INTER-ORGANIZATIONAL INFORMATION SYSTEMS ADOPTION BY UNIVERSITIES IN KENYA

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DECLARATION

I, the undersigned declare that this thesis is my original work and has not been submitted for a degree award or any other award in any University.

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DEDICATION

This work is dedicated to my brother Justus Wachira, who sacrificed a lot to pay my secondary school fees. Without his support I could not have come this far.

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OPERATIONAL DEFINITION OF TERMS

Automated Teller Machine (ATM): A computerized telecommunications device that provides the clients of a financial institution with access to financial transactions in a public space without the need for a cashier, human clerk or bank teller.

Blackboard: A tool that allows a faculty to add resources for students to access online.

Computer-mediated Network: ive transaction that occurs through the use of two or more net-worked computers.

Commission for University Education (CUE) Kenya: A body that regulates and advises the Government of Kenya on the establishment of public universities accredits and inspects private universities.

Digital library: A library where some or all of the holdings are available in electronic form, and the services of the library are also made available electronically and most often over the Internet.

Electronic Data Interchange (EDI): The electronic movement of business documents between business partners.

E-Government: Use of information technology to support government operations, engage citizens and provide public services in a

more efficient and transparent manner.

Information and Communication Technology (ICT):	Communication technologies that include the Internet, wireless networks, cell phones, voice over IP (VoIP) and other communication media.
International Network Readiness Index:	Measures of the propensity for countries to exploit the opportunities offered by information and communications technology.
Inter-organizational Information Systems:	Electronic linkages (integration) of Information Systems in different organizations, which facilitates the exchange of information between the organizations.
Inter-organizational Information Systems Adoption:	Three or more electronic links between two or more Information Systems (IS) in organizations for the purpose of transacting information.
Kenya Education Network (KENET):	A National Research and Education Network that promotes the use of ICT in Teaching, Learning and Research in Higher Education Institutions in Kenya. It aims to interconnect all the Universities, Tertiary and Research Institutions in Kenya by setting up a cost effective and sustainable private network with

high speed access to the global Internet.

Modular Object-Oriented Dynamic Learning Environment:	An open source Course management system used in training and business settings.
Public university:	A university established and maintained out of public funds.
Private university:	A university which is not established or maintained out of public funds.
Transfer Configuration Protocol/Internet Protocol (TCP/IP):	A suite of basic communication language or protocol of the Internet that is used to connect hosts on the Internet.
University:	College established under the Kenya government universities act of parliament 5 of 1985, whether public or private university.
WebCT:	A set of online tools that allows teachers to create, teach and manage online users.

ABBREVIATION AND ACRONYMS

CBK	Central Bank of Kenya
EDI	Electronic Data Interchange
E-commerce	Electronic Commerce
E-government	Electronic Government
IOIS	Inter-Organization Information System
M-banking	Mobile Banking
M-payment	Mobile Payment
M-ticketing	Mobile Ticketing
NSE	Nairobi Security Exchange
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
TCP/IP	Transfer Configuration Protocol/Internet Protocol
TAM	Technology Acceptance Model

ABSTRACT

Inter-organizational information systems (IOISs) are internet based information systems that electronically link organizations together to automate information flows and coordinate inter-organization activities between them. Kenya government, in collaboration with other stakeholders involved in enhancing teaching and research in the learning institutions have constructed a terrestrial fiber-optic network that connects most institutions of higher learning to enable them integrate their facilities for the purpose of sharing resources. Despite these efforts, adoption of Inter-Organization Information Systems (IOIS) by universities in Kenya is far from being realized. This begs the question as to what determines IOIS adoption in the universities. This study filled this gap by analyzing determinants of IOIS adopting in the universities in Kenya, given the mixed results from empirical evidence on IOIS adoption generally. A broad understanding of these factors is important to the policy makers who can embrace the motivating factors to enhance the adoption of the IOIS and suppress the barriers of its adoption. A cross-sectional descriptive survey was carried out using both qualitative and quantitative methods and a census done on 68 universities in Kenya. Data were collected using both questionnaires and semi-structured interview guide. University managers provided the required data. A logit regression procedure was used to analyze the collected data. The study revealed that the IOIS adoption is low adoption in the universities in Kenya, which was attributed to various factors. The public universities were found to have a higher level of IOIS adoption compared to the private universities. Factors that were found to influencing IOIS adoption were top management support, number of personnel with IOIS skills, availability of internet infrastructure, number of satellite campuses, perceived strategic benefits of the IOIS technology and perceived transactional benefit of the IOIS technology. The study recommended that: top management in the universities in Kenya should be educated on the strategic and transactional benefits of IOIS in the universities, universities should have skilled personnel on IOIS technology, universities should establish satellite campuses, universities should allocate more resources necessary for the improvement of the internet infrastructure and that the government of Kenya should put strategies in place to stimulate universities in Kenya to adopt the IOIS.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Inter-Organizational Information Systems (IOISs) are internet based information systems that electronically link organizations together to automate information flows and coordinate inter-organization activities between them. The term Inter-organizational Information System (IOIS) was first used by Barret and Konsynski (1982),who coined the "IS" acronym for Inter-organization Information Sharing System — systems that involve information resources like hardware, software, transmission facilities, rules and procedures, data/databases and expertise, which are shared between two or more organizations. Bakos (1991) conceptualized IOIS as an information system that facilitates the exchange of products, services and information between organizations, and include such technologies as electronic data interchange (EDI), Web-based EDI and Internet-based supply chain management systems, among others.

Cash, James and Konsynski (1985) adopted the term Inter-organization Information System (IOIS), which referred to automated information systems shared by two or more companies for efficient exchange of business transactions. From a technological aspect, Choudhury (1997) viewed the IOIS as computer network that supports information exchanges between business partners, a view that Orlikowski and Iacovou (2001) supported by describing the IOIS as an electronic communication infrastructure. From a business perspective, Boonstra and Vries (2004), and Bouchbout and Alimazighi (2009) noted that an IOIS is Information and Communication Technology (ICT) based systems

that provide an infrastructure for organizations to share information and electronically conduct business across organizational boundaries to support business applications or processes.

Some of the areas where IOISs have been implemented are in China's retail enterprises to interlink retailers and the wholesalers and China's supply chain management system to interlink various systems. This has made the growth of China's economy to be attributed to the ability of her industries to operate more efficiently and effectively due to the adoption of IOIS (Chen-Yu, Huang and Zang, 2009).

The IOISs has also been used to link pharmaceutical wholesalers and pharmacies in the Republic of Ireland and Australia, respectively, to create efficiency in ordering and delivery processes between the wholesalers and pharmacies (Bekking, 2004). In Kenya, IOIS is found in the banking industry, where the IOIS allows internet banking to take place (Gikandi and Bloor, 2012), mobile banking service (Nyangosi and Arora, 2009) and in electronic commerce (Magutu *et al.*, 2011).

By electronically linking organizations together, IOIS enables them to exchange business information, which makes them gain competitive advantage by increasing their bargaining power and by raising the switching costs of trading partners (Johnston and Vitale, 1988; Ravarini, Pigni, Buonanno and Sciuto, 2005). It also enhances organizational quality and timeliness of information (Silverman, 1990), improves efficiency (Kaefer and Bendoly, 2000) and enables entire supply chains to reduce

wasteful inventories by reacting more effectively to customer demand and jointly planning product introductions and promotions (Soliman and Janz, 2004). From a customer's perspective, the IOIS enables organizations to be more responsive to customer's orders, which improves the relationship with its business partners. From a broad view, the IOIS benefits are categorized into operational, managerial and strategic benefits (Rahim and Kurnia, 2004).

Differing IOIS benefits are realized depending on the way the IOIS technology has been implemented in an organization. Operational benefits are directly influenced by IOIS integration with back-end systems and IOIS transactions ratio. Managerial benefits are influenced by strong cooperation from the business partners, and strategic benefits are realized when appropriate changes in relevant business processes are introduced in conjunction with IOIS adoption (Rahim and Kurnia, 2004). However, for an organization to realize these benefits, a strong support from the senior management in the adopting organization is required because they must allocate necessary resources, facilitate integration process changes and take the initiative to secure cooperation from the trading partners with which to establish electronic relationships.

The need for IOIS adoption cannot be over-emphasized, since business competition has shifted from the simple firm to firm model, to competition between extended supply chain networks that are achieved by IOIS implementation (Ravarini *et al.*,. 2005). In reference to the institutions of higher learning, the Kenya Government has recognized the contribution of ICTs in the social and economic development of the nation. As a result,

an ICT policy was developed to provide affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms in order to create the awareness of the opportunities offered by ICT as an educational tool in the education sector, through the sharing of e-learning resources between institutions (Republic of Kenya, 2006).

Electronically linking universities together or with other organizations through the IOIS enables the universities to share electronic services such as e-learning, e-library, e-research and other electronic services (e-services). In the twenty first century education system that is ever changing with changes in technologies used to deliver the teaching materials, the need for IOIS adoption in the universities in Kenya is exacerbated by the fact that university students are now increasingly demanding for advanced methods of information acquisition, manipulation and application, and they show active preference for universities with greater access to Information System (IS) based resources (Adogbji and Akporhonor, 2005). Hence, universities that adopt the IOIS gain competitive advantages over the non-adopters.

This is further echoed by Turban, King and Lang (2010), who noted that IOIS enhances productivity for the adopting organization by improving efficiencies through automation of transactions, reducing intermediaries in the value chain to foster greater economic advantages, consolidating demand and supply through organized exchanges, facilitating product improvement as well as engendering innovative ways of selling existing products and services. In the education sector, the information systems such as the IOIS are

considered to have a potential to enhance the quality of teaching, learning and productivity of faculty and students, as well as the management and effectiveness of the universities (Dutta and Jain, 2006).

IOIS is achieved by establishing electronic connectivity (using the Internet and/or proprietary communication networks) to link organizations key boundary spanning business processes with those of their supply chain partners, which allows organizations to electronically transact business more efficiently with their trading partners (Kaefer and Bendoly, 2000). It is viewed as a strategic and productivity tool that provides a platform for entire supply chains to reduce wasteful inventories by reacting effectively to customer demand and jointly planning product introductions and promotions (Soliman and Janz, 2004).

There are several types of IOIS implementations, but the most commonly used types are electronic dyads, multilateral IOIS and electronic monopolies. Electronic dyads are bilateral IOISs, where a buyer or a seller establishes individual logical links with each of a selected number of sellers or buyers (Choudhury, 1997). Electronic Data Interchange (EDI) is a good example of an electronic dyad as illustrated in Figure 1.1

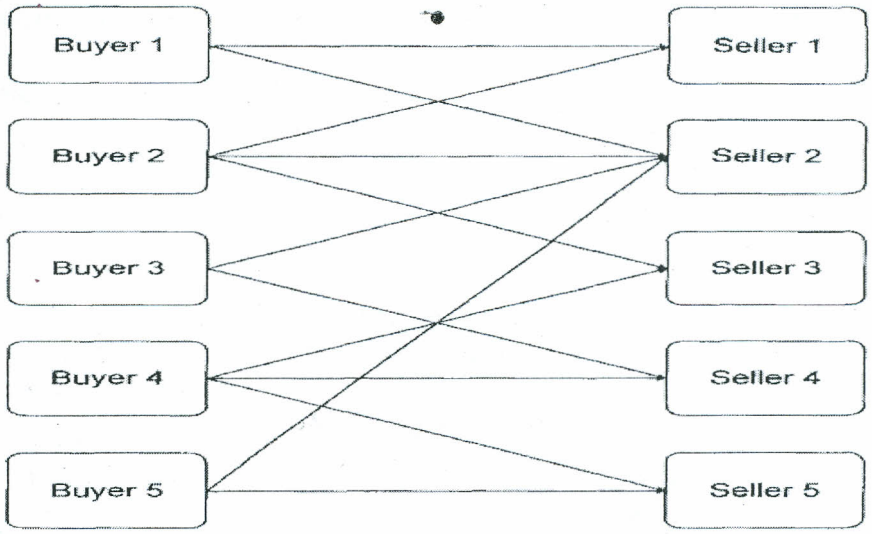

Figure 1.1: Electronic dyad

Source: Choudhury (1997)

Multilateral I em that allows an organization to communicate with a large number of trading partners (sellers, buyers or suppliers) over a single inter-organizational link, where it acts as an intermediary between an organization and its trading partners (Malone, Yates and Benjamin, 1987). An example of this type of IOIS is the electronic market shown in Figure 1.2.

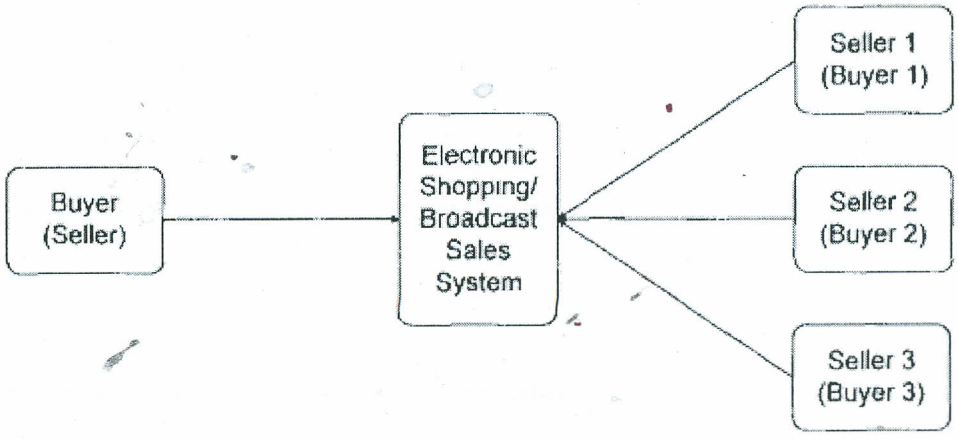

Figure 1.2: Multilateral IOIS

Source: Malone, Yates and Benjamin (1987)

Electronic monopoly is considered as an IOIS that supports a single source for the needed product. It is a special kind of electronic dyad with only one link established by the buyer of the product (Choudhury, 1997). This is shown in Figure 1.3.

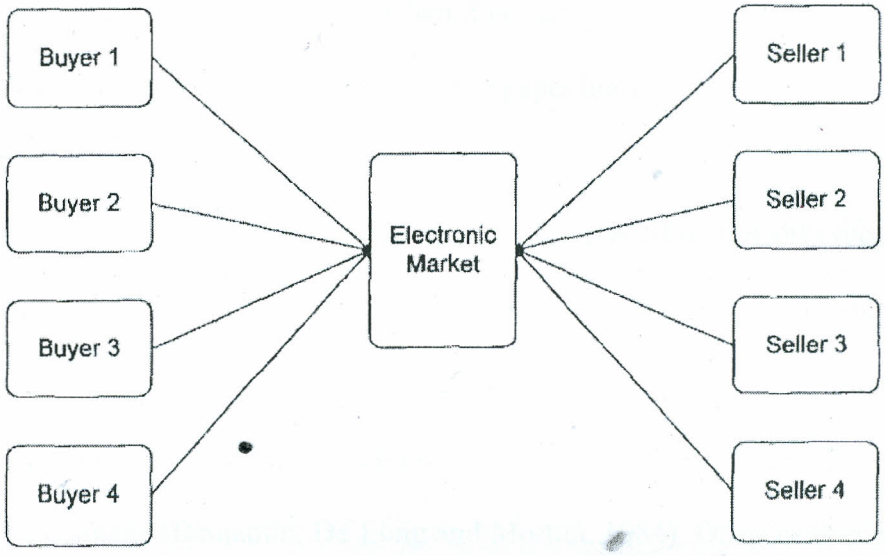

Figure 1.3: Electronic monopoly

Source: Choudhury (1997)

Electronic monopoly is established by a buyer who is seeking an efficient transaction, where all purchases are from a single supplier, or from a seller who is trying to gain market share of a product by becoming an exclusive supplier of the product.

1.1.2 Inter-organization Information System Adoption

Adoption of an IOIS technology is a decision making process that leads to a decision to adopt the IOIS technology in an organization and invest the necessary resources for the adoption (Cooper and Zmud, 1990). Resource endowments are the major determinants of

adoption decision, where lack of investment of resources significantly impedes adoption decisions (Karki and Bauer, 2004). The decision to adopt a technological innovation, according to Rogers (1995), is a process through which an organization passes from hearing about an innovation, to its adoption, and has five stages, which include awareness, interest, evaluation, trial and adoption of the innovation. However, the adoption of a technology will be visible when it is used in daily business transaction in an organization, otherwise it will be only adopted in paper but not in reality.

The early IOIS adoption was initially triggered by a number of remarkable success stories in America, such as Merrill Lynch and Company Ltd, who established a Cash Management Accounts (CMA) system that linked to its customer organizations, and as a result, enabled the organization to increase its customer base substantially, creating a competitive advantage (Benjamin, De Long and Morton, 1984). Other examples included the American Hospital Supply (AHS), which created an order entry/distribution system that directly linked the majority of its customers to AHS computers, thereby increasing customer loyalty and AHS market share. Digital Equipment Corporation (DEC) utilized the developed software technology for "expert systems", to significantly improve a system configuration problem that was being encountered when entering and specifying customers orders in the business industry (Benjamin *et al.*,1984).

However, both recipes for commercial success and the dream of seamless IOIS adoption proved elusive. Many electronic data interchange (EDI) systems failed to fully automate inter-organizational transactions as anticipated, and only 20% of business partners

(accounting for 80% of transactions) adopted EDI (Johnston and Mak, 2000). Ramanathan and Rose (2002) attributed this low adoption of IOIS to high installation cost and lack of perceived benefits that could be realized from the adoption of IOIS in organizations.

To address this concern, researchers rationalized the role of IOIS on the basis of a few apparent success factors that were visible then, to provide a guideline to practicing managers on the way forward in succeeding in IOIS adoption. To achieve this, a call was made by the researchers for a theory based cumulative research tradition, highlighting the anecdotal nature of analyses in the rationalizing role of IOIS (Bakos and Treacy, 1986; Clemons and Kimbrough, 1986).

The research that followed, according to Ramanathan and Rose (2002), probed both IOIS adopters and non-adopters rigorously across scientifically valid samples using positivistic research methods, supporting factor models and hypotheses, and centered their research on one particular technology, the "Electronic Data Interchange" (EDI). The adequacy of factor based analyses in explaining the rich and complex nature of IOIS process was questioned by the research theorists, who alternatively attempted to understand the complex and dynamic nature of IOIS by closely interacting with the adoption context using theories and methods that would allow and enable richer descriptive analysis.

1.1.3 Inter-Organization Information System Adoption by Universities in Kenya

Universities worldwide have increased their holdings of electronic information and integration of information technology in their operations, but within Africa, digital development has been uneven (Rosenberg, 2005). This has called for the environment of universities in Africa to change due to renewed recognition of the role that universities play as drivers of national development, making it necessary for investment in the electronic infrastructure and connectivity, as well as giving a higher attention to integration of e-learning, digital libraries (e-library), e-health and other related e-technologies in the universities that are key tools in enhancing the quality of higher education and making it more accessible (Rosenberg, 2005). Integrating these systems result to a cheaper, efficient and effective process of communication and information sharing.

The target population for this study was the universities Kenya. A list of the universities in Kenya was prepared as shown in Appendix D. According to Kashorda and Waema (2009), management in these universities has not recognized ICT and e-technologies integration as a strategic priority for transforming teaching, learning and research. As a result, there is lack of adequate investment in campus networks and strategies for building the necessary information systems integrations to effectively support the teaching and research activities in the Universities. This has culminated to only about 50% of the universities in Kenya having course management systems that are used for managing online courses, such as WebCT, Blackboard or Moodle. Some other universities have adopted the IOIS by integrating the universities databases with selected

commercial banks that enables students pay fees in the banks and then the information is relayed to the universities databases electronically.

Past studies have postulated that the future of universities greatly hinges on their ability to embrace and leverage the potentials of these emerging technologies at all levels of their business activities and strategies, including learning, teaching, research and administration (Venkatesh and Morris, 2000). In an effort to give the universities in Kenya a new face, Kenya Educational Network (KENET) constructed a terrestrial fiber-optic network that connects most institutions of higher learning, allowing institutions of higher learning to integrate their facilities for the purpose of sharing resources (KENET, 2009).

However, Kenya continues to drop in rankings in international Networked Readiness Index (NRI) despite the efforts made by KENET in leveraging the network interconnection in the universities, as stipulated in Table 1.1.

Table 1.1: International Networked readiness index

Period	USA	Kenya	South Africa	Mauritius
2004-05 (102 countries) Source: Dutta, Soumitra and Jain, Amit (2005)	4	75	34	47
2005-06 (115 countries) Source: Dutta, Soumitra and Jain, Amit (2006)	1	91	37	45
2011-2012 (142 countries) Source: Dutta and Osorio (2012)	8	93	72	53

Source: World Economic Forum / INSEAD Global IT Reports 2004-2012

Table 1.1 shows the NRI for Kenya in comparison to South Africa, Mauritius and the United States. The NRI measures not only the regulatory and national infrastructure, but also most importantly, usage by government institutions (such as universities), businesses and individuals. Frrrooom Table 1.1, a low ranking for Kenya suggests low level of readiness and usage by businesses, government and individuals.

1.2 Statement of the Problem

Several studies conducted in the past to establish factors influencing the adoption of IOIS have focused on developed countries, with limited studies being done for developing countries. The findings of these studies do not have a common agreement on factors influencing IOIS adoption in organizations (Almaxighi, 2009). Little research has been done to establish determinants of IOIS adoption in the in Kenya (for example, see Gikandi and Bloor, 2010; Macharia and Nyakwende, 2010; Maguta *et al.*, 2011).

In the institutions of higher learning, the use of internet based systems such as the IOIS are still in their early stages in developing countries like Kenya, and many issues regarding their adoption have not been fully addressed (Macharia and Nyakwende, 2010). Kashorda, Waema, Omosa and Kyalo (2006) found out that higher education institutions were not yet ready to effectively use Information and Communication Technology (which is the underlying infrastructure of the IOIS) in teaching, research and management of these institutions, and the factors that influence these institutions to embrace the ICT and its related innovations are not yet established.

Tarafdar and Vaidya (2006) argued that it was important for organizations to understand the fundamental factors behind technology adoption in order to enable them assess the extent to which they were inclined to develop, deploy and use technologies, and further still, come up with policies to encourage the IOIS adoption in organizations in order for these organizations to gain a competitive advantage over the organizations that had not adopted the technology.

