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Information & Communications Technologies Investment Decisions and Organizational Performance in Major Nonprofits in Kenya

Sylvester Musyoki Kisonzo
Walden University

Walden University

College of Social and Behavioral Sciences

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Sylvester Musyoki Kisonzo

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Dr. Victor Ferreros, Committee Chairperson,
Public Policy and Administration Faculty

Dr. Anthony Leisner, Committee Member,
Public Policy and Administration Faculty

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Public Policy and Administration Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2017

Abstract

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Sylvester Musyoki Kisonzo

MSc, University of Nairobi, 2001

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

The levels of organizational performance (OP) achievable from a dollar investment in information and communications technologies (ICT) remains elusive. A consensus exits among scholars and organizational leaders that effective use of ICT improves OP yet managers continue to struggle to justify investments in ICT. The purpose of this quantitative study was to explore and explain how investments in ICT related with OP. The study built on the resource-based view of the firm theoretical framework. A key question in the study was whether there existed a consistent, positive correlation between ICT investments, decision-making performance, and OP, and if so, explain the interdependence among the predictor and outcome variables. The sampling frame for the research was the major nonprofit organizations in Kenya. Data were collected using a tested and validated measurement instrument, and analyzed using SPSS software. Correlation, analysis of variance, and multiple regression analyses were used for data analysis and interpretation. Results revealed that not all investments in ICT correlate positively with OP. In fact, investments in some ICT systems did not correlate at all with OP. This study has implications for positive social change, it facilitates informed decision making that saves resources and thus improves social good. The study is expected to contribute to the body of knowledge on the effect of investments in ICT on the effectiveness of decision making and OP.

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Dedication

To my beloved children, first-born daughter Angela Mwikali and son Arthur Imani, may this achievement motivate you to become the very best one can be. To my wife Fridah, for assuming the ever essential responsibility of taking care of our children while I spent much of family time on my scholarly endeavor. To my beloved late daughter, Nina Ngina Kisonzo, whose death, at the age of 9 years 8 months, on June 9, 2009, prematurely shattered her much desired dreams of becoming a neurosurgeon.

Acknowledgement

Foremost, I thank the Almighty God for His provisions and guidance without which this doctorate journey would not have been possible. My sincere gratitude goes to my dissertation committee chair Dr. Victor Ferreros, without whose dedicated guidance, I have no idea how the dissertation journey would have been; committee member Dr. Anthony Leisner, for the unwavering and timely contributions, and URR Dr. James Mosko whose attention to every detail contributed significantly towards a quality research study. I recognize the huge contributions made by the various Walden University faculty and non-faculty members that I interacted with throughout my coursework; the dissertation journey would not have been the same without their immense preparatory support.

I am privileged to have a loving family who were very understanding and quick to justify whenever I missed important functions. So, to my wife Fridah, children Angela and Arthur, forever be blessed, your understanding and willingness to make sacrifices was never taken for granted, and will forever be fondly remembered and appreciated.

I am forever grateful to all those at whatever organization or capacity and to everyone else I did not mention, but contributed in some way to the successful completion of this dissertation.

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Chapter 1: Introduction to the Study

Introduction

The nonprofit environment becomes increasingly complex by the day, due, in part, to competition, advances in technologies, and changing stakeholder expectations (Mirchandani & Lederer, 2014). The use of information technology has continued to help organizations become more efficient by automating organizational processes to solve complex business challenges (Schwertner, 2013). Information and communications technologies, abbreviated ICT, generally refers to technologies used in the process of accessing, gathering, manipulating, and presenting information, and may include computer hardware, software systems, and connectivity (Lloyd, 2005).In this study, the term "information and communications technologies" shall be treated as synonymous with "information technology", abbreviated as IT.

The purpose of this study, conducted in the East African country Kenya, was to explore the relationships between investments in information and communications technology (ICT) and organizational performance (OP). Kaplan and Norton (1992) explain OP as referring to the achievement of organizational objectives, financial and non-financial, and the promotion of organizational efficiency and effectiveness. As organizations endeavor to achieve their business objectives and realize their vision, the need to allocate resources among competing alternatives becomes more apparent, especially towards the attainment of organizational efficiency and effectiveness. This study was posited on the fact that prioritizing resources has an impact on OP and that ICT

remains a key factor in determining OP. Informed decision making is necessary for such prioritization (Lewis & Smith, 2014; Smith, 2014).

