple linear regression was used to establish the relationship between independent, dependent and moderating variables in the study. Qualitative data on the other hand was analyzed using content analysis. Responses were analyzed based on objectives and running themes were identified and grouped according to categories and themes. Conclusions were made from the most cited themes. Results of qualitative data analysis were presented in descriptive narrative.

The results show that level of green IT awareness was low in mid sized firms as shown by a mean score of 2.54. The results have shown that level of green IT awareness was positively correlated to individual level determinants (r=.365), firm level determinants (r=.285), external determinants (r=.390) and government policy (r=.305) at 99% confidence level. Additionally, the results have shown that individual level determinants positively and significantly affected level of Green IT awareness (β=.220, p=.022). Firm level determinants were found to positively affect level of Green IT awareness (β=.140, p=.065) but this relationship was not statistically significant. The results have also shown that external determinants positively and significantly affect level of Green IT awareness (β=.294, p=.003).

5.3 Conclusions

This study has revealed that green IT awareness is low among mid sized firms in Kenya. This study concluded that individual level is an important and significant predictor of level of green IT awareness in mid sized firms in Kenya. Individual level and external determinants are especially significantly influencing green IT awareness.

Firm level determinants are not significantly influencing level of green IT awareness. This study therefore concluded that firm level is not a significant predictor of level of green IT awareness in mid sized firms in Kenya. This shows that green IT awareness in mid sized firms in Kenya have taken a back banner or it is not a priority in these firms.

External determinants are significantly influencing level of green IT awareness. This study therefore concluded that external determinants are important predictors of the level of green IT awareness in mid sized firms in Kenya.

5.4 Recommendations

This study recommends that the government and other stakeholders should come together to increase the level of green IT awareness. This is because the level of green IT awareness has been revealed to be low. If the situation is left unaddressed, carbon footprints will increase and lead to unsustainable business environment. This will be bad for not only businesses but also for the society at large.

The government in raising level of green IT awareness should focus on individual level, firm level and external determinants as they have been revealed to positively influence level of green IT awareness. The government should especially put in place policies that will ensure that at the firm level, there are pro-active activities in regard to green IT awareness and initiatives to reduce carbon footprints in organizations.

The mid sized firms in Kenya should give level of green IT awareness issue the priority and importance it deserves. Contrary, the situation as it is, level of green IT awareness issue is not a priority in mid sized firms in Kenya. The mid sized firms in Kenya should understand that increased green IT awareness and reduced carbon footprints will not only mitigate global warming but also create a sustainable business environment that secures future prospects.

5.4.1 Suggestions for Further Research

This study recommends that further research should focus on ways and frameworks of promoting green IT awareness in firms. This can be done by entrenching green IT policies in their strategic plans. Further research should examine whether green IT awareness varies with sector. This can

be done by comparing green IT awareness in manufacturing and services sector. Further research should find out why green IT awareness is not a priority in mid sized firms in Kenya.

Further research should also examine prospects of a framework for adoption by businesses to ensure active participation in creating a sustainable business environment. This can be done by promoting activities that save energy and diversify in alternative sources of energy that are renewable. Future scholars should also focus on green IT awareness among members of the public and ways to improve the situation.

5.5 Limitations

The methods used in this study may not be able to delve into unique attributes of Green IT in individual Top 100 Mid-Sized Firms. Descriptive survey is suitable for generalization purposes and therefore may ignore some unique yet important aspects of individual Top 100 Mid-Sized Firms. This study was a census and therefore assumes that Top 100 Mid-Sized Firms have homogenous characteristics across all sectors which might not be the case in reality.

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APPENDICES

Appendix II: Questionnaire

Ben N Karani,
Phone: 0720265948
Re: Data Collection for MSC

Dear Respondent,

My name is Ben N Karani, a Master of Science Degree student in Information Technology Management of the University of Nairobi. As a requirement for an award of masters degree, I am conducting research on determinants of green information technology awareness among Top 100 Mid-Sized Firms in Kenya. I am requesting you to assist in my research by providing information on issues asked in the questionnaire. Thank you in advance for your cooperation.

Your's faithfully,

Ben N Karani

Instructions

Tick, mark or write as appropriate in the spaces provided.