The government of Kenya is conscious of the benefits that can be realized through IOIS adoption in institutions of higher learning (mainly the universities), and as such, has developed an Information and Communication Technology (ICT) policy that would help to establish networks for sharing training resources and developing strategies to support research and innovation in Kenya (Republic of Kenya, 2006). The implementation of this policy can be achieved through the adoption of the IOIS in the institutions of higher learning in Kenya. Therefore, the current study will investigate the determinants of IOIS adoption in the universities in Kenya.

1.3 Objectives of the Study

1.3.1 General Objective

The general objective of this study was to determine factors influencing inter-organizational information system adoption by universities in Kenya.

1.3.2 Specific Objectives

The specific objectives of the study were:

i. To determine the influence of organizational factors on IOIS adoption by universities in Kenya;

ii. To establish the effect of inter-organizational factors on IOIS adoption by universities in Kenya;

iii. To investigate the influence of IOIS technological attributes on IOIS adoption by universities in Kenya;

iv. To determine the effect of IOIS benefit factors on IOIS adoption by universities in Kenya;

v. To determine the influence of IOIS perceived cost factors on IOIS adoption by universities in Kenya; and

vi. To establish the influence of environmental factors on IOIS adoption by universities in Kenya.

1.4 Research Hypothesis

This study collected and analyzed data to test the following research hypotheses:

HO_1: Organizational factors had no influence on IOIS adoption by universities in Kenya.

HO_2: Inter-organizational factors had no influence on IOIS adoption by universities in Kenya.

HO_3: Technological factors had no influence on IOIS adoption by universities in Kenya.

HO_4: Benefit factors had no influence on IOIS adoption by universities in Kenya.

HO_5: Perceived cost factors had no influence on IOIS adoption by universities in Kenya.

HO_6: Environmental factors had no influence on IOIS adoption by universities in Kenya.

1.5 Significance of the Study

The study contributes towards the existing literature on IOIS technology adoption in Kenya. In particular, the study creates an understanding on the factors influencing IOIS adoption by universities in Kenya. This becomes a source of knowledge for the education institutions and other organizations in Kenya that will intend to adopt IOIS. The results of this study would also enlighten the policy makers in the education sector in Kenya on the possible policies that could be implemented to enhance IOIS adoption in the education sector so that the quality of teaching and research could be improved. Finally, the study will add knowledge to the existing empirical literature in information system, by informing about the factors that influence IOIS adoption in developing countries.

1.6 Scope of the Study

IOIS adoption is beneficial to all business enterprises at large. However, the study was restrictive in scope, covering both public and private universities in Kenya. The choice of universities was informed by the fact that the adoption of IOIS was expected to improve the efficiency of teaching, research and management of the institutions of higher learning. There are 68 universities that are recognized by the Commission for University Education

(CUE) in Kenya, and these are the universities that will constitute the scope of this study. They include public universities, public university constituent colleges, chartered private universities, private university constituent colleges, universities with letters of interim authority and registered private universities.

1.7 Limitations of the Study

The researcher encountered some respondents who were suspicious of the study, and were not willing to participate in the study by providing the needed information. However, the researcher explained to the respondents that the study was being conducted for academic purpose only, and assured them that confidentiality of the information given will maintained. This was further communicated through a cover letter that was attached to the questionnaire given to the respondents (Appendix A).

Some respondents could not be available for face-to-face survey due to their busy schedules. Mail survey was used for such respondents, but still some respondent took long to respond. The researcher had to send several reminders requesting them to fill the questionnaire, and at last, most of them except a few responded.

In the process of data collection, a low response rate was encountered. However, the researcher established pre-contacts with the respondents, through emails, telephone conversations and meetings before delivering the questionnaires to them as suggested by Saunders *et al.* (2007), in order to achieve a higher response rate.

The logit regression model was used for data analysis. A minimum of about 50 cases per predictor was needed according to Agresti (2007). There were only the 54 universities,

which included public universities and their constituent colleges, private universities and their constituent colleges. This number was just slightly above the recommended minimum number of about 50 cases per predictor to allow a logit model to be used. The universities with letters of interim authority and the registered private universities were included, which raised the number of universities considered in the study to 68 universities (Appendix D), which was sufficient to allow for logit model estimation to be used for data analysis in the study.

1.8 Organization of the Study

This study is structured as follows: the foregoing chapter one provides the research background, research objectives, significance of the study, and scope and the limitations of the study. Chapter two presents literature review on the determinants of IOIS adoption by the universities in Kenya and a conceptual framework. Methodology of the study is presented in Chapter three, while the empirical results are presented in Chapter four. Finally, summary, conclusion and policy implication of the study is presented in Chapter five.

CHAPTER TWO

LITERATURER REVIEW

2.1 Introduction

This chapter reviews literature on the factors that influence IOIS adoption, and is organized under the following sub-topics: theoretical foundation, which includes diffusion of innovation theory, theory of reasoned action, technology acceptance model, Unified Theory of Acceptance and Use of Technology (UTAUT) model, institution theory, resource-based theory and critical mass theory, the empirical literature that includes various studies that have developed different inter-organization information system adoption models and literature in the past, and the conceptual framework summarizes the relationship among key variables and then identifies the gap to be filled by the study.

2.2 Theoretical Foundations

Information system research is often criticized for lacking theoretical foundations or for insufficient reference to theory in explanations of its findings (Mário and John, 2001). This study endeavors to create a theoretical foundation and establish the theory(s) that can be adopted for this study. Diffusion of innovation theory, institutional theory, resource-based theory, critical mass, behavioral adoption theory and technology acceptance model can provide important insights into the factors that influence IOIS adoption in an organization. In the following subsections, these theories are briefly discussed, as they form the foundations of the ideas and assumption used in this thesis.

2.2.1 Diffusion of Innovation Theory

Diffusion of innovation research was first started in 1903 by a French sociologist seminal researcher Tarde (1903), who first explained the stages of innovation adoption in an organization to be innovation, growth and maturity. He postulated that the innovation and maturity stages had a slower rate of adoption compared to the growth of adoption. He observed that the decision to undertake an innovation was a process that involved knowledge of the particular innovation, forming a positive attitude about it, deciding to adopt it and implementation it.

Ryan and Gross (1943) studied the process in which innovations in agriculture were adopted, and discovered that diffusion was a social process through which subjective evaluations of an innovation spread from earlier to later adopters rather than one of rational and economic decision making. They also supported the three stages of innovation adoption and their differing rates of adoption as discussed earlier by Tarde (1903). Additionally, they classified the adopters of innovation into five categories: innovators, early adopters, early majority, late majority and laggards. The innovators category were viewed as the most likely to adopt an innovation since they were more cosmopolite and belonged to a higher socioeconomic status than members of the other categories (later adopters).

Downs and Mohr (1976) severely criticized the diffusion of innovation theory, contending that it needed to be organized around attributes of both the innovations and the organizations adopting them, and argued that anyone could be an innovator if

innovations were matched with organizations targeted for adoption. Brown (1981) supported this assertion by pointing out that innovators should be categorized depending on the resources domiciled in an organization only.

Four decades later, Rogers (1983) identified five innovation attributes that determined the adoption of innovations as: relative advantage, compatibility, complexity, observability and trialability. He noted that these attributes had been extensively utilized by many researchers in order to explain the adoption and diffusion innovations. This view was opposed by Kwon and Zmud (1987), who observed that among these attributes, only relative advantage, compatibility, and complexity have been consistently identified as critical adoption factors. They further identified six stages of IT implementation as initiation, adoption, adaptation, acceptance, routinization and infusion. Predictors that would impact on any of these stages were specified as user community characteristics, organizational factors, technology factors and environmental factors (Kwon and Zmud, 1987; Tornatzky and Fleischer, 1990; Damanpour, 1991).

From a technical paradigm, Moore and Benbasat (1991), working in an information system context, expanded the five factors that impacted the adoption of innovations, which were earlier presented by Rogers (1983) to eight factors, namely: voluntariness, relative advantage, compatibility, image, ease of use, result demonstrability, visibility and trialability.

Rogers (1995) described an innovation as an idea, practice or object that was perceived to be new by an adopter, and diffusion as the process by which an innovation was communicated through certain channels over time and individuals were seen as possessing different degrees of willingness to adopt innovations. He proportioned the adopter of innovation categories of Ryan and Gross (1943) as follows:

Innovators, (2.5%) whom he defined as individuals who were venturesome, daring and risk takers, controlled substantial financial resources to absorb possible loss from an unprofitable innovation, had the ability to understand and apply complex technical knowledge, and cope with a high degree of uncertainty about an innovation.

Early Adopters (1-20%) whom he defined as individuals who were integrated part of the local social system with a greatest degree of opinion leadership in most systems, served as role model for other members or society, were respected by peers and successful. Early Majority (30-35%), whom he considered to be individuals who interacted frequently with peers, seldom held positions of opinion leadership, were one-third of the members of a system that were the early majority and the largest category who made deliberations before adopting a new idea. Late Majority (30-35%), who he viewed as individuals who adopted an innovation as a result of pressure from peers, economic necessity, were skeptical and cautious. Laggards (10-15%), who were observed to be individuals who were traditionalists, skeptics, isolated, suspicious of innovations, possessed no opinion leadership, their point of their reference was in the past, their innovation-decision process was lengthy and their resources are limited.

Rogers (1995) further defined the adoption process as the mental process through which an individual passed from first hearing about an innovation to final adoption. This was supported by Agarwal (2000), who stated that the potential users of an innovation made decisions to adopt or reject an innovation based on beliefs that they form about the innovation.

Diffusion of innovation theory, in this light, is viewed as a communication based model, and the process Rogers (1995) refers to is mediated through the two-process of communication convergence rather than a one-way linear act (Rogers and Kincaid, 1981). Additionally, diffusion can be defined as a special type of communication in which the messages pertain to a new idea making the diffusion process to be inherently uncertain due to the newness of the ideas and how it is accepted as a message.

Apart from these attributes, the perception of certain characteristics of an innovation can be influenced by the top management in the organization voluntarily (Agarwal and Prasad, 1997). This influence was acknowledged by Moore and Benbasat (1991) who defined voluntariness as the use of an innovation on a voluntary and non-compulsory basis. The initial use of the innovation without a subsequent institutionalization may undergo various stages (such as of initiation, adoption, adaptation, acceptance, routine and diffusion) before it is adopted (Cooper and Zmud, 1990). However Lowe and Locke (2006), on a contrary stand, argued that it is not necessary to follow the entire process sequentially or strictly before an innovation is adopted.

Later, Rogers (2003) identified five characteristics of an innovation that determine its adoption as relative advantage, compatibility, complexity, trialability and observability. However, rresearch has consistently found that technical compatibility, technical complexity, and relative advantage (perceived need) are important antecedents to the adoption of innovations (Bradford and Florin, 2003).

2.2.2 The Institutional Theory

The earliest insights of institutional theory in organizations is associated with the work of Selznick (1949), who viewed organizational structures as an adaptive vehicles shaped in reaction to the characteristics and commitments of participants as well as to influences and constraints from the external environment. According to Institutional Theory, organizations operate within a social framework of norms, values and assumptions about what constitutes appropriate behavior (Scott, 1995; Oliver, 1997). Decisions are made not so much according to technical or economic criteria, but on the basis of what is acceptable and legitimate within a particular environment, or organization field which typically moves towards common structures and processes due to coercive, imitative and normative expectations (DiMaggio and Powell, 1983).

Coercive pressures result from both formal and informal pressures exerted on organizations by other organizations upon which they are dependent, and by cultural expectations in the society within which organizations function. Such pressures may be felt as use of force, as persuasion, or as invitations to join in collusion. Mimetic pressure

stems from uncertainty. When organizational technologies are poorly understood, or when the goals of the organization are ambiguous, or when the environment creates symbolic uncertainty, organizations may model themselves on other organizations, in other words, imitate existing organizational models. Therefore, the process of imitation can be seen as a response to uncertainty. When an organization faces a problem with ambiguous causes or unclear solutions, it is tempted to imitate similar organizations in their field that it perceives to be more legitimate or successful.

Normative pressures stem primarily from professionalization. According to DiMaggio and Powell (1983), there are two main aspects of professionalization that act as the sources of normative isomorphism. First, universities and professional training institutions are important centers for the development of organizational norms among managers and staff. Second, professional and trade associations are another vehicle for the definition and promulgation of normative rules about organizational and professional behavior.

2.2.3 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) was developed by Davis (1989) with an aim of identifying the determinants of computer acceptance, examining information technology usage behaviors and providing a parsimonious theoretical explanatory model. TAM is rooted in social psychology, and draws on Fishbein and Ajzen (1975) reasoned action study, which established that the intent to produce a behavior depended on two basic determinants: attitude toward behavior and subjective norms. However, both TAM and

TRA describe user beliefs as determinants of the attitude toward the use of information technology (Davis, 1989).

According to Davis (1993), user acceptance was the pivotal factor that determined the success or failure of an information system adoption, and the design features of the system determined the perceived usefulness (PU) and perceived ease of use (PEOU) of the technology in the system. Davis (1993) defined perceived ease of use (PEOU) as the degree to which an individual believed that using a particular system would be free of physical and mental effort, and perceived usefulness (PU) as the degree to which an individual believed that using a particular system would enhance ones job performance. TAM has proved to be an exceptionally useful tool at predicting future system usage, specifically during the user acceptance testing phase of information system implementation project. However, Dishaw and Strong (1999) criticized TAM for defining PEOU and PU as external variables that determined the intention to use and not the actual use. TAM and innovation of diffusion theory of Roger (1995) have similarities, where PEOU and PU are conceptually similar to relative advantage and complexity.

2.2.4 Resource-Based Theory

The resource-based view (RBV) offers a perspective where a firm is viewed as a collection of resources and capabilities (Barney, 1991). To create value and gain competitive advantage, firms strive to combine resources internally and to acquire additional resources from external sources. Competitive advantage can only be sustained in the long run when the combination of resources results in a capability that is valuable,

scarce, durable and non-imitable. Resources controlled by the firm that have a high utility for other organizations and are relatively scarce on the market are called critical assets (Cox *et al.,* 2002). These critical assets form a source of power for the focal company over trading partners. The resource-based view is utilized in creating measures for dependency between companies in the current study.

Porter (1985) emphasized the importance of external forces affecting the firm and its competitive position. According to him, five forces shape the strategic decisions of a firm: the bargaining power of its customers, the bargaining power of its suppliers, the barriers of entry for new competitors, threat of substitute products/services, and the level of competition in the industry. The size of the customer/supplier pool in the value network, the cost of switching from one trading partner to the other and lock-in effects created by certain dependencies and critical resources, are all factors that can determine the adoption of IOIS between organizations.

2.2.5 Critical Mass Theory

Critical mass theory is another perspective that is used to explain the adoption of innovations. It was proposed by Marwell *et al.* (1988) to address a fundamental problem of collective action, where the instrumental pursuit of collective gain could lead members of an interest group into a "social trap" (Platt, 1973) in which the group suffers from the free-rider and efficacy problem.

The free-rider problem occurs when an individual member of the group benefits from the group without making any contribution. The efficacy problem occurs when an individual makes a contribution and does not benefit from it. The critical mass theory was described as theory that involved the creation of positive network externalities (Katz and Shapiro, 1985), or network benefits that arose as a direct function of the number of the adopters of innovation (Fichman and Kemerer, 1993).

Bouchard (1993) described critical mass theory as a theory that looks at innovations that require collective action and collaboration among potential participants. She further argued that an organization's decision to adopt an innovation would be depend on the number of the organizations that had already adopted the innovation but not on the characteristics of the innovation, hence a collective innovation did not provide advantages per se to its adopter, it was the reciprocation by others that the innovation became advantageous. As such, the benefits of adoption largely depended on size of the community of the adopters, which made the organizations to benefit from increasing returns on adoption as the network kept growing (Fichman and Kemerer, 1993). Kuan and Chau (2001) argued that an organization's decision to adopt a technology was influenced by its business partners and competitors and not the technology itself or the organization.

Teo *et al.* (2003) reported that several diverse research streams had investigated this mimicking behavior of organizations as the bandwagon effect, which suggests that, in some cases, organizations would engage in certain activities just because other

organizations do so. Since electronic information sharing between organizations requires the participation of several organizations, critical mass theory can provide important insights to understand organizations participation in these initiatives.

In the analysis of the determinants of IOIS adoption by the universities in Kenya, this study chose the innovation diffusion theory of Rogers (2003) as the basis of this analysis over the widely used Technology Adoption Model (TAM) of Davis (1989). This was due to the fact that the former is more focused on innovation and provides a wider set of adoption determinants than the latter, thus enabling a more comprehensive analysis.

In particular, while the TAM includes only two main adoption determinants: ease of use and usefulness, the innovation diffusion theory includes five adoption determinants: relative advantage, compatibility, complexity, trialability and observability, where two of these adoption determinants of the innovation diffusion theory (complexity and relative advantage) correspond to a large extent to the two adoption determinants (ease of use and usefulness) of the TAM. This implies that 'complexity' is related to 'ease of use', and 'relative advantage' is related to 'usefulness'. The remaining three can be viewed as additional to the determinants of the TAM. Therefore, the innovation diffusion theory includes to a large extent the analysis dimensions provided by the TAM and also provides some additional determinants, so that it allows for a more multi-dimensional and comprehensive analysis of the IOIS adoption in organizations. Thus, the innovation diffusion theory was the preferred option in this study. Other theoretical models that the

study draws from are institutional theory, resource based theory and the critical mass theory.

2.3 Empirical Literature

Various studies have developed different inter-organization information system adoption models in the past. Key to these models is the expounding of the factors that influence IOIS adoption in the organizations. Some of the models that are relevant to this study are discussed in this section.

Tornatzky and Fleischer (1990) developed a framework that explained the decision to adopt a technological innovation by a firm which was not only based on the technological consideration, but also dependent on the organizational and environmental contexts. They summed up the findings of their study as Technology, Organization and Environment (TOE) Framework. Figure 2.1 presents the TOE framework, which identifies three aspects that influence assimilation of IT.

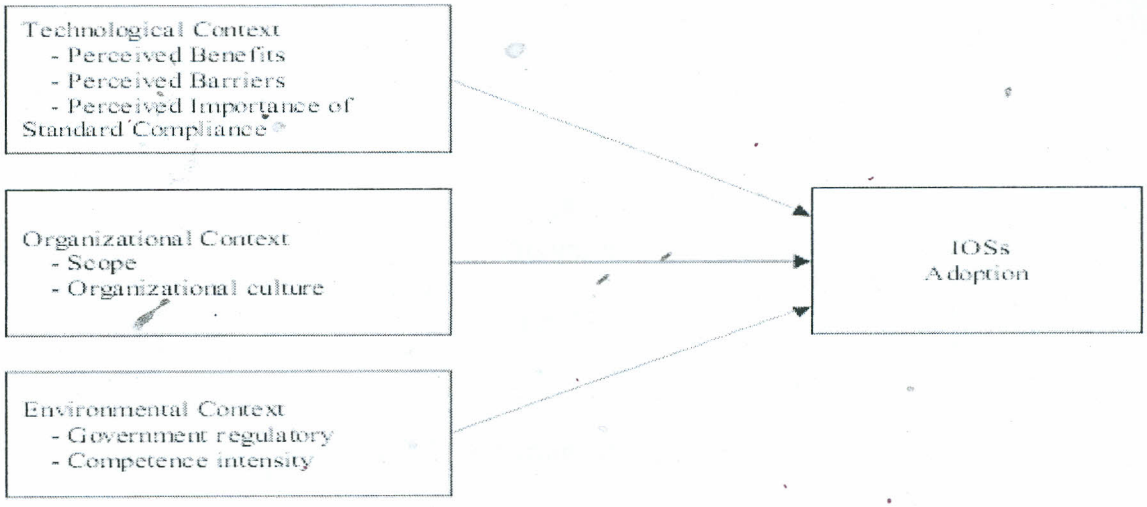

Figure 2.1: Technology, Organization and Environment (TOE) Framework

The first one is the technological context, which describes the existing technologies in use and new technologies available to the organization. The second one is the organizational context, which describes some of the organizational characteristics and resources such as the organizational readiness to adopt an innovation, top management championship, and other factors relevant to organizational context. The final one was the environmental context, which consists of the environmental characteristics in which the organization conducts their services. These three contextual factors were viewed as instrumental in influencing an organization's decision to assimilate an innovation and eventually impacts on the organization's performance.

Teo *et al.* (2003) used the institutional theory as a lens to understand the determinants of IOIS adoption in industries operating in Singapore. They carried out a survey-based research which indicated that the IOIS adoption was influenced by three institutional pressures namely: mimetic pressures, coercive pressure, and normative pressures. Their framework is presented in figure 2.2.

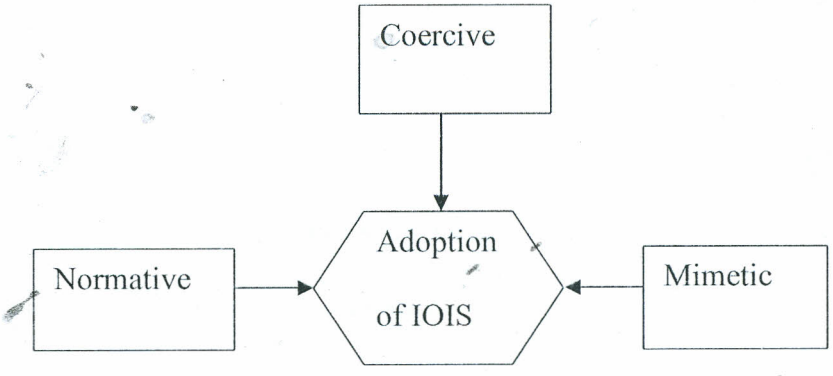

Figure 2.2: Determinants of IOIS

They defined mimetic pressures as the factors that caused an organization that had not adopted the IOIS to adopt it due to the dominance of IOIS adoption practice in the focal industry and the perceived success of other organizations in the industry that had already adopted the IOIS. On a similar perspective, Kuan and Chau (2001) described the mimetic pressures as a bandwagon effect, which implies that an organization would engage in IOIS innovation just because other organizations were involved in it and not for any economic benefits. Coercive pressures were described as a formal or informal pressures exerted on organizations to adopt the IOIS by other organizations (external to the focal organization), upon which they are dependent or have established partnership. The source of coercive pressures could also originate from customers, suppliers and sellers. The normative pressures was defined as the shared norm among a group of trading partners, which increased the likelihood of an individual organization to adoption the IOIS due to increased chances of learning its benefits and costs.

Their findings indicated that organizations were embedded in institutional networks, and called for a greater attention to be directed at understanding institutional pressures when investigating inter-organizational information systems adoption. The deficiency in this model is on the fact that the researchers limited their scope to institutional pressures and did not extend their research to other factors (that are not organizational related) which are equally important determinants of IOIS adoption.