Over the years, justification for ICT investments in for-profit and nonprofit organizations has been difficult to justify in many countries, not just in Kenya. Chief information officers and information technology directors have continuously faced challenges when called upon to explain to organizational leaders the benefits likely to result from investments in ICT (Hynek, Janeček, Lefley, Půžová, & Němeček, 2014). Thus, deciding to invest in ICT has continued to be clouded by uncertainties. While there is consensus that the benefits of the effective use of ICT improve OP, the real impact of ICT on OP remains unclear.

At the heart of every nonprofit organization's mandate is a social mission (Hawkins, 2014; Rousseau & Berrone, 2017). According to Abdul-Korah (2015), nonprofit organizations continue to offer significant contributions to societies in many countries around the world, including Kenya. While governments have a primary mandate of providing for their citizens' social welfare, they often find themselves with inadequate resources to promptly and sufficiently address the social needs that may arise from time to time. Similarly, commercial enterprises and individuals, by "giving back to society" through corporate social responsibility initiatives, or in response to specific disasters, have continued to channel part of their resources through nonprofit organizations to tackle challenges bedeviling communities (Vaccaro, 2012). Social challenges often stretch beyond country borders, for example, the effects of climate change, earthquakes, disease outbreaks, drought, food shortages, and others. Some

challenges may be enormous for a single country, especially developing countries, to bear on their own. To address such challenges effectively, nonprofits play pivotal, neutral advisory roles for experts and governments (Yates & Greenberg, 2014; Bruce & Shwom, 2015).

Nonprofits have continued to play significant roles in the Kenyan economy, such as in disaster preparedness and disaster response, the provision of health and education services, advocacy, religious initiatives, food security initiatives, among others. As social challenges continue to increase, so does the competition for the increasingly reduced resources available to nonprofits (Lacey, Weiler & Peel, 2015). The need for accurate, up-to-date, and effective reporting and communication is essential for the success of any nonprofit.

ICTs have the potential to play significant roles in enabling and facilitating nonprofit efforts in tackling these challenges using technologies and systems, such as the following: the internet for increasing rural poor incomes and alleviating poverty (Pick, Gollakota, & Singh, 2014), early warning systems, communication and information sharing platforms (for example, corporate information systems, stakeholder portals, social networking systems), donor cultivation, education and appreciation, and sector-specific information systems such as agricultural information systems, and health information systems. Such practical applications underscore the importance of the role played by nonprofits in the Kenyan economy as engines of social change and the strategic role that informed ICT investment could play in making nonprofits more accountable, efficient

and effective organizations. The results of this study could change the basis of ICT decision making among nonprofit organizations in Kenya.

This chapter covers the following series of topics: a brief background of the study, a statement of the problem, the purpose of the study, the nature of the study, the theoretical framework that forms the basis of the study, the definition of terms, assumptions, scope and delimitations, limitations, research questions, and significance of the study.

Background of the Study

Managers continue to face challenges in their endeavor to justify ICT budgets in relation to contributions from past ICT investments (Ibe, 2012). The review of literature did not provide evidence of a well-thought-out relationship between investments in ICT and OP. Nor was any model known to offer clear guidance on the relative contribution of various ICT elements, (e.g. enterprise resource planning systems, infrastructure, technical skills, etc.) to OP.

Studies on ICT and OP made general statements about “improvement in OP, effectiveness, accountability, and transparency” (Dean Jr., & Sharfman, 1996; Njuru, 2011; Sirirak, Islam, & Khang, 2011; Benitez-amado & Walczuch, 2012; Huang, 2014; Ho-Chang, Chang, & Prybutok, 2014; Hsu, 2014; Kohli, Devaraj, & Ow, 2012; Tiamiyu, Bankole & Agbonlahor, 2012; Piget & Kossaï, 2013; Mazidi, Amini, & Latifi, 2014) but fell short in empowering a decision maker to make informed decisions in considering investing in ICT.