Section A: Background Information

1. What is your position in this firm?

   Staff [ ]

   IT manager [ ]

   Other (specify) ……

2. How long have you worked in this firm?

   3 years and below [ ]

   4-7 years [ ]

   8-11 years [ ]

   12 years and above [ ]

3. What is the nature of business in this firm?

   Manufacturing [ ]

   Financial services [ ]

Telecommunication and IT [ ]

Wholesale and Retail trade [ ]

Agriculture [ ]

Energy and petroleum [ ]

Construction and real estate [ ]

Other (specify) ……..

Section B: Level of Green IT Awareness

4. In a scale of 1-5 where 1 is strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree, what is your level of agreement or disagreement with the following statements in regards to level of Green IT awareness?

Statement	**1**	**2**	**3**	**4**	**5**
a) IT equipment and systems in our firm contribute to green house gas emissions					
b) IT can be used to reduce firm's total carbon footprint					
c) I have gathered information about Green IT issues in our firm					
d) I have attended a seminar or workshop on Green IT					

Section C: Individual level determinants

5. In a scale of 1-5 where 1 is strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree, what is your level of agreement or disagreement with the following statements in regards to individual level determinants of Green IT awareness?

Statement	**1**	**2**	**3**	**4**	**5**
a) I feel responsible for reducing IT's green house gas emissions					
b) I print on both side of paper					
c) I turn off my computer when not using it					
d) I have recycled IT equipments for personal use					

Section D: Firm level determinants

6. In a scale of 1-5 where 1 is strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree, what is your level of agreement or disagreement with the following statements in regards to firm level determinants of Green IT awareness?

Statement	**1**	**2**	**3**	**4**	**5**
a) Company has a policy that states staff should turn off computers when not in use					
b) Company has an IT power consumption efficiency metric					
c) Company advocates the use of green technology by potential IT suppliers					
d) Company has taken steps to reduce its carbon footprint					

Section E: External determinants

7. In a scale of 1-5 where 1 is strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree, what is your level of agreement or disagreement with the following statements in regards to external determinants of Green IT awareness?

Statement	**1**	**2**	**3**	**4**	**5**
a) Environmental regulators has piled pressure on firms to know and adopt Green IT					
b) Industry pressure has made firms aware of Green IT					
c) International organizations' advocacy has created Green IT awareness					
d) Local organizations' advocacy has created Green IT awareness					

Section F: Government Policy

8. In a scale of 1-5 where 1 is strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree, what is your level of agreement or disagreement with the following statements in regards to government policy influence on determinants of Green IT awareness?

Statement	**1**	**2**	**3**	**4**	**5**
a) Government subsidies has influenced Green IT awareness					
b) Taxes has influenced Green IT awareness determinants					
c) Government regulations has influenced Green IT awareness					
d) Import tariffs has been used to influence Green IT in Kenya					

Appendix II: Interview Schedule

1. How would you describe level of Green IT awareness among Mid-Sized firms in Kenya in Kenya?
2. In your assessment, what determines Green IT awareness in Kenya at:
    a. Individual level?
    b. Firm level?
    c. Macro/industry level?
3. What are the external determinants of Green IT awareness among Mid-Sized firms in Kenya?
4. How has taxes influenced determinants Green IT awareness among Mid-Sized firms in Kenya?
5. How has government incentives influenced determinants Green IT awareness among Mid-Sized firms in Kenya?