Rahim *et al.* (2004) shifted from Teo *et al.* (2003) institutional pressures of IOIS adoption by considering other organizational factors that influence IOIS adoption in organizations

in Australia. They used the positivist multiple case study approach from a list of Victoria-based teaching hospitals to examine the determinants of IOIS adoption in these hospitals and their pharmaceutical suppliers. The unit of analysis was the participating organizations. They classified the organizational motivation to adopt the IOIS into two dimensions: locus of motivation and types of motivation. The term 'locus of motivation' referred to the source of motivation, which could either be internal or external. Internal motivation was considered to originate from within the organization due to its technological capabilities, while the external motivation was regarded as originating from entities outside the organization, such as powerful business partner who forces the organization to adopt IOIS, which Teo *et al.* (2003) referred to as the coercive pressures.

Rahim *et al.* (2004) found out that there were specific activities associated with each type of motivation, respectively. Instead of considering factors that influenced IOIS adoption in isolation, they classified them into four classes: techno-economic leader, socio-political leader, techno-economic-follower, and socio-political follower. They associated each class of motivation with a particular activity that was necessary for a successful IOIS adoption processes as shown in Figure 2.3.

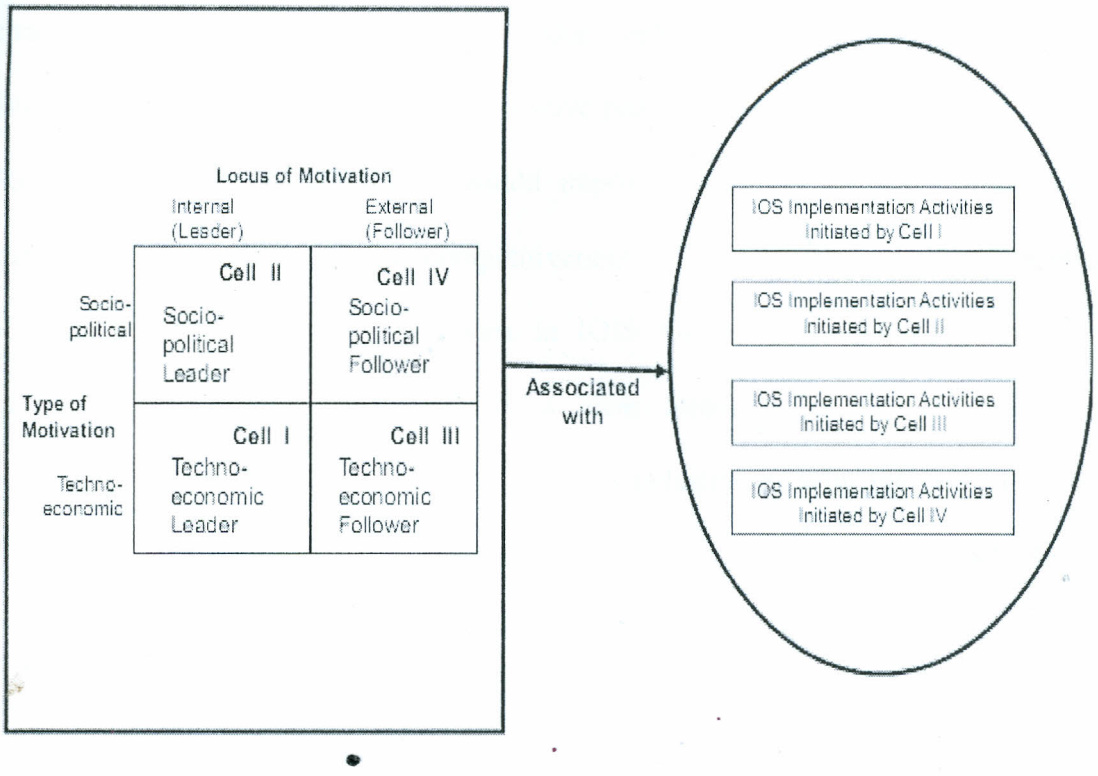

Figure 2.3: Relationship between organizational motivations and IOS adoption processes

Source: Rahim *et al.* (2004)

The locus of motivation lead to two distinct categories of IOIS adopters: IOIS leaders and IOIS followers. For organizations in which the locus of motivation was internal, the initiative to adopt IOIS generally emerged from IOIS champions. These organizations tended to become leaders of IOIS adoption by setting the pace of IOIS adoption in their industry. On the other hand, for organizations where the locus of motivation was external, the adoption of IOIS was often initiated by external entities such as customers, suppliers, government agencies, industry bodies, among others. IOIS followers did not build an IOIS, but introduced a standard IOIS network as required by their trading partners. They were simply the users of IOIS that others had developed.

Rahim *et al.* (2004) classified the determinants of IOIS adoption into four categories; techno-economic leader, socio-political leader, techno-economic-follower, and socio-political follower. The techno-economic motive propelled the organizations to invest in IOIS believing that the investment would improve organizational performance with regard to internal efficiency and competitiveness in the marketplace. Social-political motive made the organization to invest in IOIS for reasons other than immediate efficiency gains, but nevertheless with a clear intention of portraying either a "progressive" or "customer caring" image in the industry, or with the realization that there was no other way forward given that their trading partners had already adopted the IOIS (Rahim *et al.,* 2010). Social-political motive combined the mimetic and normative pressures that were discussed by Teo *et al.* (2003).

Techno-economic follower scenario occurred when an organization was approached either by its business partners or by any other influential organization about IOIS adoption, and having evaluated the potential economic benefits of the IOIS, invested in it voluntarily. Although the motivation to adopt IOIS is generated from external sources, the adoption decision was made based on an economic motive.

Consequently, socio-political follower scenario occurred when an organization was approached by its trading partner to adopt an IOIS, and a decision was made based on a socio-political motive. They did not develop an IOIS, but embraced an existing IOIS solution developed by partners or others parties. They were generally the passive users of

IOIS and introduced IOIS for reasons such as legitimacy, compliance, influence or social status (Rahim *et al.*, 2010).

Classifying motives into these two major categories was useful as it implied that those organizations which introduced IOIS prompted by techno-economic motives were likely to behave differently from those organizations that introduced IOIS inspired by socio-political motives (Rahim and Johnson, 2010).

Rahim *et al.* (2004) study offered a comprehensive explanation for the differences in IOIS adoption processes followed by different organizations in terms of their motivations for adoption in any given IOIS project. The fundamental premise of this study was that organizational motivations determined IOIS adoption processes, and thus, explained the activities that organizations representing each motivation scenario are likely to undertake when adopting the IOIS (Rahim and Jonson, 2010). The study can be commended for bringing on board more IOIS adoption factors in comparison with IOIS adoption model by Teo *et al.* (2003). Of importance was the introduction of the techno-economic factors that were not considered in the Teo *et al.* (2003) model.

However, the determinants of techno-economic and social-political motivations were not elaborated in the study. It therefore becomes difficult for a reader to identify the factors that were associated with a particular motivation of IOIS adoption in Rahim *et al.* (2004) study. This is an indicator that the study findings were vague to some extent.

Kashorda, Waema, Omosa and Kyalo (2008) did a survey to find out the e-readiness status of higher education institutions in Kenya, with an aim of assessing the level of preparedness of Higher Education (HE) institutions in Kenya to use Information and Communication Technologies (ICT) in teaching, learning, research, and management. Data was collected using a questionnaire that was completed by heads of ICT and other senior university administrators such as finance managers and academic registrars of the twenty five KENET member institutions that included both universities and tertiary institutions. Data was analyzed using a modified e-readiness assessment tool that was originally developed by the Center for International Development at Harvard University.

The study found out that most of the higher education institutions in Kenya do not have integrated information systems (IOIS) and were not ready to use ICT for e-learning, ICT was not a strategic priority for the these institutions, Internet bandwidth, which supports information systems integration, was not being allocated sufficient budget and the ICT strategy was not aligned with the educational goals of these institutions. However, the study found out that few institutions (University of Nairobi and Kenyatta University) had installed course management software like Moodle, WeBCT or Blackboard that were being used to supplement the classroom teaching, but there was a lack of Internet availability, that the study attributed to the fact that Internet bandwidth costs were relatively high in Kenya, without which integration of information systems (IOIS) between these institutions become difficult.

Bagchi and Udo (2007) used pooled regression analysis on a large set of data from World Bank with an aim of comparing the ICT adoption factors in African nations with that of developed nations. Their findings showed that the economic development, education/training, and infrastructures played a significant role in ICT adoption. However, since the ICT is the underlying infrastructure for IOIS, the study found out that the effects of these factors could be similar or different in the developed and developing nations depending on the specific factor being considered. The study further found out that the economic development was a major factor in ICT adoption, and the higher the rate of inflation, the slower the ICT adoption in both African and developed nations. The findings were in line with an earlier study by Adams (1997), who used the regressions analysis to investigate the challenges facing African nations in the information age. His study highlighted the barriers of information technology systems adoption to include: deteriorating rural infrastructures, poor education, ineffective telecommunication operations, and poor governance.

Penttinen and Tuunainen (2009) used linear regression analysis to assess the effect of external pressure on inter-organizational information system adoption in small companies in Finland. A census was done from suppliers of a large Finnish company, and the unit of analysis was the censured companies. They established that the institutional pressures exhibited a significant and high influence on intentions to adopt the IOIS, which supported the findings of Teo *et al.* (2003).The institutional factors that influenced the adoption of IOIS were specified as: perceived benefits, supplier pressure, bandwagon effect, external pressure from customers, and organizational readiness to adopt the IOIS

innovation. It is evident, from the study of Penttinen and Tuunainen (2009) that a higher emphasis has been given to the external pressures factors that are imposed on a less powerful organization to coerce it to adopt the IOIS.

Kashorda and Waema (2009) analyzed the levels of network access (which included information infrastructure, Internet availability, Internet affordability, network speed and quality) in the universities in East Africa using a survey. It was found out that the East African universities were spending less than 1% of their annual budgets on ICT, with Kenyan universities being marginally at a higher stage of network access than all other universities in East Africa. However only 33% of the ICT strategies were aligned to the mission of the East African universities, despite the fact that they were attracting and retaining highly qualified ICT staff coupled with the support of the Vice Chancellors (VCs) on the network access initiatives. This pointed to the fact that the universities in East Africa were considering ICT as strategic tool for achieving their educational outcomes but the adoption of information systems (IOIS) between the universities if far from being realized.

Nevertheless, Kashorda and Waema (2009) found out that United States International University, and University of Nairobi in Kenya and Makerere University in Uganda had automated all their frontend and backend processes and provided off-campus library services to support learning, teaching, and research such as ICTs in libraries, ICT research and innovations, and enhancing ICT with education. Such universities were also the ones where the champion for ICT was the Vice Chancellor or at least a Deputy Vice

Chancellor. These findings are in line with the finding of the study by Kashorda, Waema, Omosa and Kyalo (2006), discussed earlier in this study, that found out that the level of e-readiness in institutions of higher learning is still low.

In an endeavor to create a broad understanding on the factors that are driving forces of IOIS adoption Bouchbout and Alimazighi (2009), reviewed and analyzed the literature that has been published in IS journals with an aim of identifying the determinants of Business to Business (B2B) adoption in supply chain management (SCM) systems. They found out that the IOIS technology complexity, compatibility, relative advantage, top management support, organizational size, organizational readiness to accept the IOIS technology, resources resident in the organization, environmental uncertainty, industrial pressure and competitive pressures have a significant role as determinants of IOIS adoption. They further classified these determinants of IOIS adoption into five groups, namely: inter-organizational context, organizational context, technological context, perceived costs, and perceived benefits as depicted in Figure 2.4.

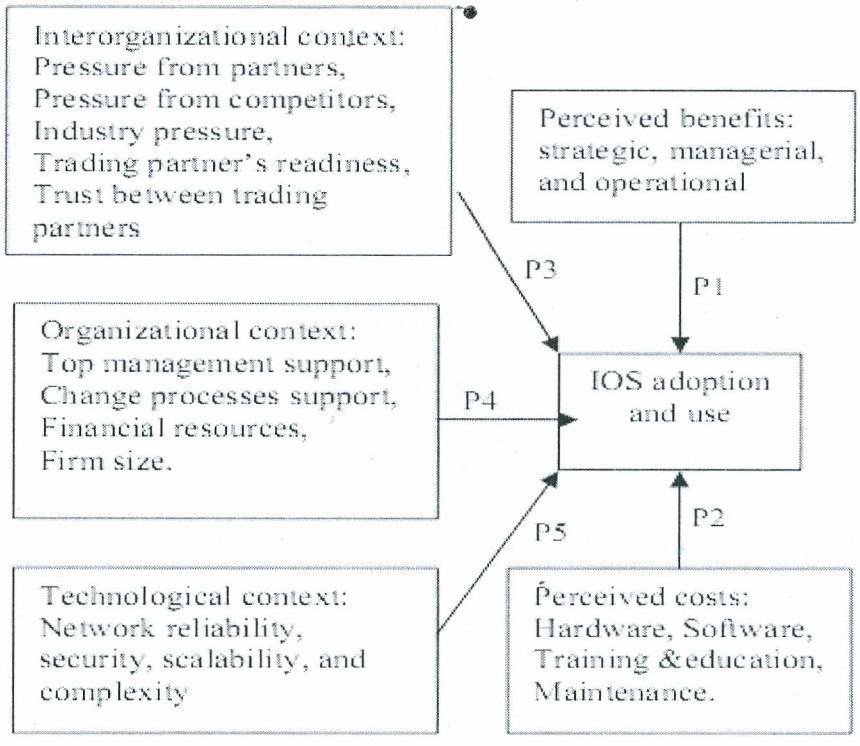

Figure 2.4: The research framework for IOS adoption

Source: Bouchbout and Alimazighi (2009) pg 513.

Bouchbout and Alimazighi (2009) elaborated the organizational, inter- organizational, technological, perceived benefits factors that influenced IOIS adoption. The study build on the study of Tornatzky and Fleischer (1990) that was limited to technological, organizational and environmental factors, which Bouchbout and Alimazighi (2009) studied together with inter- organizational and perceived benefits without considering the environmental factors in their study. The independent variable was clearly shown as IOIS adoption and use, with five independent variables well elaborated.

Nyangosi and Arora (2009) examined the adoption of mobile banking service in Kenya, between the last quarter of 2006 to the third quarter of 2007 using structured and pre-

tested questionnaires. A census was done on customers of all commercial banks in Kenya in some selected major cities, and the unit of analysis was the respondents which were analyzed using descriptive analysis. The study concluded that mobile banking technology in Kenya was at its nascent stages and argued that the situation was the same in many other developing countries. They attributed the hindrances to mobile banking technology adoption in Kenya to impaired non-availability of infrastructure, lack of government legislation and the prevailing nation conditions (economic, cultural, social and political factors) that did not support mobile banking and other ICT related innovation adoption in Kenya. Mobile phone money transfer services (mobile banking) have escalated in Kenya.

Gikandi and Bloor (2010) underscore the finding of Nyangosi and Arora (2009) in their survey based research that was carried out amongst banks controlling approximately 90% of Kenya's formal banking industry, using data obtained from an annual financial report by Central Bank of Kenya (CBK) between years 2005 to 2009. The research aimed to establish the adoption and effectiveness of electronic banking (a type of IOIS) in Kenya. The study found the barriers of electronic banking adoption to be: lack of clear legal regulations that govern e-banking adoption, relevant technical training, internet security and ICT infrastructure. Both Nyangosi and Arora (2009) and Gikandi and Bloor (2010) concentrated on the barrier of IOIS adoption in their studies, and never investigated the factors that are motivators of IOIS adoption.

Muathe, Wawire and Ofafa (2010) studied the determinants of adoption of ICT by Small and Medium Enterprises (SME) within the health sector in Nairobi, Kenya using a logit

model. The study looked at the ICT in general without narrowing down to a specific area of ICT, such as IOIS, and concentrated on the factors that determine the internal automation of the hospitals (intra-organization) and not the integration of different information systems between hospitals (inter-organization).

In addition, the study of Muathe, Wawire and Ofafa (2010) *et al.* (2010) stated that it was difficult for Small and Medium Enterprises (SMEs) to operate an online business due to cost and organization change requirement. This contradicted an earlier study by Morrel and Ezingeard (2002), who argued that the internet-based technologies (such as IOIS) provides the SMEs with new opportunities to effectively support the management of supply chain activities by supporting the flow of materials with a more efficient way of communicating and sharing information between them through alliances and new forms of cooperation. Furthermore, Amit and Zott (2001) posited that SMEs were increasingly realizing the potential benefits of e-commerce technologies and using it to transact business with their customers and suppliers.

The logit model, according to Agresti (2007) logistic regression does not assume a linear relationship between the dependent and independent variables, the dependent variable must be a dichotomy (two categories), and it does not require normally distributed dependent data or homogeneity of variance. He further postulated that the logit model is a cumulative function, thus ordinary sum of squares regression and all normality tests are invalid in the model, however larger samples are needed than for linear regression

because maximum likelihood coefficients are large sample estimates, therefore a minimum of about 50 cases per predictor is recommended.

It is also not clear whether the cost of operating online business is high in Kenya, as posited by Muathe, Wawire and Ofafa (2010) *et al* (2010), when the required facilities to establish online business such as broad band networking has also become very cheap (Wang, Chang and King, 2003), and prices of the computer equipment has tremendously reduced in Kenya due to Kenya government waiver on the taxation of computer items in Kenya. This leaves the reader to wonder whether it is actually difficult or not for SMEs to operate online business in Kenya. Such contradictory findings are as a result of the lack of understanding of the factors that influence IOIS adoption in Kenya. In addition, the target population was the hospitals in Nairobi, which could be unsatisfactory to be used for generalization.

Magutu *et al.* (2011) used a survey research design and purposeful sampling to explore the barriers faced by commercial banks in Kenya in adoption e-commerce technology. Descriptive statistics was used to analyze data from the respondents. The study established that e-commerce adoption in Kenya was relatively low. The barriers of its adoption were found to be incompatibility with existing legacy systems, security concerns, unreliable telecommunication systems (such as internet) as well as lack of legislation governing e-commerce transactions.

Magutu *et al.* (2011) research findings concurred with the research findings of Mwesige (2003), who used a survey research on internet cafe users in Uganda to investigate the factors that were barriers to the penetration of the IOIS underlying infrastructure, such as Internet in Uganda. He established the barriers to be poverty, high costs of computers and lack of education in information systems. With the recent liberalization of telecommunication service, the current study will investigate the viability of the barriers stipulated by Magutu *et al.* (2011) in public and private universities in Kenya.

Loukis and Spinellis (2011) investigated the main barriers to the adoption of Business to Business (B2B) e-marketplaces (a type of IOIS) by Hellenic Aerospace Industry (HAI) in Greece using a case study based research. They identified various categories of barriers to the adoption of Business to Business (B2B) e-marketplaces. A first category encompassed the technical barriers, which were mainly associated with network security, hardware and software compatibility and systems integration, database conversion, and network bandwidth and connectivity. A second category of barriers comprised of the organizational barriers, which were mainly associated with resistance to change, lack of training, lack of awareness concerning the potential benefits, lack of management commitment and problems in the integration of inter-firm business processes. A third category of barriers was concerned with dimensions of the collaboration between the enterprises such as the lack of strategic alignment, the lack of trust and various types of conflicts. Finally, a fourth category of barriers was associated with the lack of required infrastructures, such as appropriate legal and regulatory frameworks as well as financial,

logistics and telecommunications infrastructures. The study was restricted to barriers of IOIS adoption only.

2.4 Overview of the Literature and Research Gaps

Existing literature has identified a range of organizational, inter- organizational, environmental, technological and perceived benefits and cost factors that affect the adoption of the IOIS. Most of these factors were identified in the contexts of IOS adoption initiatives examined in North American and European organisations. It is not clear whether these factors are also applicable in understanding IOIS adoption in Kenya and in particular the Kenyan universities.

Liberalization of telecommunication and use of broadband communication have taken root in Kenya in the recent past. The current study will establish whether the determinants of IOIS adoption spelt out in the past literature (Adams, 1997, Bagchi and Udo, 2007, Penttinen and Tuunainen , 2009, Bouchbout and Alimazighi, 2009, Nyangosi and Arora (2009) study are viable in the universities in Kenya in an ever changing information technology and liberalized sectors. Most of the past studies in Kenya concentrated on factors that hinder IOIS adoption and ignored the factors that motivate its adoption. The current study will broaden the sphere of the factors that influence IOIS adoption both motivators and those that hinder its adoption.

The findings of KENET (2008) echoed the finding of the study by Kashorda, Waema, Omosa and Kyalo (2006) that found out that the level of e-readiness in institutions of

higher learning was at low levels. The current study will establish the factors that influence e-readiness in these institutions.

Nyangosi and Arora, (2009), Gikandi and Bloor (2010) and Loukis and Spinellis (2011) investigated only the factors that are barriers o IOIS adoption, without considering the factors that motivate its adoption. No past study investigated the combination of barriers and motivators in the context of organizational, inter-organizational, Technological, perceived benefits, perceived cost and environmental factors in Kenya to the best of the researcher's knowledge. The current study aims to combine all these factors in order to have a study that is all inclusive of the factors that influence IOIS adoption in the universities in Kenya.

The privatization of telecommunication sector in Kenya and the government waiver on taxation on computer equipment and is expected to lower down the cost of IOIS development. IOIS infrastructure, such as the internet, and data security has also improved considerably in Kenya in the recent past (Wang *et al.*, 2003) is equally expected to be a motivator to the IOIS adoption in Kenya, hence the current study will establish effect of these initiatives in the adoption of IOIS technology in universities Kenya.

There is lack of clarification on whether the factors that impact on the IOIS adoption are similar or different in the developed and developing nations. It is argued in the literature that this will depend on the specific factor being considered. This study aims at

comparing the determinants of IOIS adoption in the developing and developed nation, and clarifying their relationships.

A summary of factors influencing IOIS adoption from selected studies is presented in Table 2.1.