Research on the impact of IT investments on firm performance focused primarily from a profit-making perspective (Barua & Mukhopadhyay, 2000; Dedricj et al., 2003); Devaraj, 2003; Kohli, Devaraj, & Ow, 2012; Hoadley & Kholi, 2014). Few studies were found in the literature reviewed that studied the influence of ICT from the perspective of a nonprofit's performance (e.g., Dameri, 2005; Hu et al., 2007). To move beyond such studies, one may imagine a world in which a manager is able to state, with considerable levels of certainty, the resultant return on a dollar spent on ICT. The time is long overdue when managers could deliberately establish target levels of performance by investing certain amounts of resources in ICT. It is such a gap that drove the need for a study that would make an attempt at explaining OP from the perspective of ICT investment decision making. The term "investment decisions", in this study, is used as defined by Woolridge and Snow (1990) that "these are commitments of current resources in anticipation of generating future payoffs (p. 355).

ICT, being a broad discipline, is one among a complex set of elements that may contribute to a nonprofit OP; other elements are caliber of leadership and staff, leadership style, organizational learning practices and culture, staff diversity, alignment of organizational mission and strategy with social needs, employee motivation, partner support (donors, governments, etc.), and the availability and stability of financial resources. Similarly, ICT is made up of numerous subcomponents that have the potential to impact OP in different ways: infrastructure, technical competence of ICT staff, appropriateness of software and timing of deployment, cost of ICT, depth and breadth of automation, exposure to malicious attacks, reliability of services (internal and external

providers), leadership support, user involvement in developing or selecting solutions, ICT budget, employee morale, and others. As is the case with the broader ICT, the different subcomponents of ICT may have varying levels of impact on OP.

A valuable contribution to the knowledge in this domain would be a study whose results offered not only an understanding of the relationships between ICT investment decision making—and its influence on OP—but informed the power of the various components that make up ICT in contributing to OP . When I did the literature review, I found no works in this area of study. It was therefore expected that the results of this study would shed light on the association between investments in ICT and organizational performance and offer managers and organizational leaders much needed power to make investment decisions. The results of this study are expected to open up research in the broader domain of the relationships between decision making and OP for more efficient and effective use of scarce resources for the greater benefit of stakeholders, in nonprofit as well as for-profit organizations.

Problem Statement

The level of resources that organizations should commit to ICT for increased OP remains a global challenge. Since the challenge is not specific to any sector, it is felt in profit and nonprofit organizations. The continued lack of a sound basis that justifies leaderships' expenditure of organizational resources in ICT, leaves such investment decisions clouded with uncertainties. In fact, ICT management have continued to find it difficult to convincingly state the relative organizational benefits of investing a certain dollar amount in ICT. While there is consensus on a positive correlation between

investments in ICT and OP, the extent and depth of the correlation remains unclear. Organizational leadership has had difficulty discerning the levels of OP that could be achieved from certain levels and mix of ICT investments.

An opportunity therefore exists for the provision of insights, not only to guide investment decisions that lessen nonvalue-adding expenditures in ICT, but to enable effective ICT investment decisions, especially for resource-challenged nonprofit organizations. Nonprofit organizations have expansive mandates, primarily centered on creating positive social impact on generally resource-challenged communities, and soundly justifying every dollar spent outside of direct program activity.

Research has supported the existence of a strong relationship between a firm's performance and its IT capabilities (Melville et al., 2004). Studies by Noruzy et al. (2013) argued that a firm's investment in ICT may not necessarily facilitate innovation unless specific ICT components are carefully designed to support a firm's objectives. Other studies on the relationship between ICT and OP—while making significant contributions in areas related to improvement in OP, effectiveness, accountability, and transparency (Njuru, 2011; Sirirak, Islam, & Khang, 2011; Tiamiyu, Bankole & Agbonlahor, 2012)—were found to be nonspecific in empowering decision makers on how to arrive at informed decisions as they invest in ICT. This gap suggested a need to undertake a study that would provide insights into the relationship between ICT investment decisions in the various ICT elements and OP, with a particular emphasis on the nonprofit sector.