Appendix III List of Top 100 Mid-Sized Firms 2014

1. OPTIVEN ENTERPRISES Ltd
2. VEHICLE AND EQUIPMENT LEASING LTD
3. SHADE SYSTEMS E.A. Ltd
4. NORTH STAR COOLING SYSTEMS Ltd
5. LEAN ENERGY SOLUTIONS Ltd
6. WOTECH KENYA Ltd
7. PHARMAKEN LIMITED
8. SYNERMEDICA (KENYA) LTD
9. NOVEL TECHNOLOGIES EA LTD
10. ASLAN ADVENTURE
11. MEGA PACK K LTD
12. EAST AFRICA CANVAS CO LTD
13. HAJAR SERVICES LTD
14. PEWIN CABS
15. BTB INSURANCE
16. BLUEKEY SOFTWARE SOLUTIONS (K) LTD
17. ARK CONSTRUCTION
18. DIGITAL CITY LIMITED
19. VIVEK INVESTMENTS LTD
20. WOODBRIDGE GROUP LTD
21. ONFON MEDIA LTD
22. LANOR HOLDINGS
23. ASL CREDIT
24. SPRY ENGINEERING CO. LTD
25. PWANI CELLULAR SERVICES LTD
26. PINNACLE K TAVEL & SAFARIS
27. POWERPOINT SYSTEMS EA LTD
28. SPECICOM TECHNOLOGIES LTD
29. EXECUTIVE HEALTH SULUTIONS LTD
30. ALLWIN PACKAGING INTL LTD
31. AFRICA PRACTICE EA LTD
32. UPPERHILL EYE AND LASER CENTRE
33. CUBE MOVERS LTD
34. MACHINES TECHNOLOGIES (2006)LTD
35. CHARLESTON TRAVEL LTD
36. AFRICA BIOSYSTEMS LTD
37. IMPAX BUSINESS SYSTEMS
38. KENYA BUS SERVICE MANAGEMENT LTD
39. ELITE TOOLS LTD
40. MIC GLOBAL RISKS INSURANCE BROKERS LTD
41. LANTECH (AFRICA) LTD
42. SMART BRANDS LTD
43. CARE CHEMISTS
44. STITCH MASTERS LTD

45. ALEXANDER FORBES FINANCIAL SERVICES EA LTD
46. RONGAI WOKSHOPS AND TANSPOT LTD
47. COAST INDUSTRIAL & SAFTY SUPPLIERS
48. ELDOHOSP PHARMACEUTICALS
49. STILE GAS SUPPLIES LTD
50. MURANGA FORWARDERS LIMITED
51. FURNITURE RAMA LTD
52. CONVENTIONAL CARGO CONVEYORS LTD
53. TOTAL OFFICE SOLUTIONS EA LTD
54. TYPOTECH IMAGING SYSTEMS
55. UNIQUE OFFERS LTD
56. DEVSONS INDUSTRIES LTD
57. GENERAL CARGO SERVICES LTD
58. JOGIAN INTERLINK LTD
59. WAUMINI INSURANCE BROKERS
60. PROFESSIONAL CLEAN CARE LTD
61. XRX TECHNOLOGIES LTD
62. AMEX AUTO & INDUTRSIES HARDARE
63. SYNERMED PHARMACEUTICALS (K) LTD
64. NDUGU TRANSPORT COMPANY
65. SECURITY WORLD TECHNOLOGY LTD
66. VINTAGE TRAVEL & TOURS SERVICES LTD
67. VINEP FORWARDERS LTD
68. DUNE PACKAGING LIMITED
69. REVENZO TRADING LTD
70. TRINITY PETROLEUM LTD
71. SOFTWARE TECHNOLOGIES LTD
72. AVTECH SYSTEMS LTD
73. AAR CREDIT
74. THIKA WAX WORKS LTD
75. EUROCON TILES PRODUCTION
76. POLYGON LOGISTICS LTD
77. RUSHAB PETROLEUM LTD
78. PRAFULCHANDRA & BROTHERS LTD
79. HEALTHY U 200 LTD
80. SHEFFIELD STEEL SYSTEMS LTD
81. VIRO LOCKS LTD
82. SPECIALIZED ALUMINIUM RENOVATORS LTD
83. KENBRO INDUSTRIES LTD
84. NAIROBI ENTERPRISES LTD
85. OFFICE DYNAMICS LTD
86. DE RUITER EAST AFRICA LTD
87. BROLLO KENYA LTD
88. MELVIN MARSH INTERNATIONAL LTD
89. SIGMA SUPPLIES LTD
90. SENSATIONS LTD

91. SUPREME PHARMACY LTD
92. ISOLUTIONS ASSOCIATIONS
93. KURENT TECHNOLOGIES
94. TOTAL SOLUTIONS
95. TRIDENT PLUMBERS LTD
96. PALBINA TRAVEL LTD
97. TABAKI FREIGHT
98. HOTEL WATERBUCK LTD
99. XTREME ADVENTURES LTD
100. SATGURU TRAVEL AND TOURS

Source: KPMG & Nation Media Group (2014)