Table 2.1 Summary of literature review

Research study	Main determinants of IOIS adoption	Gap
Tornatzky and Fleischer (1990)	Technological context, organizational context and environmental context.	Determinants of IOIS adoption were limited to Technological, organizational and environmental context only and did not explore other factors that influence IOIS adoption
Adams (1997)	Lack of infrastructures, poor education, ineffective telecommunication operations and poor governance	Technological, inter-organizational, perceived benefits and perceived cost factors which influence IOIS adoption were not considered.
Teo *et al.* (2003)	Coercive pressures, Normative pressures and Mimetic pressures	Determinants of IOIS adoption were limited to external pressures only. Other factors that influence IOIS adoption were not studied.
Rahim *et al.* (2004)	Techno-economic and socio-political motivation factors	Determinants of techno-economic and social-political motivations were not elaborated. Independent and dependent variables were not clarified.
Bagchi and Udo (2007)	Lack of economic development and high rate of inflation	The study was limited to the environmental factors that are hindrances to IOIS adoption without exploring other factors that influence IOIS adoption in an organization
Penttinen and Tuunainen (2009)	Perceived benefits, supplier pressure, bandwagon effect, external pressures from customers and organizational readiness to adoption the IOIS.	Environmental factors and technological factors that influence IOIS adoption were not considered in the study.
Bouchbout and Alimazighi (2009)	Inter-Organizational context, organizational context, technological context, perceived costs and perceived benefits.	Environmental factors that influence IOIS adoption were not considered in the study.

Nyangosi and Arora (2009)	Lack of infrastructure and government legislation to support IOIS adoption and the prevailing nation conditions (economic, cultural, social and political)	Technological and inter-organizational factors were not considered in the study. The motivating factors of IOIS adoption were also not featured in the study. Only a subset of factors that hinder IOIS adoption were considered.
Gikandi and Bloor (2010)	Lack of IOIS adoption legal regulations, relevant technical training and the infrastructure supporting IOIS adoption.	Considered only a subset of the factors that hinder IOIS adoption, and failed to explore further on other factors that are hindrances and motivators of IOIS adoption.
Magutu *et al.* (2011)	Incompatibility with existing legacy systems, Lack of infrastructure supporting IOIS adoption and legislation governing IOIS transactions.	Organization, inter-organization, perceived benefits and cost factors were not considered in the study. Factors that are Motivators of IOIS adoption were not considered also in the study.
Loukis and Spinellis (2011)	Lack of required infrastructures, perceived benefits, top management support, trust between trading partners, training, legal and regulatory frameworks and IOIS incompatibility with legacy systems.	The study did not consider factors that are motivators of IOIS adoption but only concentrated on the factors that hinder IOIS adoption.

Source: Researcher (2012)

2.5 Conceptual Framework

Bouchbout and Alimazighi (2009) theoretical framework is adapted as the conceptual framework for this study with modifications. The framework is found to conceptualize the factors that influence IOIS adoption in organizations, that is, inter-organizational context, organizational context, technological context, perceived benefits and perceived costs. In an endeavor to develop a framework with more inclusive independent variables, the inter-organizational context is modified to include the mimetic pressure factor which is adapted from Tornatzky, and Fleischer (1990) IOIS model. Organizational context was modified to include organizational culture change development. The change process and internal resources are elements of top management, and therefore were combined to form the top management support factor. In the technological context, network reliability was

replaced with technological support infrastructure that was considered to be a more relevant determinant of IOIS adoption in a developing country setting. The conceptual framework developed in this study (Figure 2.5) is discussed as follows;

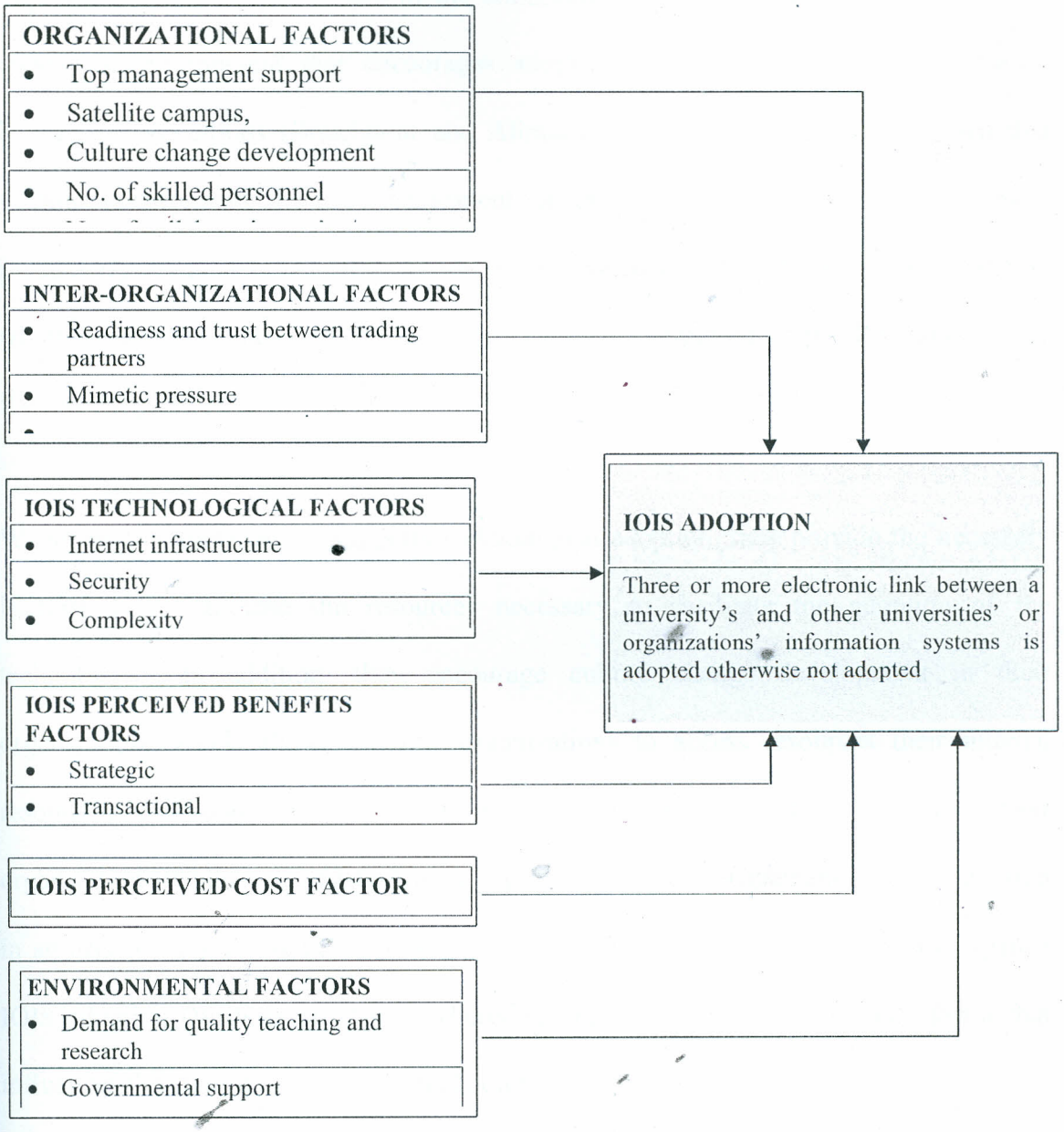

Figure 2.5: Conceptual framework: Factors that influence IOIS adoption

Source: Adapted from Soliman and Janz (2004); Bouchbout and Alimazighi, (2009) and modified by the researcher.

2.5.1 Organization Factors

2.5.1.1 Top Management Support

Top management support refers to the commitment from top management to provide conducive environment that encourages adoption of electronic information sharing between organizations (Bouchbout and Alimazighi, 2009). Research has shown that without support from the top management, an innovation is less likely to be adopted, particularly in inter-organizational information systems adoption and implementation where it has been consistently found to play an important role (Premkumar and Ramamurthy 1995).

When the top management supports technological adoption, they provide the necessary leadership and allocate the resources necessary to facilitate the adoption of the technology. In addition, they encourage culture change development in their organization, which allows external organizations to access resources their internal resources, and convince other organizations to establish IOIS links with their organization (Rahim et *al.* (2004). The perception of the top management on IOIS adoption in an organization can act as a positive force in developing IOIS or as a barrier against IOIS adoption (Williamson, 2007). Therefore, top management support is a factor that influences the adoption of the IOIS technology.

2.5.1.2 Organization Size

Large size organizations are more likely to have IOIS transactions with their trading partners. The number of employees in an organization has often been used as a measure of the size of a particular organization (Thong, 1999). The current study considers the number of skilled personnel and collaborating partners/customers and satellite campuses that a university has as a better measure of an organization's size in IOIS research. This is due to the fact that the more the skilled personnel and collaborating partners/customers that a university associates with and the more the satellite campuses that a university has, the more likely it is to adopt an IOIS innovation in order to improve the transactions efficiency.

2.5.1.3 Culture Change Development

Culture can be explained in terms of values and practices (Karahanna, Evaristo and Srite, 2005; Bunker, Kautz and Nguyen, 2007). A value is an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence. Once a value is learned, it becomes integrated into an organized system of values where each value has a relative priority (Karahanna *et al.*, 2005). Practices are learned through socialization at the workplace after an individual's values are organizational in place with learned ways of doing things, such as facts about the world, how it works and cause-effect relationships" (Karahanna *et al.*, 2005).

Cultural theory has been used to explain an extensive range of social behaviors and outcomes in organizational settings, organization performance, corporate strategy, job attitudes, administrative practices, merger and acquisition outcomes, technology transfer practices and conflict resolution strategies in product innovation settings (Leidner and Kayworth, 2006). Organizational culture is dominant when an organization adopts an inter-organizational information system. It is more influential in an inter-organizational domain as organizations have to deal with their partners in the same industry. In an organization, organizational culture can drive or inhibit the individuals within an organization to pursue the adoption of IOIS. IOIS adoption opens the organizational data to be accessed directly by other organizations within the IOIS integration cluster. An open organization culture should therefore be developed for a successful adoption of IOIS in order to allow this to happen, which is not possible in a closed culture.

2.5.2 Inter-organization Factors

These are factors that are inter-organization related, which include the following:

2.5.2.1 Trust between Trading Partners

Trust between trading partners is the organization's belief that another company will perform actions that will result in positive outcomes for the organization, as well as not taking unexpected actions that would jeopardize the organization's business outcome (Rahim and Kurnia, 2004). A trust relationship between trading partners is developed when an organization believes that the other partner is competent, open, concerned and reliable in inter-organization business transactions (Bouchbout and Alimazighi, 2009). For an IOIS integration to be established between trading partners, there must be an

established trust relationship between them, otherwise it becomes difficult to adopt the IOIS in organizations that do not have a trust relationship between themselves.

2.5.2.2 Mimetic Pressure

Mimetic pressure is a "bandwagon effect," which suggests that organizations will engage in IOIS innovation just because other organizations are involved in the same activity and not for any economic benefits (Kuan and Chau, 2001). The mimetic pressure makes an organization to imitate other organizations that have already adopted the IOIS. This is mainly due to the popularity of the technology and the perceived success of the organizations that have already adopted the technology.

2.5.3 Technological Factors

Bouchbout and Alimazighi, (2009) described the technological context as the ability of the perceived characteristics of existing technologies in an organization to influence the IOIS adopt in the same organization. The main technological characteristics that influence IOIS adoption are: Internet infrastructure, security of data sent over the IOIS link and perceived complexity of the technology.

2.5.3.1 Internet Infrastructure

Availability of an Internet infrastructure that is reliable and fast would support IOIS adoption in organizations. Today, business communication requires increased bandwidth to accommodate the transfer of large multimedia files, such as video and audio files and other business related information between trading partners, and the network should be

reliable and offer sufficient bandwidth to transfer the information (Bouchbout and Alimazighi, 2009).Internet being a network of networks of computers should be reliable and fast with sufficient bandwidth, since many organization critically evaluate the level of reliability and the amount of bandwidth available in the Internet before making any commitment to adopt an internet related innovation, such as the IOIS integration with trading partners.

2.5.3.2 Security of Data sent over the IOIS Link

Security concern is a paramount technological characteristic in terms of confidentiality and fraud in IOIS transaction. When organizations integrate using IOIS link, they place confidential data online, which makes them to open themselves to potentially damaging security breaches. The IOIS adoption may hinge on security-related issues since IOIS can expose sensitive information to potential hackers to steal, alter, or make the systems malfunction. The business data regularly exchanged between the trading partners requires a reliable, fast and secured communication link.

2.5.4 Perceived Benefits Factors

The perceived IOIS benefits that would influence an organization to adopt the IOIS technology are strategic and transactional. Strategic benefit of the IOIS is the perceived ability of the IOIS to change or maintain relationships with external organizations, particularly the relative amount of bargaining power held by the trading partners (Johnston and Vitale, 1988). Transactional benefits of the IOIS are concerned with

improvement of the efficiency and economic status of the organization, particularly sales or purchase process.

2.5.5 Perceived Cost of IOIS Technology

The cost of IOIS adoption will entail the hardware, software and other facilities necessary for IOIS adoption. The perceived cost of these facilities could influence the adoption of IOIS in an organization.

2. 6 Environmental Factors

The external environment in which an organization conducts its business will also influence its innovative capability such as the IOIS adoption (King, and Anderson, 1995). Organization will pay more attention on innovation when they are faced with environments with higher demand (Miles and Snow, 1978). An organization that is conducting business in an environment with high demand for services or products could be influenced by such an environment to adopt the IOIS.

Governmental support is another important environmental characteristic for technological innovation (Zhu and Weyant, 2003). Government can provide financial incentives, pilot projects, and tax breaks to stimulate technological innovation for logistics service providers. Therefore this study argues that the environmental uncertainty and governmental support are important factors that influence the adoption of IOIS.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methods and processes that were followed by the researcher to conduct the study. This section outlines the study's research design, target population and study site, the empirical model, definition and measurement of variables, data collection instruments, testing the instruments for validity and reliability, data collection procedures and methods of data analysis and presentation of results.

3.2 Research Design

The study used a combination of cross-sectional descriptive survey and explanatory research design. A descriptive research gives a thorough and accurate description survey by determining the "how" or "why" the phenomena came into being, and also what is involved in the situation (Neuman, 1997). This is achieved by portraying an accurate profile of the events and situations (Robson, 2002), which Sunders *et al.* (2007) considered as an extension of, or forerunner to an explanatory research.

On the other hand, an explanatory study goes beyond description and attempts to explain the reasons for the phenomena that the descriptive study only observed (Cooper and Schindler, 2003) by seeking to establish a casual relationship between variables (Sunders *et al.*, 2007). Therefore, a descriptive study would look at what is going on, while an explanatory study seeks to explain why it is going on (Sekaran, 2003). The researcher

uses theories or hypothesis to account for the forces that caused a certain phenomenon to occur (Cooper and Schindler, 2003).

A cross-sectional study seeks to measure the relationship of variables at a specified time, either to describe the incidence of a phenomenon or how variables are related (Sunders *et al.,* 2007. The population of interest (universities in Kenya) was thoroughly investigated in their places of operation so as to freely give more information without the manipulation of unfamiliar environments in order to understand the factors that influence IOIS adoption in these institutions of higher learning.

Although most Information System (IS) researchers prefer utilizing either a quantitative or qualitative methodology in isolation, there has been an increasing number of studies that advocate for the benefits of combining one or more research methods (Kaplan and Duchon, 1988; Lee, 1991; Mingers, 2001). In this study, both quantitative and qualitative data was collected in order to gain a richer understanding of the factors influencing adoption of IOIS. Combining these methods together introduced both testability and context into the research, and increased the robustness of results because the findings were strengthened through cross-validation, leading to a richer understanding of the phenomena under investigation. Furthermore, this also gives additional insights to be revealed through this triangulation, which would otherwise remain undiscovered if a single methodological approach was used (Kaplan and Duchon, 1988). Mugenda and Mugenda (2003) and Saunders *et al.* (2007), in support of this approach, observed that there was no single research approach that was sufficient in isolation, and as such, has to

be mixed to obtain optimum results. However, quantitative method was used extensively in this study.

3.2 Theoretical Framework of the Model

The factors influencing the adoption of IOIS in this study were determined using the logistic model, also known as logit model. The model calls for the analysis and prediction of a dichotomous outcome. Traditionally, this could have been addressed by either ordinary least squares (OLS) regression or linear discriminant function analysis. However, both techniques were found to pose challenges in handling dichotomous outcome due to their strict statistical assumptions such as linearity, normality and continuity for OLS regression, and multivariate normality with equal variances and covariances for discriminant analysis (Cabrera, 1994; Lei and Koehly, 2000). An alternative model that could have been used was the linear probability model or the probit model.

While comparing of the two models, Polson and Spencer (1992) observed that the probit and logit models were the two most frequently used applications for analyzing the relationship between dependent discrete variables (adoption) and explanatory variables, and both yielded similar parameter estimates that were difficult to distinguish statistically. However, the logit model was used in this study, since it is easier to estimate, simpler to interpret and able to predict the presence or absence of IOIS adoption based on values of a set of predictor variables (Abebaw and Belay, 2001).

In addition, the model is also considered a standard method of analysis when the outcome variable is dichotomous in nature (Hosmer and Lemeshow, 2000). It is well suited for describing and testing hypotheses about relationships between a categorical outcome variable and one or more categorical or continuous predictor variables (Peng, Lee and Ingerasoll, 2002) such as the case of the IOIS adoption in this study. In the current study, the dependent variable was 'the adoption of the IOIS, which was measured as a dichotomous response variable (0 = non - adoption of the IOIS, and 1= adoption of the IOIS).

Discrete choice problems involve choices between two or more discrete alternatives, such as adopting or not adopting a technological innovation. Discrete choice analysis examines situations in which the potential outcomes are discrete, such that the optimum is not characterized by standard first-order conditions. They statistically relate the choice made by each entity (such as an organization) to the attributes of the person and the attributes of the alternatives available to the person. The choice of which technology to adopt in an organization, for example, is statistically related to the organization's capability to adopt it as well as the attributes of the technology itself. The models estimate the probability that an organization will adopt a particular technology (Karki and Bauer, 2004).

The utility of an organization to adopt a technological innovation is expressed as:

$$U_i = f(X_{ij}) + \varepsilon_i \quad \text{.....3.1}$$

where:

U_i = the utility organization i is expected to derive by adopting IOIS technology.

X_{ij} = vector of observable attributes that drive organization i to adopt IOIS technology j.

These attributes consist of the characteristics of the technology and the organization, some which can be observable and some are not observable:

ε_i = The random error term that is assumed to follow a normal distribution.

If the adoption of the technological innovation is y_i, then:

$y_i = 1, if\ U_i > 0$. The unobserved term, ε_i is assumed to have a logistic distribution.

The specification is written as:

$$y_i = \begin{cases} 1, & if \quad U_i > 0 \\ 0, & if \quad U_i < 0 \end{cases}$$

If then the probability of adopting the IOIS technology is $P(y_i = 1) = P_i$:

$$P_i = \frac{1}{1+e^{-z}} = \frac{e^z}{1+e^z} \qquad \text{.....(3.2)}$$

The probability of not adopting IOIS is:

$$1 - P_i = \frac{1}{1+e^z}$$

where $Z = X\beta + \mu$

From equation 3.2, the odds ratio can be specified as:

$$\frac{P_i}{1-P_i} = e^{XB+u} \quad \text{.....(3.3)}$$

Equation 3.3 is the odds ratio, which is the ratio of the probability that an organization will adopt the IOIS, to the probability that an organization will not adopt the IOIS. However, since the data that was used in the study constituted individual level data, the odds ratio was converted into a logistic equation by obtaining natural logs on both sides to obtain equation (3.4), which is estimated using Maximum Likelihood estimation (MLE).

$$\ln\left[\frac{P_i}{1-P_i}\right] = Z = XB + u = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + ... + \beta_k X_{ik} + u_i \text{.....3.4}$$

$X_{i1}...X_{ik\,i}$ are the explanatory variable.

3.3.1 Empirical Analysis

The variables of the empirical model are identified from the reviewed literature. Equation 3.4 is modified to yield the functional equation of the form:

$$\ln\left[\frac{P_i}{1-P_i}\right] = Z = XB + u = \beta_0 + \beta_1 Tmgt + \beta_2 X_{i2} + ... + \beta_k X_{ik} + u_i \text{.....3.5}$$

$$\ln\left[\frac{P_i}{1-P_i}\right] =$$

$$\beta_0 + \beta_1 Tmgt_i + \beta_2 Cmps_i + \beta_3 Skil_i + \beta_4 Colb_i + \beta_5 Ccde_i + \beta_6 Tbtp_i + \beta_7 Mipr_i + \beta_8 Tifs_i$$
$$+ \beta_9 Secu_i + \beta_{10} Cmpx_i + \beta 1_1 Strg_i + \beta_{12} Trls_i + \beta_{13} Ovct_i + \beta_{14} Dqtr_i + \beta_{15} Govt_i \text{.....3.6}$$

where:

P is the probability of adopting IOIS technology.

$\beta_1 - \beta_{15}$ are the coefficients from the log of the odds ratio function.

ε_i = a vector of random terms

Explanatory variables are:

Tmgt is the top management support

Cmps is the number of campuses

Skil is the number of skilled personnel

Colb is the number of collaborating universities

Ccde is the culture change development in order to support IOIS adoption

Tbtp is the trust between trading partners

Mipr is the mimetic pressure to adopt IOIS

Tifs is the technological internet infrastructure support the adopt IOIS

Secu is the security of the IOIS technology

Cmpx is the complexity of the IOIS technology

Strg is the strategic benefit of the IOIS technology

Trsl is the transactional benefit of the IOIS technology

Ovct is the overall cost of facilities necessary for IOIS adoption

Dqtr is the demand for quality teaching and research

Govt is the Government support

3.3.2 The Marginal Effect

Instead of the slope coefficients (β) being the rate of change in Y (the dependent variables) as X changes (as in the linear probability model or ordinary least square regression), the marginal effect was used in the logit regression in the current study. In the marginal effect, the slope coefficient is interpreted as the rate of change in the "log odds" as X changes.

From equation 3.3: $\frac{P_i}{1-P_i} = e^{X\beta+u}$ 3.7

$$\ln\left(\frac{P_i}{1-P_i}\right) + X\beta + u$$

$$\frac{\partial \ln\left(\frac{P_i}{1-P_i}\right)}{\partial X_i} = \beta_i \quad \text{..... 3.8}$$

But what is of interest in the current study is the marginal effect, $\frac{\partial P_i}{\partial X_i}$ which is a measure of how much the change of X_i influences the probability P_i of the IOIS adoption.

Therefore marginal effect = $\frac{\partial P_i}{\partial X_i} = \beta_i(1-P_i)P_i$ 3.9

3.4 Definition and Measurement of Variables

The independent variables stipulated in the empirical model are categorized into organization factors, inter-organization factors, technological factors, environmental factors, perceived benefits factors and perceived cost factors. They are operationalized and hypothesized to influence IOIS adoption positively, negatively or indefinite as depicted in Table 3.1.