Purpose of the Study

The purpose of this quantitative study was to explore, understand, and explain the relationship between making investments in ICT and OP from the perspective of a nonprofit organization. An understanding of such a relationship between the multiple variables on the two sides of the equation— which could result in a model— could significantly contribute toward knowledge as appertains to the correlation between the impacts of decisions affecting ICT investments and the performance of nonprofit organizations. The study sought to explain relationships that may form a basis for the possible development of guiding principles for investment decisions in ICT and OP. This study also sought to explain the areas and levels of emphasis that management should direct its efforts toward as it engages in ICT investment decisions for desired OP levels.

The dependent variable in this study was OP, while the independent variables were ICT investment in the four elements of ICT, namely enterprise resource planning (ERP) systems, management information systems (MIS), business intelligence (BI) systems and integrated systems, and decision-making performance. The relationship between the dependent and independent constructs were mediated by organization size, measured in terms of number of employees and annual organizational revenue.

This study sought to contribute to the scholarly literature on the correlation between ICT investment decision making and OP. The study was expected to contribute to the body of knowledge available to practitioners that enables decision making in ICT investments that result in the best value for money. The study was also expected to promote social change by providing a model that could enhance the understanding for

optimized spending on the various elements of ICT. Allocation of resources in appropriate ICT investments not only results in increased efficiencies and effectiveness but also minimizes waste while increasing resources available for direct social impact to the communities targeted through nonprofit initiatives.

Research Questions and Hypotheses

I hypothesize that investing in certain types of ICT systems has an effect on the effectiveness of decision making, and hence OP in an organization. This study therefore sought to answer the research questions that follow. In order to answer the research questions, the hypotheses listed under each of the respective research questions were postulated: -

1. How is decision making performance in an organization related to investments in ICT?

   H_{01}: There is no strong correlation between investments in ICT / ICT usage and decision-making performance.

   H_{a1}: There is a strong correlation between investments in ICT / ICT usage and decision-making performance.

2. What is the correlation between investments in ICT and OP?

   H_{02}: There is no strong correlation between investments in ICT / ICT usage and OP.

   H_{a2}: There is a strong correlation between investments in ICT / ICT usage and OP.

3. What is the correlation between decision making performance and OP?

H_{03}: There is no strong correlation between decision-making performance and OP.

H_{a3}: There is a strong correlation between decision-making performance and OP.

4. How does a firm's investment in ICT affect OP and decision making performance?

   H_{04}: There is a no stronger correlation between investments in ICT / ICT usage and decision-making performance than between investments in ICT / ICT usage and OP.

   H_{a4}: There is a stronger correlation between investments in ICT / ICT usage and decision-making performance than between investments in ICT / ICT usage and OP.

5. How is decision making performance affected by information quality compared with system quality?

   H_{05}: There is no stronger correlation between information quality and decision making performance than between system quality and decision making performance.

   H_{a5}: There is a stronger correlation between information quality and decision making performance than between system quality and decision making performance.

6. What is the correlation between investments in ERP, MIS, BI or an integrated system and OP?

H_{06}: There is no stronger correlation between investing in an integrated system and OP than between individual ICT systems and OP.

H_{a6}: There is a stronger correlation between investing in an integrated system and OP than between individual ICT systems and OP.

Theoretical Framework for the Study

Four theoretical frameworks were evaluated in selecting the framework on which this study would be grounded. The resource-based view (RBV) of the firm was deemed the most appropriate (Penrose, 1959; Wernerfelt, 1984). According to RBV, leveraging an organization's unique capabilities and resources improves OP. It is within the RBV tenet that research on information systems has continually considered the value creation of IT as a critical determinant of OP (Newbert, 2007). It is my view that it is the knowledge, flexibility, and complementarity with which IT is employed in an organization that determines IT's eventual contribution to, and influence on, other organizational resources to improve an organization's efficiency and effectiveness and thus its productivity. Only organizations that are can manage the resources at their disposal have the highest chances of achieving benefits from those resources and achieving a competitive advantage over others (Sanchez & Mahoney, 2012; Camison & Villar-Lopez, 2014; Wiengarten, Humphreys, Cao, & McHugh, 2013). Therefore, investment decision making, which prioritizes resources allocation and manages their deployment, is critical in determining the effectiveness and value of a resource to an organization.