Table 3.1: Operationalization and Measurement of Variables and Hypothesis

Category	Variable Definition	Operationalization	Measure	Hypothesized Direction of the Variable
Dependent variable	IOIS adoption (Y)	Three or more electronic link between a university's organizations' information system and other universities' or organizations' information systems is adopted, otherwise not adopted	Dummy variable based on the actual data:1 if adopted, otherwise 0: if not adopted	None
Independent Variables				
Organizational factors	Top management support $(Tmgt)$	Support garnered from the top management of the university in allocating the necessary resources, supporting new processes and persuading other universities to join the IOIS cluster	Perceived influences on the IOIS adoption by amount of the support garnered from the top management of the university in allocating the necessary resources, supporting new processes and persuading other universities to join the IOIS cluster on a 1-5 scale	Positive
	Number of satellite campuses $(Cmps)$	Number of satellite campuses that a university has.	A continuous variable of the number of satellite campuses that a university has, which were perceived to influence the IOIS adoption in a university.	Positive

	Number of skilled personnel (*Skil*)	Number of personnel with IOIS knowledge and experience that a university has.	A continuous variable of the number of skilled personnel that a university has, which were perceived to influence the university to adopt the IOIS	Positive
	Number of collaborating universities (*Colb*)	Number of collaborating universities/organizations that a university has.	A continuous variable of the number of collaborating universities/organizations that a university has, which were perceived to influence the university to adopt the IOIS	Positive
	Culture change development (*Ccde*)	Efforts made by the university to open the university data to be accessed directly by other university and organizations within the IOIS integration cluster.	Perceived influences on the IOIS adoption by efforts made by the university to open the university data to be accessed directly by other university and organizations within the IOIS integration cluster on a 1-5 scale	Positive
Inter-organizational factors				
	Trust between partners (*RTTP*)	Having trading partners that were willing and able to adopt IOIS, and were trusted to perform actions that would not jeopardize the university's business interest.	Perceived influences on the IOIS adoption by the trading partners that were trusted to perform actions that would not jeopardize the university's	Positive

			business interest, and were ready to adopt the IOIS on a 1-5 scale	
	Mimetic pressure (*Mipr*)	Pressure to adopt IOIS due to perceived success of other universities that have adopted it.	A continuous variable of the number of other universities that were perceived to be successful after adopting the IOIS, which influenced it to adopt the IOIS.	Positive
Technological factors	Internet infrastructure (*Intn*)	Existing internet infrastructure supporting IOIS adoption by organizations	Extent to which the existing internet infrastructure supporting IOIS adoption by organizations influence the IOIS adoption on 1-5 scale	Positive
	Security (*Secu*)	The ability of the IOIS to transaction information without loss or unauthorized access	Degree to which the ability of the IOIS to transact information without loss or unauthorized access influence IOIS adoption on 1-5 scale	Positive
	Complexity (Cmpx)	Whether the IOIS innovation is perceived as difficult to understand and use	Dummy variable based on the whether the IOIS innovation is perceived as complex or not, Yes: If IOIS is complex No: if IOIS is not complex	Positive if not complex
Perceived benefits	Strategic (Strg)	Ability of the IOIS to change or maintain relationships with external organizations.	Extent to which the ability of the IOIS to change or maintain relationships with external	Positive

			organizations influences the IOIS adoption on 1-5 scale	
	Transactional (Trsl)	Improvement of the efficiency in teaching, research, management and economic status of the university.	Extent to which improvement of the efficiency in teaching, research, management and economic status of the university influences the IOIS adoption on 1-5 scale	Positive
Perceived cost	Overall cost (*Ovct*)	The market price of software, hardware, training, installation, maintenance and Internet	Dummy variable based on the overall cost of facilities supporting IOIS adoption, 1; if affordable, 0: if unaffordable.	Positive if affordable
Environmental factors	Demand for quality teaching and research (*Dqtr*)	Demand by stakeholders for quality level of teaching and research in the university.	Extent to which the demand by stakeholders for quality teaching and research influences the university to IOIS adoption on 1-5 scale	Positive
	Government support (*Govt*)	Government provision of financial incentives, pilot projects, and tax breaks to stimulate IOIS adoption.	Extent to which the amount of financial incentives provided by the government, number of pilot projects and the amount of tax breaks initiated by the government influences the IOIS adoption.	Positive

Source: Researcher (2012)

3.5 The Profile of the Study

The study was conducted on universities in Kenya that are established under the Kenya Government universities' Act of Parliament 5 of 1985 (Republic of Kenya, 2010), and accredited by the Commission of University Education in Kenya. This included: public universities; constituent colleges of public universities that were established in 2007 by a Legal Order under the Act of the universities; chartered private universities that have been fully accredited by Commission for University Education in Kenya; constituent colleges of private universities; universities with Letters of Interim Authority from the Commission for University Education in Kenya to offer degree level of education while receiving guidance and direction from the Commission for University Education in order to prepare them for the award of Charter; and registered private universities that were offering university level education before the establishment of the Commission for University Education in 1985 and were issued with Certificates of Registration in 1989 by the Commission for University Education in Kenya.

3.6 Target Population and Study Area

The target population for this study was the universities Kenya. A list of the universities in Kenya was prepared as shown in Appendix D. The universities in Kenya were selected since they are known to have established links between themselves and the commercial banks to create an efficient procedure of fee payment by the students to the universities bank accounts, and the fee information is relayed electronically to the universities databases. Another factor that made the universities in Kenya to be considered in this study was due to the fact that Kenya Education Network (KENET) has put efforts to

construct a terrestrial fiber-optic network that connects most institutions of higher learning, allowing them to integrate their facilities for the purpose of sharing resources (KENET, 2009). The universities that were considered to have adopted the IOIS are those that have established inter-organizational or inter-departmental IOIS integrated.

The target respondents were the Information Technology (IT) managers in each organization, since they were considered to have technical knowledge on IOIS adoption, as used by Pang and Bunke (2007), and Bouchbout and Alimazighi (2009). Seidler (1974) observed that such informants, who are knowledgeable about a particular organization, could answer questions about generalized patterns of behavior at the organization level. The target population that was considered in this study was 68 universities in Kenya as presented in Appendix D.

3.7 Sampling Technique and Sample Size

A census was done on the universities in Kenya. Since there were only 6 universities in Kenya, this number was too small to sample since the logit model estimation requires a minimum sample size of about 50 samples according to Agresti (2007). In addition, a census was considered as being able to allow the researcher to collect data from all the categories of the universities in Kenya.

3.8 Data Collection Instruments and Procedure

3.8.1 Data Collection Instruments

The study made use of both the primary and secondary data. The secondary data was collected by conducting a detailed review of various literatures such as strategic plan, research and training plans and reports of the various universities. This was expected to reveal factors that influence IOIS adoption in these institutions. Primary data was collected by use of semi-structured questionnaire as used by Ssewanyana and Busler (2007). The use of semi-structured questionnaire was deemed necessary to enable the researcher to collect both qualitative and quantitative data. Semi-structured questionnaire and interviews were administered to the ICT managers of each university. The intention of the semi-structured interviews was to probe further into the issues that may not be answered by the use of the questionnaires, and are considered in the current study as a preferable choice of getting a more multi-faceted view of the factors that influence IOIS adoption in an organization. They also left room for unstructured data both in the form of speech, atmosphere, and other rich sources of information. Interviews were audio-taped and transcribed to ensure that the data was collected and used accurately.

A questionnaire was developed based on the objectives of the study. The questions were designed to cover general background information of the respondents relating to IOIS adoption based on the conceptual framework. The survey consisted of eight sections, which are: Appendix A that contained the cover letter explaining the purpose of the research; Appendix B having the questionnaires, Appendix C, which had the interview

guide that sought information on the factors that influence IOIS adoption in the universities in Kenya.

3.8.2 Reliability Tests

In this study, Cronbach's Alpha, which is a reliability test that indicates how well items in a set are positively correlated to one another, was used to measure internal consistency. As stated by Straub (1989), high correlations between alternative measures or large Cronbach's Alphas are usually signs that the measures are reliable. Cronbach's Alpha was computed in terms of the average interconnections among the items measuring the concept, and the closer the measure was to 1, the higher the internal consistency reliability (Independent variables on the dependent variable). Generally, reliabilities of 0.7 and over are considered acceptable as done by Muathe, Wawire and Ofafa (2010).

The results of items tested for reliability are shown in Appendix E. The statistics table indicates that the actual value for Cronbach's alpha 0.918. George and Mallery (2003) specified the ranges of cronbach's alpha (α) as follows: $\alpha \geq 0.9$ is excellent, $0.9 > \alpha \geq 0.8$ is good, $0.8 > \alpha \geq 0.7$ is acceptable, $0.7 > \alpha \geq 0.6$ is questionable, $0.6 > \alpha \geq 0.5$ is poor and finally $0.5 > \alpha$ is unacceptable. They further noted that a high value of Cronbach's alpha ($\alpha > 0.95$) may suggest a high level of item redundancy; that is, a number of items asking the same question in slightly different ways.

The actual value for Cronbach's alpha realized in this study indicated a high level of internal consistency for the scale used. However, the Item Total Statistics table presents the value that Cronbach's alpha would be if a particular item was deleted from the scale.

It can be seen that the removal of any item would lower the value of the Cronbach's alpha except the ability to reduce number of transaction (α will be 0.932), the ability to reduce delay (α will be 0.922) and increase ability to compete (α will be 0.928). The correlations of these items were also poor. Item total correlation for increase ability to compete was 0.414, ability to reduce delay was -0.285 and ability to reduce number of transaction was -0.341. Since deletion of these three items results in some significant change in the value of Cronbach's alpha, and since they were not correlating well with the other items, there was a statistical reason to drop them and therefore the three items were dropped and not used in the questionnaire.

3.8.3 Validity Tests

A pilot test was carried out with tertiary institutions to test the data collection instruments before the main survey. This enabled the researcher to check the validity of the data collection instruments and estimate with some accuracy the average completion time. The tertiary institutions in the pilot study were not included in the final sample. To complement the pilot test, this study made use of expert opinion to attest the content validity of the instrument (Straub, 1989). The feedback was used to improve the data collection instruments by eliminating any ambiguities and inadequate terms.

Six tertiary institutions [Institute of Advance Technology (IAT), Nairobi Institute of Business Studies (NIBS), Kenya Institute of Development Studies (KIDS), Kenya Institute of Professional Studies (KIPS), Zitech College and Universal College] that are offering university degree in collaboration with accredited universities in Kenya were

given the questionnaires that were intended to be used in the research. They were requested to evaluate them for clarity, omissions, irrelevancy, redundancy and any other issue or issues that could be deemed necessary to be attended to. The corrections suggested in the pilot testing were incorporated in the questionnaire to remove the redundant questions, improve clarity and make it more inclusive. The said items that were recommended for amendment are tabulated Appendix F.

3.8.3 Data Collection Procedure

Data was collected over a period of four months. First, the researcher sought permission from Kenyatta University to start the process of collecting data which was granted (Appendix H). Afterwards, the researcher recruited and trained five research assistants to enable quick and timely collection of data. Before commencing data collection, the researcher sought an appointment with the ICT managers of the target organizations under study, after which the research assistants proceeded to self-administer questionnaires to the managers and staff involved in the IOIS transactions in the organizations, under the supervision of the researcher. The researcher administered the interviews to the ICT managers and the staff of the universities. The interviews were audio-taped and transcribed to ensure that the data was collected and used accurately.

After collecting data, it was edited to check for completeness, consistency and reliability. Afterwards, the data was transferred to the STATA for analysis.

3.9 Data Analysis and Reporting

The first step involved coding the responses in the coding sheets by transcribing the data from questionnaire by assigning characters symbols (numerical symbols). This was followed by screening and cleaning of data to make sure there were no errors. Afterwards, data was analyzed based on the objectives of this study. The quantitative data was analyzed using descriptive statistics such as frequency distributions, mean and percentages. Open-ended questions was analyzed by first identifying themes or topics such as ideas, concepts, terminologies, behaviors or phrases used, then organize these themes into coherent categories that summarize and bring meaning to the text as suggested by Ratcliff (2002).

The binomial logit model, specified in sub-section 3.2, was used for empirical analysis, to draw inference about the population. The correlation matrix test was used to examine the levels of multicollinearity between the independent variables. The independent variables that were not highly correlated were included in the model, and those that were highly correlated were omitted from the model as done by Oketch, Wawire and Mburu (2010).

The likelihood ratio test, which is analogous to the F-test in linear regression models (Kanninen and Khawaja, 1997), with its associated Chi-square statistics, was used for testing the overall significance of relationships estimated using maximum likelihood in a logit. Agresti (1990) argued that the likelihood ratio statistic was viable, particularly if the sample size is small or the parameters are large, and noted that a good model was one that resulted in a high likelihood of the observed results.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter explains the response rate and current rate of IOIS adoption by the public and private universities in Kenya, types of IOIS mainly adopted, followed by organizational, inter-organizational, technological, perceived benefits, perceived cost and environmental factors that are determinants of the IOIS adoption by the universities in Kenya. Finally the chapter presents regression results on the factors that influence the adoption of IOIS in the universities in Kenya, based on the research objectives.

4.2 Response Rate

The overall response rate from both the public and private universities in Kenya is presented in Table 4.1, before providing analysis based on the research objectives of this study.

Table 4.1: Distribution of respondents in each sampled university

Type of Universities	Frequency	Percentage	Valid Percentage
Public universities	7	10	15
Public universities constituent colleges	19	28	40
Chartered private universities	13	19	28
Registered Private universities	2	3	4
Private universities with letter of interim authority	6	9	13
Total	**47**	**69**	**100**
Missing	21	31	
Total	**68**	**100**	

Source: Survey data, 2012

As presented in Table 4.1, the percentage of the total number of respondents from the private universities (Chartered private universities, Registered Private universities and Private universities with letter of interim authority) was 39 per cent, which was lower compared to percentage of the total number of respondents from the public universities and the public universities constituent colleges, which was 50 per cent. The total response rate was 89 per cent, which compares well with the response rate of 70 per cent recommended by Yun and Trumbo (2008), and 46 per cent recommended by Sheehan (2001). The response rate depicted in Table 4.1 could be explained by the nature of the sensitivity of the information sought from respondents. In some instances, the interviews had to be terminated since the respondents were reluctant to share the information, and in

other cases, respondents had to seek further authority from the senior management, who were reluctant to grant the permission to divulge the information needed.

4.3 Level of IOIS Adoption by Universities in Kenya

The level of IOIS adoption by universities in Kenya is summarized in Table 4.2 and Figure 4.2.

Table 4.2 Level of IOIS adoption in the Level of IOIS adoption in the universities in Kenya

IOIS	Frequency	Percentage	Valid Percentage
Adopted	8	11	17
Not adopted	39	58	83
Total	**47**	**69**	**100**
Missing	21	31	
Total	**68**	**100**	

Source: Survey data, 2012

It can be observed from Table 4.2 that 83 % of the respondent indicated that their universities had not adopted the IOIS, while 17% had adopted. This shows that the IOIS adoption is low in the universities in Kenya, as justified in the reviewed literature. This finding supports Kashorda and Waema (2009) study, which found that universities in Kenya are still at low levels of network access.

4.4 Levels of IOIS Adoption in the Public and Private Universities in Kenya

The levels of IOIS adoption and non-adoption vary both in the public and private universities as presented in Table 4.3.

Table 4.3 Levels of IOIS adoption in the public and the private universities in Kenya

Type of Universities	IOIS Adopted	IOIS not Adopted
Public universities	3	4
Public universities constituent colleges	2	17
Chartered private universities	2	11
Registered Private universities	0	2
Private universities with letter of interim authority	1	5
Total	**8**	**39**

Source: Survey data, 2012

As shown in Table 4.3, the level of IOIS adoption is higher in public universities (19%), than in the private universities (14%). This is contrary to the findings of Kashorda and Waema (2006) that public universities had a lower level of information system integration than the private universities, since they provided less than three PCs per 100 students, while most of the private universities provided more than 10 PCs per 100 students.

Later, Kashorda and Waema (2009) found that public universities were at a higher level of network access than the private university, which supports the findings of this study. This can be explained partly by the fact that the universities have been expanding their institutions of late by opening more satellite campuses that are electronically connected to

the main campuses, resulting to a higher level of IOIS adoption in the public than the private universities.

On the other hand, more private universities had of late been accredited by the Commission for University Education in Kenya (CHE). Most of these new universities have no satellite campuses and they lack the resources necessary for IOIS adoption, which further lowers the IOIS adoption level in the private universities.

4.5 Types of IOIS Adopted by Universities in Kenya

Various universities in Kenya have adopted different types of IOIS, while others have adopted more than one type of IOIS. Figure 4.1 shows the levels of adoption of different types of IOIS by the universities in Kenya.

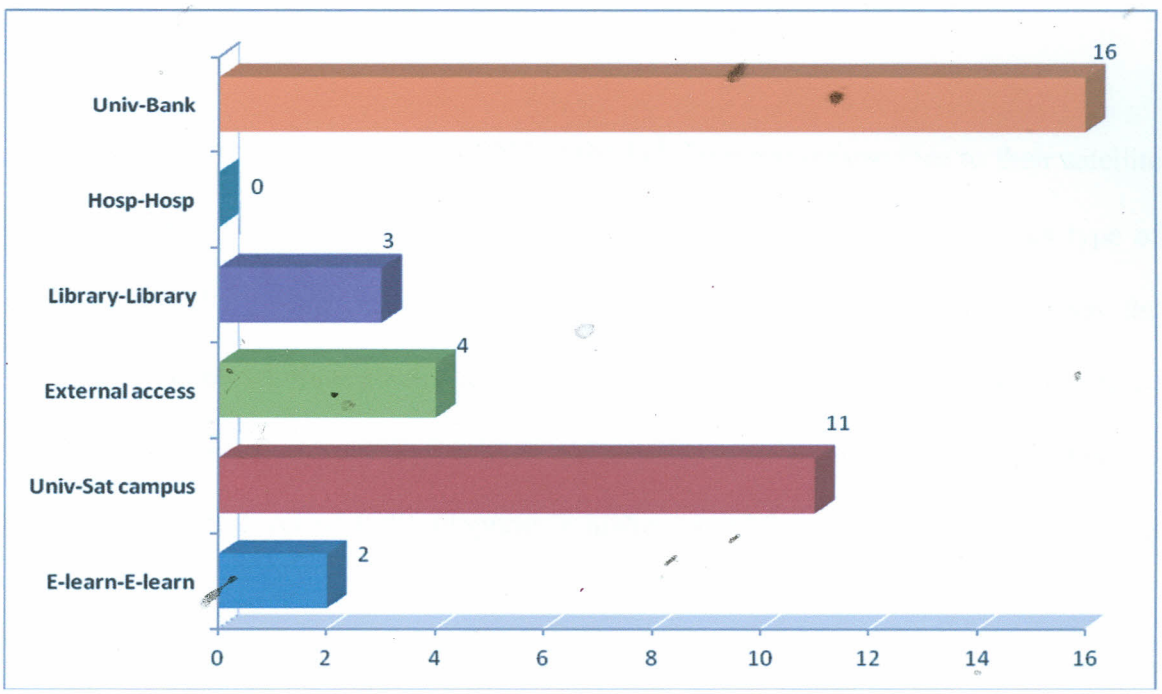

Figure 4.1 Types of IOIS adopted by universities in Kenya

From Figure 4.1, it can be observed that the highly adopted type of IOIS is the university to commercial bank link (Univ-Bank), which has been adopted by 16 universities. This explains the fact that universities are offloading the burden of students paying fees directly to the universities, but instead fees are paid to the commercial banks and then payment information is electronically relayed to the university database. This has the advantage of reducing overhead costs and improving the fees payment process.

Large universities (majority being public) have found it cumbersome to handle the students' fees payment process directly due to the large population of students, hence, adopting university-to-bank IOIS link to make the process easier and effective. This explains why the majority of the universities that have adopted the IOIS are public universities.

The second highly adopted type of IOIS is the link between universities to their satellite campuses (univ-sat campus), which has been adopted by 11 universities. This type of IOIS is important, since it allows communication and data to be sent between the university's main campuses and their satellite campuses. Most public universities have satellite campuses, but very few private universities have satellite campuses. This too explains why the level of IOIS adoption is higher in public universities than in private universities.

4.6 Duration of IOIS Adoption by Various Universities

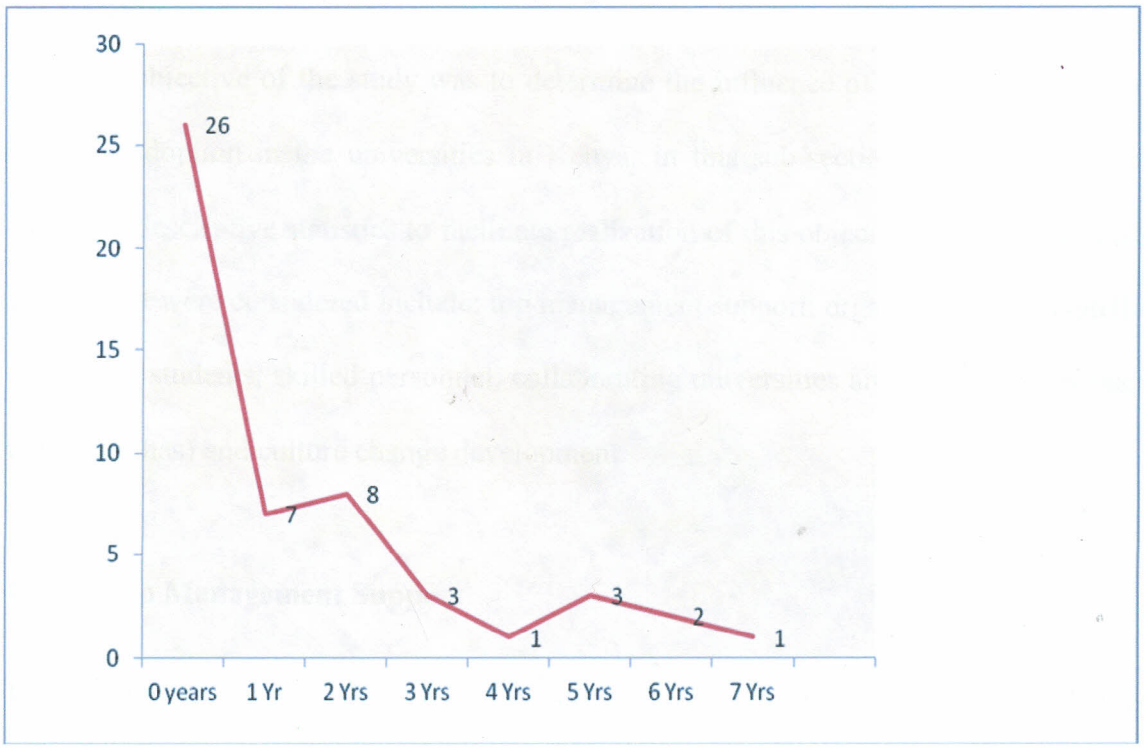

Figure 4.2 Duration of IOIS adoption in various universities

The duration of IOIS adoption by various universities in Kenya is presented in Figure 4.2. As shown in Figure 4.2, 26 universities had not adopted the IOIS (0 years). Only 7 universities had adopted the IOIS for a period of between 4 to 7 years, whereas 18 had adopted the IOIS for between 1 to 3 years. Most notably is the fact that the highest number of IOIS adoption occurred in the last 2 year. This is a clear indication that the adoption of the IOIS technology by universities in Kenya is currently on the rising trend. The rise in IOIS adoption by universities in Kenya can be explained by the need to enhance efficiency in operations.

4.7 Organizational Factors

The first objective of the study was to determine the influence of organizational factors on IOIS adoption in the universities in Kenya. In this sub-section, data was analyzed using the descriptive statistics to facilitate realization of this objective. The organization factors that were considered include: top management support, organization size (satellite campuses, students, skilled personnel, collaborating universities and organizations that a university has) and culture change development.

4.7.1 Top Management Support

Top management support in a university is expected to positively influence the adoption of IOIS in a university. Table 4.4 summarizes respondents' view with regard to top management support in adopting the IOIS.

Table 4.4: Top management support in IOI in IOIS adoption

Top Management Support	Frequency	Percentage
Strongly disagree	6	13
Disagree	8	17
Uncertain	2	4
Agree	14	30
Strongly agree	17	36
Total	47	100

Source: Survey data, 2012

While 66% of the respondents agreed that top management support in their universities motivated them to adopt the IOIS adoption, 30% were in disagreement and 4% were

uncertain. Out of the eight (8) universities that had adopted IOIS, 87% of these universities indicated that the support from top management had motivated them to adopt the technology. However it was also noted that not all the universities whose top management supported the IOIS adoption ended up adopting it. This could be attributed to lack of resources necessary for IOIS adoption, or not prioritizing the IOIS adoption above other projects undertaken by the universities. The respondents who disagreed and those who were uncertain were from universities that had not adopted the IOIS, and whose top management was not supporting the adoption of the IOIS in their universities.

These findings are in line with the findings of Rahim and Kurnia (2004), who argued that the top management support and commitment was a strong factor that positively impacted on the adoption of Efficiency Consumer Response (ECR) technology system in Melbourne, Australia.

4.7.2 Open University Culture

An Open University culture that allowed staff to integrate the business processes with partner organizations was expected to influence the adoption of IOIS. Table 4.5 provides the respondents view on open university culture on IOIS adoption.

Table 4.5 Open university culture influence on IOIS adoption

Open University Culture	Frequency	Percent
Strongly disagree	5	10.6
Disagree	7	14.9
Uncertain	6	12.8
Agree	9	19.1
Strongly agree	20	42.6
Total	**47**	**100**

Source: Survey data, 2012

Whereas 25% of the respondents agreed that their university had an open culture that allowed staff to integrate the business processes with partner organizations, 75% of the respondents disagreed. The high number of respondents could be attributed to the fact that the main type of IOIS implemented by the universities in Kenya were university to commercial bank, and satellite campus to main campus types of IOIS, which did not require an open culture, since these types of IOISs were more or less accessed by users from the same organization and not designed to be accessed by external users.

4.7.3 Number of Satellite Campuses

The number of satellite campuses in a university was expected to motivate the adoption of IOIS. Table 4.6 tabulates the number of satellite campuses in the universities that were studied.

Table 4.6: Number of satellite campuses

Number of Satellite Campuses	Frequency	Percentage
0	31	66
1	3	6
2	5	12
3	2	4
4	2	4
5 to 15	4	8
Total	**47**	**100**

Source: Survey data, 2012

The number of satellite campuses in a university was one of the measures of the size of a university. The higher the number of satellite campuses, the larger the size of a university. It was expected that large-sized universities were motivated to adopt IOIS. It can be observed from Table 4.6 that 31 universities had no satellite campuses, whereas 13 had at least 2 satellite campuses. Out of the 31 universities that had no satellite campuses, 7% had not adopted the IOIS. On the other hand, out of the 16 universities that had at least one satellite campus, 11% had adopted the IOIS. This is in line with the findings of Almazighi (2009), who found that large-sized organizations were more likely to adopt the IOIS than the small-sized organizations. However, some universities that had no satellite campuses had adopted the IOIS, which was dependent on other factors other than the number of satellite campuses.

4.7.4 Number of Organizations that Collaborate with the Universities in Kenya

The number of organizations/universities that a university collaborates with is likely to influence the adoption of the IOIS. Table 4.7 presents the number of organizations that collaborates with a university.

Table 4.7 Number of organizations collaborating with a university

Number of Collaborating Organizations	Frequency	Percentage
0	7	15
1-5	27	57
6-10	9	19
Over 10	4	9
Total	**47**	**100**

Source: Survey data, 2012

From Table 4.7, it can be observed that 7 universities had not collaborated with any organization, whereas 27 universities had collaborated with between 1 to5 organizations. A total of 9 universities had collaborated with between 6 to 10 organizations, while 4 universities had collaborated with over 10 organizations. This shows that most universities in Kenya collaborated with other universities and organizations, but at a low scale. Out of the 8 universities that had adopted the IOIS, 88% (7 out of 8) were from the 40 universities that had collaboration with other organizations, which explains that the collaboration between universities is able to influences, the IOIS adoption. However, collaboration within the universities in Kenya is low, which contributes to the low level IOIS adoption in these universities.

4.7.5 Number of Skilled Personnel in the Universities in Kenya

Availability of personnel with necessary skill and knowledge on IOIS set up, operation and maintenance is expected to influence the adoption of IOIS in a university. Table 4.8 presents the number of IOIS skilled personnel in the universities in Kenya.

Table 4.8 Number of IOIS skilled personnel in the universities in Kenya

No. of skilled personnel in a university	Frequency	Percentage
0	18	38
1 to 3	23	49
4 to 7	6	13
Total	**47**	**100**

Source: Survey data, 2012

The study revealed that 38% of the respondent universities had no IOIS skilled personnel, 49% had only between 1 to 3 skilled personnel, and only 13% had between 4 to 7 skilled personnel. It can be observed that 25% (2 out of 8) of the total universities that had adopted the IOIS were from the 18 universities that did not have any personnel with IOIS skills, while 75% (6 out of 8) of the universities that had adopted the IOIS were from the 29 universities that had personnel with IOIS skills. This reveals that the personnel with IOIS skills in a university influence the adoption of the IOIS. Without adequate skilled personnel to install, operate and maintain the IOIS, it would be difficult for a university to adopt the IOIS. These findings are supported by Githeko and Johnson (1997), who found that lack of skilled workers in an organization, was a barrier to IOIS adoption.

4.8 Inter-Organizational Factors

The second objective of the study was to establish the effect of inter-organizational factors on IOIS adoption in the universities in Kenya. Among the inter-organizational factors considered included: pressure from customers and partners to adopt IOIS; trading partners that were willing, able and trusted to perform actions that would result in positive outcomes for the university; and pressure to adopt IOIS due to perceived success of other universities that had adopted it.

4.8.1 Trust between Trading Partners

From the reviewed literature, the adoption of IOIS is likely to be motivated by the number of trusted partners expected not to take actions that would jeopardize the university's business outcome. Table 4.9 shows the responses from the respondents on the perceived influence to adopt the IOIS by the trusted partners of a university.

Table 4.9 Perceived Influence to Adopt the IOIS by the Trusted Partners

Perceived Trusted	Frequency	Percent	Valid Percentage
Strongly disagree	13	28	30
Disagree	16	35	37
Uncertain	3	6	7
Agree	7	15	17
Strongly agree	4	8	9
Total	**43**	**92**	**100**
Missing	4	8	
Total	**47**	**100.0**	

Source: Survey data, 2012

From Table 4.9, it can be observed that 74% of the respondents disagreed or were uncertain that there was trust relationship between their universities and other universities or business partners, who were ready to adopt IOIS. This category of universities formed the 38% (3 out of 8) of the total universities that were found to have adopted the IOIS. However, 26% of the respondents agreed that there was a trust relationship between their universities and other universities or business partners, who were ready to adopt IOIS. It can be observed that 62% (5 out of 8) of the total universities that had adopted the IOIS came from this group of universities. This finding can be explained by the fact that for a university to establish an electronic link with a business partner, by means of IOIS, it must have established that the partner is trustworthy. Otherwise, it becomes difficult to establish such a link.

The finding is supported by Loukis and Spinellis (2011) study, which found out that lack of trust between trading partners acted as a barrier to IOIS adoption in an organization. This, as a consequence, explains why a large number of universities in Kenya have not adopted the IOIS. Without such partners, it becomes difficult for a university to adopt the IOIS.

4.8.2 Imitation Pressure.

The imitation pressure to adopt the IOIS due to a perceived success of other universities that had adopted the IOIS is likely to motivate universities to adopt the IOIS. Table 4.10 shows the responses from the respondents on the perceived influence to adopt the IOIS by the imitation pressure.

Table 4.10 Perceived Influence to Adopt the IOIS by the Imitation Pressure

Perceived Trusted	Frequency	Percent
Strongly disagree	19	41
Disagree	11	23
Uncertain	2	4
Agree	9	19
Strongly agree	6	13
Total	**47**	**100.0**

Source: Survey data, 2012

From Table 4.10, it can be observed that 64% of the respondents did not consider the imitation pressure to have had influence on IOIS adoption in their universities. From this group of respondents was found the 75% (6 out of 8) of total universities that had adopted the IOIS. Nevertheless, 32% of the respondents agreed that imitation pressure had influenced IOIS adoption in their universities, and from this group, 25% of the total universities that had adopted the IOIS. This reveals that imitation pressure had little influence on IOIS adoption in the universities in Kenya.

This finding is contrary to the findings of Kuan and Chau (2001), who found that imitation pressure, was a bandwagon effect, which made organizations to engage in IOIS innovation just because other organizations were involved in it and not for any economic benefits. This study further contradicts the finding of Teo *et al.* (2003), who found that organizations in Singapore that had not adopted the IOIS were able to adopt it due to dominant IOIS adoption practice and perceived success of the organizations that had already adopted it.

4.9 IOIS Technological Factors

The third objective of this study was to investigate the influence of IOIS technological attributes on IOIS adoption by universities in Kenya. Among the technological factors that were considered included: technological support infrastructure necessary for IOIS adoption; security of information sent over the IOIS link; and complexity of the IOIS technology.

4.9.1 Technological Support Infrastructure Necessary for IOIS Adoption

Technological support infrastructure necessary for IOIS adoption, mainly the availability of internet connection that is used to link the organization in an IOIS cluster, is an integral factor that is expected to influence IOIS adoption in an organization. Table 4.11 summarizes perception of the respondents with regard to the availability of internet connection that was reliable and fast to motivate a university to adopt the IOIS.

Table 4.11 Availability of Internet connection that was reliable and fast

Availability of internet connection	Frequency	Percent
Strongly disagree	17	36
Disagree	19	40
Uncertain	2	4
Agree	7	15
Strongly agree	2	5
Total	47	100

Source: Survey data, 2012

Whereas 76% of the respondents disagreed that the available internet connection was reliable and fast to motivate their university to adopt IOIS, 20% of the respondents were of the opinion that the availability of internet connection that was reliable and fast motivated their university to adopt the IOIS. This finding explains the fact that availability of internet connection that is reliable and fast is able to motivate an organization to adopt the IOIS.

The findings are supported by Kashorda *et al.* (2006), who found that the state of internet connection and speed in the universities in Kenya was so poor to an extent that 75% of the students considered cyber cafés to provide better speeds than the campus networks. They found that all of the users considered the internet speeds to be frustrating and slowing down their academic work.

4.9.2 Security Guarantee of Information sent over the Internet

The entire purpose of adopting IOIS is to transact information between organizations that have established an electronic link between themselves. Given that the IOIS link mainly uses the internet, the main concern is the internet security. The security guarantee of information sent over the internet from unauthorized access, theft or modification is crucial and is expected to motivate an organization to adopt the IOIS. Table 4.12 summarizes the perception of the respondents in terms of security guarantee of information transmitted over an IOIS link motivating a university to adopt the IOIS.

Table 4.12 Security guarantee of information sent over internet

Security guarantee of information	Frequency	Percentage
Strongly disagree	19	40.4
Disagree	15	31.9
Uncertain	7	14.9
Agree	3	6.4
Strongly agree	3	6.4
Total	47	100

Source: Survey data, 2012

From Table 4.12 it can be observed that 72% of the respondents indicated that there was no security guarantee of information sent over the IOIS link, while 13% were in agreement that security guarantee of information sent over the IOIS link motivated them to adopt the IOIS. The findings reveal that the failure of most universities to adopt IOIS was owing to the fear of their confidential information being accessed by unauthorized persons rather than by universities/organizations in the IOIS cluster.

These findings are in line with the study of Gikandi and Bloor (2009), who found that internet security concerns was a hindrance to the adoption of electronic banking (a type of IOIS) in the commercial banks in Kenya. Magutu *et al.* (2011) also found that internet security was a barrier to the adoption of electronic commerce (a type of IOIS) in Kenya.

4.9.2 Perception that the IOIS is Complex

The perception that the IOIS technology is complex is likely to hinder an organization from adopting the IOIS. Figure 4.3 summarizes the perception of the respondents on the complexity of the IOIS.

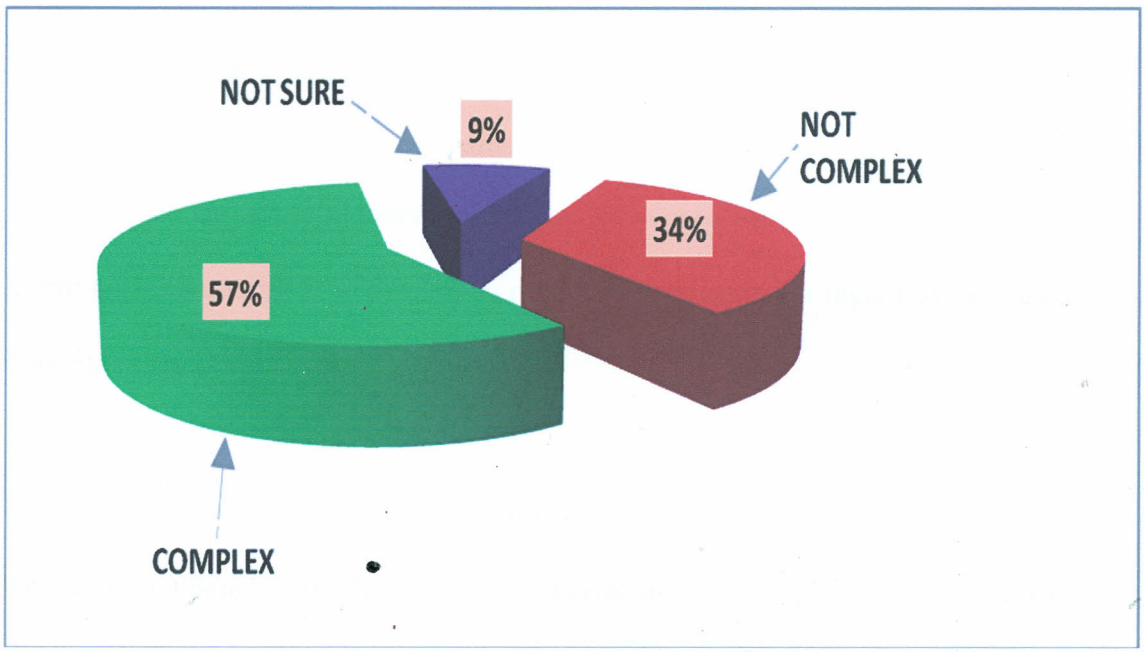

Figure 4.3 Perception on the complexity of IOIS technology

As presented in Figure 4.3, a total of 57% respondents were of the view that the IOIS technology was complex to understand and use, while 34% were of the contrary opinion. This high percentage of respondents with the perception that the IOIS was complex could possibly explain the low level of IOIS adoption by universities in Kenya.

4.10 IOIS Perceived Benefits Factors

The third objective of this study was to determine the effect of IOIS benefit factors on IOIS adoption by universities in Kenya. The perceived benefits factors considered included: transactional benefits — ability of the IOIS to improve the efficiency of

teaching, research, management and economic status of the university; and strategic benefits — the ability of the IOIS to change or maintain relationships with external organizations.

4.10.1 Transactional Benefits of Adopting IOIS

The ability of the IOIS to improve the efficiency of teaching, research, management and economic status of the university is expected to motivate an organization to adopt it. Table 4.11 summarizes the perception of the respondents with regard to the transactional benefits of adopting IOIS.

Table 4.13 Transactional benefits of IOIS

Transactional Benefits of IOIS	Frequency	Percentage
Strongly disagree	5	10
Disagree	7	15
Uncertain	4	8.5
Agree	19	40.4
Strongly agree	12	26
Total	**47**	**100.0**

Source: Survey data, 2012

From Table 4.13, it can be observed that about 23% of the respondents were of the opinion that adoption of IOIS did not have any transactional benefits. This is an indication that these universities had not adopted the IOIS, and if they adopted, they were not realizing tangible benefits from it, supposedly due to poor internet connection or lack of skilled worked to operate it. Nevertheless, 67% of the respondents were of the opinion

that adoption of IOIS conferred transactional benefits to the university. The universities could have realized transactional benefits from two main types of IOIS adopted by most universities in Kenya, including: universities to bank IOIS link, which made payment of fees by students efficient; and university to satellite campuses IOIS link, which improved transaction of information between the campuses.

This finding is supported by Turban, King and Lang (2010), who found that IOIS enhanced productivity of the adopting organization by improving efficiencies through automation of transactions, reducing intermediaries in the value chain to foster greater economic advantages, consolidating demand and supply through organized exchanges, facilitating product improvement as well as engendering innovative ways of selling existing products and services.

4.10.2 Strategic Benefits of IOIS

The ability of IOIS to change or maintain a university's relationship with other universities and organizations is likely to influence its decision to adopt IOIS. Table 4.14 summarizes the responses of the respondents from the universities in Kenya on their perception on the IOIS strategic benefits in their respective universities.

Table 4.14: Perception of the IOIS strategic benefits on IOIS adoption

Strategic Benefits	Frequency	Percent	Valid Percent
Strongly disagree	12	25.5	27.3
Disagree	13	27.7	29.5
Uncertain	6	12.8	13.6
Agree	7	14.9	15.9
Strongly agree	6	12.8	13.6
Total	**44**	**93.6**	**100.0**
Missing	3	6.4	
Total	**47**	**100**	

Source: Survey data, 2012

From Table 4.14, it can be observed that whereas 57% of the respondents were of the opinion that adoption of IOIS did not confer strategic benefits to their universities, 30% of the respondents were of the opinion it did. This points to the fact that most universities did not adopt IOIS because they did not perceive any strategic benefit.

4.11 Perceived Cost Factor

The fourth objective of this study was to determine the influence of IOIS perceived cost factor on IOIS adoption in the universities in Kenya. The perceived cost factor considered in this study was the overall cost of the facilities necessary for IOIS adoption, which are likely to influence the decision of a university to adopt IOIS. Figure 4.4 summarizes the perception of the respondents with regard to the overall cost of the facilities that are necessary for IOIS adoption.

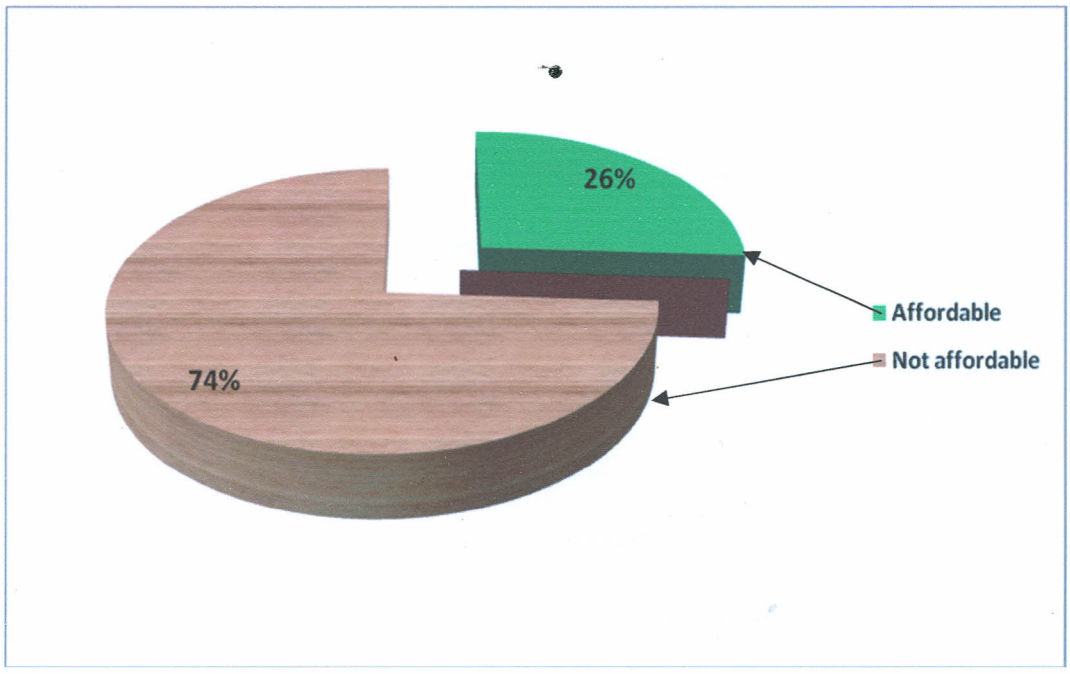

Figure 4.4 Perception of overall cost of IOIS

From Figure 4.4, it can be observed that 74% of respondents perceived the overall cost of IOIS to be unaffordable. This could be a part of the 83% of the universities in the study that were found not to have adopted IOIS (see Table 4.2). On the other hand, 26% of the respondents perceived the overall cost of IOIS to be affordable. These could be universities that were stable financially, such as the large-sized public and private universities, and those with external financial sponsors. The universities that could have perceived IOIS to be unaffordable could have been the small public and more likely the newly accredited private universities by Commission for University Education, which had low student population and lacked the network facilities.

This finding is supported by Almazighi (2009), who found that large organizations with stable financial bases were more likely to adopt the IOIS technology.

4.12 Environmental Factors

The fourth objective of this study was to establish the influence of environmental factors on IOIS adoption in the universities in Kenya. The environmental factors considered included: the demand for quality teaching and research and government support to the universities.

4.12.1 Demand for Quality Teaching and Research

Table 4.13 summarizes the respondents' view on the influence of demand for quality teaching and research on the decision to adopt IOIS.

Table 4.15: Influence of demand for quality teaching and research on adoption of IOIS

Demand for Quality Teaching and Research Influenced Adoption of IOIS	Frequency	Percentage	Valid Percentage
Strongly disagree	2	4	4
Disagree	3	6	7
Uncertain	15	33	33
Agree	9	19	20
Strongly agree	16	34	36
Total	**45**	**96**	**100.0**
Missing	2	4	
Total	**47**	**100**	

Source: Survey data, 2012

From Table 4.15, it can be observed 56% of the respondents were of the opinion that the demand for quality teaching and research influenced the decision of their universities to IOIS, while 11% indicated that it did not. This finding is supported by Kashorda *et al*

(2006) who found out that the network access in the universities in Kenya improves the quality of teaching in such institutions.

4.12.2 Government Support

The respondents were of the opinion that the Government had not given universities any financial incentives or tax waiver to stimulate them to adopt the IOIS. This indicated that the government of Kenya has not put in place policies and incentives to ensure that the universities in Kenya are encouraged to adopt the IOIS.

4.13 Regression Results

In this sub-section, regression results to facilitate realization of the general objective of this study are presented based on equation 3.5 in chapter three. A binomial logit model was estimated and thereafter the marginal effects of the explanatory variables derived. In the model, the adoption of Inter-Organization Information System (IOIS) was the dependent variable that took the value of one (1) if IOIS was adopted and zero (0) if IOIS was not adopted. The explanatory variables that were considered included top management support, culture change development, number of IOIS skilled personnel, number of satellite campuses, number of collaborating universities, mimetic pressure to adopt IOIS, trust between partners, internet infrastructure support to adopt IOIS, perceived security of data offered by the IOIS technology, perceived complexity of the IOIS technology, perceived strategic benefits of the IOIS technology, perceived transactional benefits of the IOIS technology, perceived overall cost of the IOIS technology, and demand for quality teaching and research.

In order to determine the explanatory variables to use, correlation analysis was undertaken to establish the degree of correlation between the explanatory variables to avoid problem of multicolinearity. Multicolinearity problem arises when two or more explanatory variables are highly but not perfectly correlated with each other. If two or more independent variables are sufficiently correlated, it becomes difficult to separate the effects of one explanatory variable on the dependent variable, from the effects of others. However, explanatory variables are rarely uncorrelated with each other and so multicolinearity is a matter of degree. The degree of correlation between the explanatory variables is presented in Appendix G.

All the variables with a correlation of 0.50 and above were identified, and only one of the variables was selected for use in regression in this study and the others were dropped. For instance, the degree of correlation between the culture development and the top management support was 0.8021. Top management support was picked and culture development dropped from the regression. The correlation between the trust between partners, and the number of IOIS skilled personnel was 0.5246. The number of IOIS skilled personnel was picked and the trust between partners was dropped from the regression. The correlation between mimetic pressure and the perceived overall cost of IOIS technology was 0.6110. The perceived overall cost of IOIS technology was picked and mimetic pressure dropped from the regression. The correlation between the number of collaborating universities and the demand for quality teaching and research was 0.7274. The demand for quality teaching and research was picked, and the number of collaborating universities was dropped.

The following explanatory variables were included in the logistic equation: top management support, number of IOIS skilled personnel, perceived overall cost of the IOIS technology, internet infrastructure, number of satellite campuses, perceived strategic benefits, demand for quality teaching and research, perceived data security from the IOIS technology, perceived transactional benefit of the IOIS technology, and perceived complexity of the IOIS technology. The results of the logistic regression are presented in Table 4.16.

Table 4.16: IOIS Adoption Logistic Regression Results

Variable	Coefficient	Std. error	Z	P>|Z|	95% coefficient	Interval
Complex	-5.4103**	2.3363	-2.32	0.021	-9.9894	-0.83129
Skills	0.20766**	0.9661	2.15	0. 032	-0.01831	0.39701
Cost	-1.03201***	0.38973	-2.65	0.008	-1.79588	-0.26813
Campus	0.24192**	0.10990	2.07	0.028	0.02652	0.45733
Strategic	0.33571**	0.151576	2.21	0.027	0.03864	0.63277
Support	4.10995**	2.05622	2.00	0.046	0.07982	10.3804
Transaction	4.87872**	2.2154	2.20	0.028	0.53656	9.22089
Security	-1.31135	1.44011	-1.91	0.363	-4.13393	1.51122
Internet	4.17959**	1.77972	2.35	0.019	0.69139	7.66779
Demand	1.48076	2.42506	0.61	0.541	-3.27228	6.23380
Number of observations 47				**LR Chi squared (11) 38.31**		
Probability > Chi 0.0001				**Pseudo R^2.....0.6507**		
*** Significant at 1 per cent level of significance				** Significant at 5 per cent level of significance		
* Significant at 10 per cent level of significance						

Source: Survey data, 2012

Log Likelihood (LR) test gave a value of 38.31 which was statistically significant at 1% level. This implies that the overall logit model that was estimated was statistically

significant, that is, there was a significant relationship between the log of odds ratio and the explanatory variables.

From Table 4.16, the Pseudo R squared of the regression was 0.65, which implies that the included variables explained only 65 per cent of the variations in the adoption of the IOIS among the universities studied. The remaining 35 per cent was explained by other explanatory variables not included in the model. Similarly, seven explanatory variables, namely, top management support (support), number of IOIS skilled personnel (skills), internet infrastructure (internet), number of satellite campuses (campus), perceived strategic benefits of the IOIS technology(strategic) and perceived transactional benefit of the IOIS technology (transaction) had the expected positive signs that were statistically significant at 5 per cent level of significance.

The coefficient of perceived complexity of the IOIS technology (complex) had the expected negative sign and was statistically significant at 5 per cent level of significance. This implies that the higher the perception of the complexity of the IOIS technology, the less the probability of adopting the IOIS technology by the universities in Kenya. The coefficients of the perceived cost of the facilities necessary for the IOIS adoption (cost) had the expected negative signs and was statistically significant at 1 per cent level of significance, which implied that the higher the cost of the IOIS technology, the less the probability of adopting the IOIS technology by the universities in Kenya

Only the coefficients of two variables, demand for quality teaching and research (demand) and perceived data security from the IOIS technology (security) were not

statistically significant at 1 per cent, 5 per cent or 10 per cent levels of significant. In the organization factors, top management support (p = 0.046), number of personnel with IOIS skills (p = 0.032) and number of satellite campuses (p = 0.028) were statistically significant. In the technological factors, the availability of internet infrastructure that was fast and reliable (p = 0.019) and the perception that the IOIS technology is complex (p = 0.021) were statistically significant. In the perceived benefits of the IOIS technology, the perceived strategic benefits (p = 0.027) and the perceived transactional benefits (p = 0.028) were statistically significant. In the perceived cost factor, the perceived cost of the facilities necessary for IOIS adoption (p = 0.008) was statistically significant. These result findings reveal that the adoption of the IOIS technology is influenced by these eight variables.

The coefficient of top management support was positive, which implies that the higher the top management support in IOIS adoption, the higher the probability of IOIS adoption by the universities of Kenya. Therefore, the level IOIS adoption is higher in the universities where the top management supports the IOIS adoption venture than in the universities where there is no top management support. The findings are in agreement with the findings of Davila et al., 2003, Srinivasan, Lilien, and Rangaswamy (2002) and Davila, Gupta and Palmer (2003), which showed that the firms whose management supports the adoption of the technologies are more willingness to adopt the technologies than the firms whose management does not support the adoption of the technologies.

The coefficient of the number of personnel with IOIS skills was positive, which indicated that the universities with personnel who have IOIS skills are more likely to adopt the IOIS than the universities without personnel who have IOIS skills. This is in line with the argument of Webster (1995) that the lack of skilled manpower resources is an impediment to technological innovation, since considerable skills and know-how to implement and operate the technology are required.

The coefficient of the number of satellite campuses that a university had was positive. This means that the universities with satellite campuses are more likely to adopt the IOIS than the universities without satellite campuses. Since the number of satellite campuses that a university had was used as a measure of the size of a university, these results are in support of the assertion by Srinivasan, Lilien, and Rangaswamy (2002) and Davila, Gupta and Palmer (2003) that large organizations had higher probabilities of adopting technologies than small organizations.

The positive and significant coefficient of Internet infrastructure was as expected in this study. It means that in the universities where the Internet infrastructure is fast and reliable the likelihood of IOIS adoption is higher than in the universities where the Internet infrastructure is slow and unreliable. These finding are in agreement with the findings of Soliman and Janz (2004) who found out that the Internet is a promising platform that allows technological adoption that allow exchange of information along the business channels, and Vadapalli and Ramamurthy (1997) who found the internet to be a key factor for quick diffusion of technological innovations among organizations.

The negative and significant coefficient of the perceived complexity of the IOIS technology implied that the adoption of IOIS by the universities in Kenya is inversely related to the complexity of the IOIS technology. This finding is in conformity with the argument of Dykeman (1997) that operations complexity of Internet Bases Information Systems (IBIS) technology are issues of concern that are unique to the environment of conducting electronic commerce (EC) over the Internet and can hamper its adoption.

The coefficient of the perceived transactional benefits of IOIS pointed to the fact that the universities who perceived IOIS to provide transactional benefits are more likely to adopt the IOIS than the universities that do not perceive the IOIS to provide transactional benefits. This finding is consistent with the findings of Chau and Tam (1997) and Xu *et al.* (2004) who found out that perceived transactional benefits of the IOIS motivates the organization to adopt the IOIS. However, the finding is contrary to the argument of Almazighi (2009) that organizations shy away from adopting the IOIS due to lack of perceived transactional benefits.

The positive and significant coefficient of the perceived strategic benefits of IOIS implies that the IOIS technology is more likely to be adopted by the universities in Kenya that perceive it to provide strategic benefits that the universities that do not perceive it to provide strategic benefits. This result is contrary to the findings of Soliman and Janz (2004), who found out that lack of strategic benefits of Electronic Data Interchange (EDI) and Internet-based IOS was a barrier to their adoption. However, it is in conformity with

the study of Rahim, Shanks, Johnston and Sarker (2007), who postulated that the IOIS adoption was motivated by the strategic benefits that can be realized from it.

Finally, the negative and significant coefficient of the perceived cost of the facilities necessary for IOIS adoption implies that the IOIS adoption is inversely proportional to the perceived cost of the facilities necessary for its adoption. This means that the universities that perceive the cost of the facilities necessary for IOIS adoption to be unaffordable are less likely to adopt the IOIS that the universities that perceive the cost of the facilities necessary for IOIS adoption to be affordable. This contrary to the findings of Rahim *et al.* (2007) who found out that the cost of IOIS adoption was hindrance to its adoption.

The interpretation of the coefficient values, according to (Woodridge, 2000), is complicated by the fact that the estimated coefficients from the model cannot be interpreted as marginal effect on the dependent variable. Therefore, there was need to estimate the marginal effects of the model.

4.13.2 The Marginal Effects

The marginal effects were estimated and the results are presented in Table 4.17.

Table 4.17 Result of Logistic Regression Analysis for Marginal Effects

Variable	dy/dx	Std. Err.	Z	P>|Z|	95% coefficient Interval		X
Complex	-0.721607***	0.21885	-3.30	0.001	-1.1505	-.29266	.510638
Skills	0.510638**	0.01448	1.96	0.050	-.00001	.05676	9.80851
Cost	-0.14101**	0.06483	-2.18	0.030	-.26808	-.01395	6.55319
Campus	0.0300**	0.01582	2.09	0.037	.00205	.06406	13.2128
Strategic	0.0458736*	0.02623	1.75	0.080	-.00553	0.8662	11.8085
Support	0.6245445**	0.25607	2.44	0.015	.12265	1.1264	.553191
Transaction	0.6845273***	0.22806	3.00	0.003	.237536	1.1315	.510638
Security	-0.179669	0.20333	-0.88	0.377	-.57819	.21885	.510638
Internet	0.68225***	0.21858	3.12	0.002	.253832	1.1106	.617021
Demand	0.14327	0.15879	0.90	0.367	.16795	.45450	.14327

*** Significant at 1 per cent level of significance
** Significant at 5 per cent level of significance
* Significant at 10 per cent level of significance

Source: Source: Survey data, 2012

As depicted in Table 4.17, all the marginal effects of the explanatory variables had the expected signs except the marginal effect of perceived security of data sent over the IOIS link, which was shown to be negative. The marginal effects of the perceived security of data sent over the IOIS link and the demand for quality teaching and research were not statistically significant at 10 per cent levels of significance. The explanatory variables that increased the likelihood of IOIS adoption by universities in Kenya included the IOIS skilled personnel in a university, satellite campuses within a university, perceived strategic benefits of the IOIS, top management support, perceived transactional benefits of the IOIS, and the availability of internet infrastructure On the other hand, perception of

the complexity of the IOIS technology and the perceived overall cost of IOIS decreased the likelihood of IOIS adoption by universities in Kenya.

The marginal effects of the perceived complexity of IOIS technology, perceived transactional benefits of IOIS and the availability of internet infrastructure were statistically significant at 1 per cent level of significance, whereas the coefficients of number of IOIS skilled personnel in a university, number of satellite campuses within a university, perceived overall cost of IOIS and top management support were statistically significant at 5 per cent levels of significance. On the other hand, the coefficient of perceived strategic benefits of the IOIS was statistically significant at 10 per cent level of significance.

From the marginal effects tabulated in Table 4.17, the perceived complexity of the IOIS technology had the highest marginal effect of -0.72 on the likelihood of IOIS adoption by universities in Kenya. This means that the probability of a university adopting the inter-organization information system (IOIS) was 72 per cent lower in a university where IOIS was perceived to be complex than in a university where it was perceived not to be complex. This can be attributed to the fact that IOIS technology needs to be installed, operated and maintained. If it is perceived to be a complex technology, the universities will shy away from adopting it.

This finding compares positively with studies by Rogers (1983) and Zmud (1987), which identified complexity of a technology innovation as critical determinant of its adoption Zheng and Zhong (2005) who examined the factors that influenced the adoption of

internet banking technology in that the ease of use of internet banking technology was a major factor influencing its adoption. This was also supported by Tat, Nor, Yang, Hney, Ming, Yong (2008), who examined predictors of intention among users of internet banking to continue using internet banking services, and revealed that the strongest predictor for continued use of internet banking technology was the ease of use of the technology. Further still, Yuttapong, Sirion and Howard (2009) found that complexity of technology influenced negatively the adoption of internet banking in Thailand.

The second most important determinant of IOIS adoption in Kenya was the perceived transactional benefits of the IOIS, which had a marginal effect of 0.69. This revealed that the probability of a university adopting the inter-organization information system (IOIS) was 69 per cent higher in a university where the IOIS was perceived to provide transactional benefit than in a university where it was not perceived to provide transactional benefits. This can be explained by the fact that for a university to adopt the IOIS, it must, foremost, be aware of the benefits that IOIS innovation would offer to the university.

These findings supports empirical evidence by Noor and Lam (2009), which showed that perceived benefits, was one of the factors that affected innovation adoption in the firms. Rahim and Kurnia (2004) found that good understanding of the various types of benefits to be gained from IOIS encouraged the senior management to be committed to IOIS adoption, and as a result, allocate resources for its successful adoption.

The availability of internet infrastructure, which had a marginal effect of 0.68, was the third most important determinant of the likelihood of IOIS adoption by universities in Kenya. This means that the probability of a university adopting the inter-organization information system (IOIS) was 68 per cent higher where there was availability of internet infrastructure that was fast and reliable, compared to where there was no internet infrastructure. The significance of this could be attributed to the fact that for a university to join an IOIS cluster, internet connection is needed to link the universities together, since the IOIS is a service provided through the internet.

The significance of internet infrastructure in adopting internet based information systems such as IOIS has been supported by Zheng and Zhong (2005), who examined the trend in the internet revolutions that had set the Chinese banking sector in motion, and the factors that had influenced the adoption of internet banking in China, and found that tinternet availability was a major factor affecting the adoption of internet banking. This was further supported by Gikandi and Bloor (2010), who found that the lack of internet infrastructure in Kenya was an impediment to internet banking adoption by commercial banks in the country.

The fourth most important determinant of the likelihood of IOIS adoption in the universities in Kenya was top management support, which had a marginal effect of 0.63. This means that the probability of a university adopting the inter-organization information system (IOIS) was 63 per cent higher in a university where the top management supported the IOIS adoption, than in a university without the top

management support. The could be justified by the fact that the top management have the ability to encourage organizational changes in business processes in conjunction with IOIS adoption requirements demands, and persuades the business partners to join the IOIS cluster, without which, it would be an uphill task to adopt the IOIS.

The significance of the top management support as a determinant for technological adoption has been supported by Agarwal and Prasad (1997) study, which found that the perception of certain characteristics of an innovation could only be successful when influenced by the top management in the organization. Rahim and Kurnia (2004) found that a strong support from the senior management was required, to enable an organization to successfully adopt the IOIS. This is because the senior management must allocate necessary resources to facilitate integration, process changes, and must take initiative to secure cooperation from the trading partners with whom to establish electronic relationships.

Kashorda and Waema (2009) analyzed the levels of network access in the universities in East Africa and found that the East African universities that had high levels of network access were those that had the Vice Chancellors' (top management) support on the network access initiatives. This finding was further supported by Almazighi (2009), who found that IOIS could not be initiated without the full support from senior management in an organization.

The fifth most important determinant of IOIS adoption by universities in Kenya was the number of IOIS skilled personnel in a university, which had a marginal effect of 0.51. This means that as the number of IOIS skilled personnel increased by 1, the probability of a university adopting the inter-organization information system (IOIS) increased by 51 per cent.

The perception that the overall cost of the facilities necessary for IOIS adoption was the sixth most determinant of IOIS adoption, with a marginal effect of –0.14. This implies that the probability of a university adopting the inter-organization information system (IOIS) was 14 per cent lower in a university that perceived the overall cost of the facilities necessary for IOI adoption to be high than in a university that perceived the overall cost of the facilities necessary for IOI adoption to be low.

This finding is supported by Haugen and Behling (1995) study, which investigated factors influencing the adoption of Electronic Data Interchange (EDI) in Australian organizations. The study found that cost of EDI hardware was an excessive hurdle for small companies wanting to adopt EDI to communicate with business partners, since compatible hardware were required at both ends of the companies in order to have seamless processing. The finding is further supported by Bartholomew (1997) study, which found that the cost of Internet-Based Inter-organizational Information Systems (IBIS) was a hindrance in its adoption by small medium enterprise (SME) due to additional costs associated with the value added network (VAN) services that was required as an intermediary to link the small medium enterprises together. Wilder (1998)

found that switching costs associated with establishing a new linkage prevented companies from making otherwise prudent changes required to accommodate inter-organization based information systems. This finding also supports Soliman and Janz (2004) study, which found that the lower the costs of IOIS and the higher the benefits, the higher the probability of adoption the IOIS.

The seventh determinant of IOIS adoption by universities in Kenya was the perceived strategic benefits of the IOIS technology, which had a marginal effect of 0.05. This means that the probability of adopting the inter-organization information system (IOIS) by a university that perceived IOIS as able to provide strategic benefits was 5 per cent higher than a university that did not perceive the IOIS as able to provide strategic benefits.

This finding is in line with Reekers and Smithson (1994) study, which postulated that strategic benefits resulted from the development of corporate strategies to gain competitive advantage and to increase market-share through strengthening close relationships with trading partners, which enticed organizations to adopt technologies that were able to offer such benefits. Angeles, Nath and Hendon (1998) also supported these findings by noting that IOIS implementation often encouraged organizations to reengineer their existing business processes, which in turn offered substantial strategic benefits that encouraged organizations to adopt IOIS. A further support was from Rahim and Kurnia (2004), who found that in Australia, strategic benefits had the capability of

influencing organizations to adopt the IOIS due to the competitive advantage, greater sales and improved relationship with trading partners.

The final statistically significant determinant of IOIS adoption by universities in Kenya was the number of satellite campuses that a university had, which had a marginal effect of 0.03. This means that an increase in the number of satellite campuses that a university had by 1, increased the probability of a university adopting the inter-organization information system (IOIS) by 3 per cent. This finding is in line with the findings of Almazighi (2009), who found that large-sized organizations were more likely to adopt the inter-organization information system than small-sized organizations.

Demand for quality teaching and research had a marginal effect of 0.13 although it was not statistically significant at 10 per cent level of significance. This finding is contrary to the findings of King, and Anderson (1995), who found out that the external environment in which an organization conducts its business is able to influence its adoption of innovation such as the IOIS adoption . The coefficient of the perceived security of the IOIS technology did not have the expected positive sign but a negative sign, and it was not significant at 1 per cent, 5 per cent or 10 per cent levels of significance.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Introduction

This chapter provides a summary of the study draws conclusions and makes policy recommendations based on the results of the study. It also provides areas for further research.

5.2 Summary

The purpose of the study was to determine factors influencing inter-organization information system (IOIS) adoption by universities in Kenya. Earlier studies had concentrated on inter-organization adoption in banking industry (mobile banking, internet banking, electronic commerce etc) in Kenya, with few research conducted on IOIS adoption in the education sector, especially universities in Kenya.

The Kenyan Government's Vision 2030 has underscored the importance of education sector and projects to have the sector generate the human resource needed to meet the rapidly changing and diverse needs of the country's economy (Republic of Kenya, 2007). This shows that there is need for strategies to be put in place to ensure that the country's education is of high standard, hence the need for inter-organization system adoption by universities in Kenya. However, despite the fact that the Kenyan Government has come up with information and communication technology (ICT) policy for Kenya, the IOIS levels of adoption has remained low in the country.

The study used a cross-sectional descriptive survey and a census on the universities in Kenya. Data was collected using both questionnaires and semi-structured interviews that were administered to universities' ICT managers. In summarizing and describing the collected data, descriptive statistics was used, while the logit model marginal effects estimations was used for inferential statistics to predict the marginal effect of various factors on the probability of IOIS adoption by universities in Kenya. The overall fit of the model was tested using the log likelihood and its associated chi-square statistics. Using descriptive statistics, the study revealed that IOIS adoption by universities in Kenya was still at its infant stage, and the level of IOIS adoption was found to be higher in the public universities than in the private universities.

The study also found that the main type of IOIS used by universities in Kenya was the bank-to-university IOIS for financial transactions, which revealed that universities were adopting the IOIS to mainly improve the financial transactions by taking advantage of the transactional benefits of the IOIS technology. The university-to-satellite campus IOIS was the second highly adopted to interconnect universities to their satellite campuses for ease of sharing resources and establishing an efficient communication within a university set up. No university had adopted the hospital-to-hospital IOIS, despite the fact that several universities had operational health facilities and some had fully fledged hospitals.

The study further revealed that the majority of universities had adopted the IOIS in the last two (2) years. This means that the universities in Kenya had started realizing the benefits that could be conferred to them by adopting the IOIS. Using the logistic

regression, the factors that were found to be the most important determinants of the likelihood of IOIS adoption by order of their marginal effects were the perceived complexity of the IOIS technology, perceived transactional benefits of the IOIS, availability of internet infrastructure, top management support, the number of IOIS skilled personnel in a university, perception that the overall cost of the facilities necessary for IOIS adoption, perceived strategic benefits of the IOIS technology and the number of satellite campuses that a university had.

5.3 Conclusion

For the country to realize the national economic goals stipulated in Kenya Vision 2030, there is need for the education sector, and mainly the institutions of higher learning such as the universities in Kenya, to provide quality teaching and research as a means of achieving a high standard of education. This can be realized through the adoption of the IOIS by the universities in Kenya. The significance of the current study is twofold. First, it presents new insights on the determinants of IOIS adoption by universities in Kenya, by spelling out eight significant determinants of IOIS adoption in the universities in Kenya which are: complexity of IOIS technology, number of IOIS skilled personnel in a university, cost of facilities necessary for IOIS adoption, number of satellite campuses that a university has, perceived strategic and transactional benefits of the IOIS and the availability of an internet infrastructure that is reliable and fast. Secondly, it contributes to the empirical literature by estimating the probability of the universities in Kenya adopting the IOIS, which was found to be generally high.

5.4 Policy Implication

The study found out that the IOIS adoption by universities in Kenya is at its infant stage. The universities in Kenya should put strategies in place that will propel them to adopt the IOIS as a strategic means of enhancing the quality of teaching and research.

The strategies should be in line with the following suggested policies which are guided by the objectives of this study.

a) Organization Factors

In order to improve the level of IOIS adoption in the universities in Kenya, the government in conjunction with the Ministry of Higher Education, Science and Technology, and the Commission for University Education should put strategies in place to educate the top management of the universities in Kenya to understand the functionalities and the benefits that IOIS can offer to their institutions. This is because the top management support was found to be significant in influencing IOIS adoption by universities in Kenya.

The universities in Kenya should ensure that they engage experienced and knowledgeable manpower resources to manage the installation, operation and maintenance of the IOIS. This is because the study has shown that the personnel with IOIS skills influence the adoption of IOIS by universities in Kenya.

Universities in Kenya are nowadays moving their services closer to the people by opening satellite campuses in various places in Kenya and beyond with a view of expanding the universities in Kenya. When such satellite campuses are established, the universities should establish inter-campuses link, which is achieved by adopting the IOIS to link the campuses together. This in turn enhances the level of IOIS adoption in the universities in Kenya.

b) Technological Factors

Since the internet is mainly the media used to link the universities together, the universities in Kenya should, through the Ministry of Information and Communication and other non- governmental bodies such as Kenya Education Network (KENET) should ensure that universities enjoy a subsidized cost of internet connection that is reliable and fast. This would enable the universities that cannot afford to pay for a high cost of internet connection to have internet connection in their universities. This will consequently enable the universities to adopt the IOIS due to the availability of a reliable and fast internet connection.

The universities in Kenya should jointly enforce standards and uniformity on the Information Technology (IT) degree offered in the universities in Kenya to ensure that they are of high quality. This will ensure that the students who graduate with such degrees will have adequate skills and knowledge in IOIS adoption, and will not view it as a complex technology. This is necessary since the complexity of IOIS was found to be significant in hindering the IOIS adoption in the universities in Kenya.

c) Perceived Benefits of the IOIS Technology

Since the adoption of the IOIS in the universities in Kenya gives them the strategic and transaction benefits, the top management in these universities need to be proactive in ensuring that their universities adopt the IOIS as a means of realizing these benefits.

The government, through the Ministry for Higher Education, Science and Technology, and the Ministry of Information and Communication, should embark on an awareness campaign on the benefits that comes along with adoption of the IOIS by universities in Kenya. The awareness is expected to make the top management in the universities to support the adoption of the IOIS by allocating necessary resourcing and supporting the logistic issues that goes along with the IOIS adoption.

d) Perceived Cost of the Facilities Necessary for IOIS Adoption

The universities should lobby the Government through the Ministry of Higher Education for tax incentives in the acquisition of hardware, software and other facilities necessary for IOIS adoption for educational purposes. The universities should also seek donations from the Governmental and non-governmental organization for hardware, software and other facilities necessary for IOIS adoption for education purposes. This should be done with an aim of making the IOIS adoption affordable by the universities in Kenya, which has the capability of enhancing its adoption. This is because the cost of facilities necessary for IOIS adoption was found to be a significant determinant of hindering IOIS adoption in the universities in Kenya.

5.5 Suggestion Areas for Further Research

This study limited its target population to the universities in Kenya. The study recommends that further study be done on a more inclusive population of the universities and tertiary institutions in Kenya to establish the determinants of IOIS adoption in these institutions. This will establish whether the factors that are determinants of IOIS adoption in the universities in Kenya varies with nincrease of the target population. It would also be necessary to conduct further study that extends the target population to universities beyond Kenya, supposedly in East Africa Community, to establish whether the factors that are determinants of IOIS adoption in the universities in Kenya are similar to the determinants of IOIS adoption in the other universities in the East African community.

Due to the high demand of higher education in Kenya, it is expected that in the recent future, the number of universities in Kenya are going to be higher than the number used in this study. It is therefore recommended that further study be conducted using a higher target population than the one used in this study. This will establish whether the determinants of IOIS adoption in the universities in Kenya are similar or different when the target population is increased.

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Appendix A: Cover Letter

Stephen Waithaka
Department of Management Science
School of Business
Kenyatta University
P.O. BOX 43844-00100
Nairobi – Kenya.
Email: stwaithaka@yahoo.com

☐ ***I would like to get a copy of the final report of this study***

Dear Respondents,
I am currently conducting a study on "Determinants of Inter-Organization Information System (IOIS) Adoption in the Universities in Kenya" at Kenyatta University. Inter-Organization Information System (IOIS) is an information system that inter-link organizations electronically for the purpose of transacting business information.

The information you will provide will be useful in helping me come up with appropriate thesis that can improve of IOIS adoption in universities in Kenyan and consequently help in achieving the Kenya vision 2030 of raising the earnings in Kenya by transforming the business sectors in Kenya into an efficient, multi-tiered, diversified in product range and innovative sectors. This study aims to research on the IOIS adoption innovation that can be a viable strategy in achieve the Kenya vision 2030.

Participating in this survey is voluntary, and your business will not be affected in anyway by your participation in this survey. Please be assured that this information is sought for research purposes only and your responses will be strictly confidential. No individual's responses will be identified and the identity of the individuals responding will not be published or released to anyone. Protecting the confidentiality of your answers is very important to me, as well as Kenyatta University.

This survey will take approximately 15 minutes to complete. Please be free to complete the questionnaire and make additional notes in the instrument where necessary.

Your time in completing this survey is greatly appreciated and if you would like to get a copy of the final report of this study please feel free to indicate on the top of the questionnaire or contact me on the email address on top of this letter.

Yours faithfully,

Stephen Waithaka (Admin No: D86/1866/2009)

Appendix B: Questionnaire

General Questions

Respondents Name (optional):

1. Name of the university (necessary) :
2. Specific type of business :
3. Location of university :
4. What type of IOIS is used in your organization? (Check all that apply).

☐University to a bank link for students' fee payment

☐University-to-university e-learning databases integration

☐Library-to-library (e-library resources) integration

☐Hospital-to-hospital (e-health) integration

☐University-to-satellite campus IOIS

Specify any other 1. 2. 3. 4.

Approximately how long has Inter-organization Information System (IOIS) been used in your organization:

☐ None of the above. My university **HAS NOT YET ADOPTED** the IOIS

Organizational factors

Please evaluate the following statements by selecting the appropriate check box in each row.	**Strongly Disagree**	**Disagree**	**Uncertain**	**Agree**	**Strongly Agree**
An open university culture that allows staff to integrate the business processes with partner organizations motivated your university to adopt IOIS.	☐	☐	☐	☐	☐
Top management support, such as allocating the necessary resources and encouraging the introduction of new process to support IOIS adoption, motivated my university to adopt the IOIS.	☐	☐	☐	☐	☐

Please give answer to the following questions

1. How many personnel in your university have the network, database or website administration knowledge and skills?
2. How many satellite campuses does your university have?
3. How many collaborating universities and organizations does your university have?
4. Approximately how many employees does your university have?
5. Approximately how many students does your university have?

Inter-organizational factors

Please evaluate the following statements by selecting the appropriate check box in each row.	**Strongly Disagree**	**Disagree**	**Uncertain**	**Agree**	**Strongly Agree**
Trust between my university and other universities or business partners who were ready to adopt IOIS motivated my university to adopt the IOIS	☐	☐	☐	☐	☐
Other organizations or universities that had become successful after adopting the IOIS were emulated, which influenced my university to adopted the IOIS	☐	☐	☐	☐	☐

Technological factors

Please evaluate the following statements by selecting the appropriate check box in each row.	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
Availability of Internet infrastructure that was reliable and fast and a network infrastructure in my university motivated my university to adopt the IOIS.	☐	☐	☐	☐	☐
Security guarantee of information transacted between the universities and the business partners motivated my university to adopt the IOIS.	☐	☐	☐	☐	☐
Is IOIS generally considered as a complex technology to use in your university	☐ **Yes**	☐ **No**	☐ **Not Sure**		

Perceived/Economical benefits factors

Please evaluate the following statements by selecting the appropriate check box in each row.	Strongly Disagree	Disagree	Uncertain	Agree	Strongly agree
Need to reduce transaction costs motivated my university to adopted IOIS	☐	☐	☐	☐	☐
The ability of the IOIS to change or maintain relationships with external organizations motivated my university to adopt it.	☐	☐	☐	☐	☐
The ability of the IOIS to improve the efficiency of teaching, research, management and economic status of the university motivated my university to adopt it.	☐	☐	☐	☐	☐

Perceived cost factors

Please give answer to the following questions

1. Is the cost of facilities necessary for IOIS adoption perceived as affordable or unaffordable in your university?

   Affordable Unaffordable

Environmental factors					
Please answer the following questions by selecting the appropriate check box in each row.	**Strongly Disagree**	**Disagree**	**Uncertain**	**Agree**	**Strongly Agree**
The university's teaching and research demand motivated my university to adopt the IOIS	☐	☐	☐	☐	☐

Give answer to the following question

How much Government financial incentives has your university received to motivate it to adopt the IOIS?

How many pilot projects had the government initiated to motivate you to adopt the IOIS?

How much tax wavers has the government initiate to stimulate your organization to adopt the IOIS?

Appendix C: Interview Guide for the Participating Staff

Background Information

- Your name (optional)
- Your title
- Name of the university
- Number of years you have been working for this university in this position years.

General Questions

- What are some of the factors that affected your university's decision to participate in IOIS adoption initiative?

- How long has your university been participating in this initiative? years.

Benefits

- What are the benefits for your university to participate in the IOIS initiative?

Costs

- In the context of your university overall budget, how significant is it to participate in this initiative? What kind of costs did the university incur?

Risks

- What are the risks for your university to participate in this initiative?

Technological factors

- Was it easy to integrate IOIS with your existing computer systems? Were they compatible?
- Do you think that sharing data electronically is an easy or a difficult process? Elaborate
- Do you think that the system is difficult to use in general, or is it user-friendly? Elaborate
- Do you have any information security risk concerns with the adoption of IOIS? Which risks?
- Is the Internet reliability and connection speed/bandwidth an influencing factor in IOIS adoption? How?

Organizational factors

- Did participation in this initiative require few/moderate or much change in the way the work was done/operation processes?

- Was this initiative compatible with your university's needs? Elaborate

- Did the number of business partners/satellite campuses/students in your university influence the IOIS adoption in your university? If yes, how?
- Did you require changing the organization culture as far as sharing your organizational information with other organizations is concerned? How?

Top Management Support

- What is the attitude of your chief executive and top management toward the deployment of IOIS? How?

- What about the attitudes of the employees?

IT resources

- How much of your university operations are computerized?

- Does your university have IOIS professional IT manager? Explain
- Are the personnel in your university proficient in IOIS implementation, operation and maintenance?

Organization Size

- Approximate number of employees in your university
- Approximate number of business partners in your university
- Approximate number of firms/companies/students served by your university
- Approximate number of employees in your university

Inter-Organization Factors

Inter-organization Trust

• In general, how are the relationships between your university and the collaborating business partners?
• Are there any issues of trust between your university and the business partners? Elaborate
• Did the trust between your university and the business partners influence your university to adopt the IOIS?

External pressure

• Were you knowledgeable about other universities participating in this initiative?
• Did the number/identity of other universities participating in this initiative affect your participation decision? How
• Did any business partner influence/coerce you to adopt the IOIS How?

Environmental factors

Policy/Legal Framework

• Have you received any kind of aid from the government in order to stimulate you to adopt the IOIS? Elaborate

• Did you experience/have you been experiencing product demand uncertainty in your university?

Explain Did this influence your decision on IOIS

• Do you think a policy/legal framework should be put in place to enforce participation in IOIS initiative and be mandated by law? Specify

• If you compare your university to those that are not participating in this initiative, what are the major differences?

• In your opinion, what incentives are necessary to increase the level of local university participation in IOIS adoption initiative? What would motivate other universities in Kenya to participate in this initiative?

• Is there anything that you would like to add? Is there anything that I should have asked you about this issue, but I didn't ask?

Appendix D: List of universities in Kenya

PUBLIC UNIVERSITIES
1. Kenyatta University
2. University Of Nairobi
3. Moi University
4. Egerton University
5. Maseno University
6. Jomo Kenyatta University Of Agriculture and Technology
7. Masinde Muliro University of Science and Technology
8. Kenya Polytechnic University College
9. Kisii University
10. Chuka University C
11. Dedan Kimathi University of Technology
12. Technical University of Kenya
13. Technical University of Mombasa
14. Pwani University
15. South Eastern University
16. Meru University of Science and Technology
17. Multi-Media University of Kenya
18. University of Kabianga
19. Maasai Mara University
20. Jaramogi Oginga Odinga University of Science and Technology
21. Laikipia University
22. University of Eldoret
23. Karatina University

PUBLIC UNIVERSITY CONSTITUENT COLLEGES
1. Murang'a University College (JKUAT)
2. Machakos University College (UoN)
3. The Kenya Cooperative University College (JKUAT)
4. Embu University College (UoN)
5. Kirinyaga University College (KU)
6. Rongo University College (MU)
7. Kibabii Universtity College (MMUST)
8. Garissa University College (EU)
9. Taita Taveta University College (JKUAT)
CHARTERED PRIVATE UNIVERSITIES
1. University of Eastern Africa, Baraton,
2. Catholic University of Eastern Africa
3. Scott Theological College
4. Daystar University
5. Africa Nazarene University
6. United States International University
7. Africa Nazarene University
8. Kenya Methodist University
9. St. Paul's University
10. Strathmore University
11. Mount Kenya University
12. Kabarak University
13. Pan Africa Christian University
14. Mount Kenya University
15. Africa International University

16. Kenya Highlands Evangelical University
PRIVATE UNIVERSITY CONSTITUENT COLLEGES
1. Hekima College
2. Tangaza College
3. Marist international college
4. Regina Pacis university college
5. Great Lakes University of Kisumu
6. KCA University
7. Adventist University of Africa
PRIVATE UNIVERSITIES WITH LETTERS OF INTERIM AUTHORITY
1. Kiriri Women's University of Science and Technology
2. Aga Khan University
3. Gretsa University
4. KCA University of East Africa
5. Adventist University
6. Presbyterian University of East Africa
7. Riara University
8. Inoorero University
9. The East African University
10. Genco University
11. Management University of Africa
REGISTERED PRIVATE UNIVERSITIES
1. Nairobi International School of Theology
2. East Africa School of Theology

Source: Commission of University Education (CUE) (2013)

Appendix E: Measuring Instruments Reliability Testing Results

Cronbach's Alpha =0.918		Number of items=31	
		Reliability Statistics	
Factors	**Variable**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Organization factors	Top management support	0.881	0.716
	Culture change development	0.812	0.427
	No. of satellite campuses	0.633	0.882
	No. of collaborating univs/orgs	0.519	0.916
	No. of skilled personnel	.900	0.409
Inter-organization factors	Mimetic pressure	.622	0.814
	Trust between a university and partners	0.721	0.892
Technological factors	Availability of Internet infrastructure	0.864	0.615
	Security guarantee of information transacted	0.529	0.741
	Complex technology	0.683	0.913
Perceived benefits factors	Ability to reduce number of transaction	-0.341	0.922
	Strategic benefits	0.875	0.681
	Ability to reduce delay	-0.285	0.932
	Increase ability to compete	0.414	0.928
	Transactional benefits	0.900	0.818
Perceived cost	Cost of facilities necessary for IOIS adoption	0.884	0.822
Environmental factors	Demand	0.804	0.512

Source: (Survey data, 2012)

Appendix F: Measuring Instruments Validity Testing

Item number	Description of amended items	Type of change incorporated
1	On the cover letter, there is no information of the University where the doctor of philosophy degree is being done	Inclusion of Kenyatta University added after the title of the thesis.
2	On the general questions item 5, which asks "Name of organization" should be reworded.	Name of the university (necessary)
3	On the general questions item 5 that asks "What type of IOIS is used in your organization? (Check all that apply), hospital to hospital IOIS should be added.	☐Hospital-to-hospital (e-health) integration
4	On the general questions item 5 that asks "What type of IOIS is used in your organization? "What type of IOIS is used in your organization? (Check all that apply)", in the "Specify any other" item, provision for some options should be included.	Specify any other 1. 2. 3. 4. 5.
5	An item should be provided for the universities that have not adopted the IOIS	☐ None of the above. My university **HAS NOT YET ADOPTED** the IOIS
6	The IOIS adoption section is redundant, since the same has been asked in the general questions sections.	The IOIS adoption section was removed in the questionnaire
7	On the organization factors item 1 asking "How much financial resources have the top management in your organization allocated to support the IOIS adoption?" Should be reworded and measured using a 1-5 likert scale.	Top management support, such as allocating the necessary resources and encouraging the introduction of new process to support IOIS adoption, motivated my university to adopt the IOIS. ☐Strongly disagree ☐ Disagree ☐Uncertain Agree ☐ Strongly agree

8	In the organization factors, item 2 "How many personnel in your organization have the IOIS adoption knowledge and skills?" to clarify on the specific type of skills.	How many personnel in your university have the network, database or website administration knowledge and skills?
9	In the Inter-organizational factors item 4, "How many other organizations that had become successful after adopting the IOS caused your organization to emulate them and adopt the IOIS also?" needed to be re-organized and measured with a Yes and a No variables, and a quantitive value.	Did your university know of any other organizations or universities that had become successful after adopting the IOIS, and as a result emulated them and adopted the IOIS? YES NO If YES, approximately how many?
10	In the technological factors, the first question should be reworded to ask for the availability of network infrastructure	Availability of Internet connection that was reliable and fast and a network infrastructure in my university motivated my university to adopt the IOIS.
11	On the perceived benefits factors item 6 "What was the average cost of establishing internet connection between your organization and trading partners that was required for the adoption of IOIS in your organization?" Should be reworded.	What is the average cost of establishing internet connection in your university to facilitate the IOIS adoption in your university?
12	On the perceived benefits factors, another item should be added to test the perception of each university on the perceived cost of IOIS adoption	My university considers these costs to be Very low Low Average High Very high

Appendix G: Pairwise Correlation Matrix for the Explanatory Variable

	Support	Culture	Skill	Cost	Internet	Camp	Trust	Mimetic	Strategic	Demand	Collab	Security	Transct	Complx
port	1													
ture	0.802	1												
kill	0.278	0.127	1											
ost	0.442	0.414	0.326	1										
rnet	0.406	0.369	0.136	0.128	1									
mp	0.084	0.016	0.084	0.118	-0.091	1								
ust	0.457	0.44	0.525	0.371	0.515	0.031	1							
netic	0.365	0.603	0.138	0.611	0.249	0.091	0.726	1						
tegic	0.497	0.507	0.403	0.319	0.289	-0.043	0.650	0.662	1					
mand	-0.246	-0.302	0.054	-0.167	0.461	-0.260	0.183	-0.013	0.128	1				
llab	0.459	0.526	0.348	0.485	0.311	0.016	0.760	0.766	0.737	0.727	1			
urity	0.393	0.532	0.312	0.421	0.350	-0.045	0.721	0.709	0.705	0.167	0.830	1		
nsct	0.187	0.304	0.102	0.240	0.059	0.022	0.284	0.111	0.157	-0.181	0.351	0.198	1	
mplx	-0.017	-0.132	-0.082	0.186	-0.083	0.078	0.1593	0.147	-0.025	0.136	0.201	0.096	0.044	1

Source: Survey data, 2012

Appendix H: Copy of a Letter Giving the Researcher Permission to Collect Data

KENYATTA UNIVERSITY
GRADUATE SCHOOL

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

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 57530

Internal Memo

FROM: Dean, Graduate School

DATE: 10th September, 2012

TO: Mr. Stephen Waithaka
C/o Management Science Department

REF: D86/CTY/1866/09

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that the Graduate School Board at its meeting of 3rd September, 2012 approved your research proposal for the Ph.D degree entitled, **"Determinants of Inter-Organizational Information System Adoption by the Universities in Kenya."**

You may now proceed with data collection.

Thank you.

JOHN M. ODONGI
FOR: DEAN, GRADUATE SCHOOL

c.c. Chairman, Management Science Department

Supervisors:

1. Dr. Tom Kimani Mburu
Department of Economic Theory
Kenyatta University

2. Dr. Julius Korir
Economic Theory Department
Kenyatta Univeristy

3. Dr. Stephen Muathe
Department of Business Administration
Kenyatta University

JMO/bkk

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