The RBV framework is relevant to this study because it is a solid foundation upon which the research questions may be answered. The RBV recognizes resources as the building blocks of OP, it recognizes the importance of informed decision making and the management of resources in a mix to deliver best value to an organization. This study is expected to extend the RBV framework by examining the best mix of ICT resources with other organizational resources, in service of effective ICT investment decision making for improving performance.

The RBV theoretical framework is discussed in detail in Chapter 2.

Nature of the Study

In this study I made extensive use of multiple correlation and multiple regression quantitative design techniques. These techniques were used to explore the potential relationships hypothesized in the research questions.

The Partial Least Squares with Structured Equation Modelling (PLS-SEM) technique was stipulated as a complementary analysis technique to be used in this study because of its strong predictive capabilities, especially relating to sources of competitive advantages (Hair, Hult, Ringle, & Sarstedt, 2016), and because this study aimed at understanding and explaining relationships between investments in ICT and OP (which could be closely associated with competitive advantage). However, after getting down to the actual analysis, it was deemed unnecessary to use the PLS-SEM technique. The size of the final sample and the response rates made it possible to use conventional correlation and regression techniques to examine the relationships, strength, and direction between ICT investments, decision-making performance, and OP.

Key Variables

The key variables to be studied were investments in ICT, how such investments impact the organizational decision making process, and their impact on OP. The study's primary target was exploring and explaining the contribution of ICT to OP.

OP was the dependent variable while the independent variables were decision making performance and the actual investments in core ICT systems and infrastructure based on the decisions taken by organizational leadership. Decision making performance was measured through the quality of information/data maintained in, and generated from, the ICT systems invested in, the quality of ICT systems in use, the contribution of ICT to the decision-making process itself, and ICT's contribution to the effectiveness of communicating decisions. The value of investments in ICT were measured through the investments in, and the use of, the core ICT systems and resources. This was restricted to enterprise resource planning (ERP) systems, management information systems (MIS), business intelligence (BI) systems, and the core infrastructure upon which the systems operate. The relationship between the independent and dependent variables were moderated by other factors, such as external economic climate, political climate, donor priorities, competition, and innovativeness; the control variables were the number of employees, the annual organizational revenue, and the transaction costs.

These variables were derived from the hypothesis that, while ICT may be a key driver necessary for *high* OP, not *all* elements of ICT, or investments in them contribute to OP in the same measure. It was therefore essential for organizational leadership to be well informed of high-return ICT investment areas for helping investment decision

making. An exploration and understanding of the relationship between investments in ICT and OP may be necessary for explaining points beyond which further investments in ICT—in anticipation of a positive change in OP—may not be worthwhile.

Methodology

This quantitative study made use of data from major nonprofit organizations in Kenya: those with staff of at least 10, those with an annual budget of at least US $10 million, and those that had used ICT for at least 5 years and had made investments in it. It was those major nonprofits, defined with the criterion-based sampling method explained above, that made up the population from which samples were drawn. From each of the major nonprofit organizations, a targeted sample of four management staff members was drawn up, with two being senior ICT management staff and the other two being executive management staff. Quantitative data were obtained from the selected sample, using the measurement instrument developed by Hou (2013). This questionnaire-based instrument, with a Likert-type scale, was deemed suitable for data collection due to its appropriateness (see Leedy & Ormrod, 2005) for collecting the quantitative data needed to resolve the research questions.

The use of the questionnaire, based on the measurement instrument developed by Hou (2013), as planned, was made available to participants through a web-based questionnaire for ease of access and the preservation of anonymity required of the data collection exercise. To start data collection, a sample was drawn up; the sample organizations were criterion-based, and a determination of the exact sample size was made in response to a predetermined level of significance, effect size, and power of the

statistical research study (Field, 2013). G*Power was used in the scientific determination of the sample size used in the study.

The use of a tested measurement instrument for data collection was considered because such tools have been tested for reliability and validated over the years and they save time that would be required for testing and validating a student's own developed data collection tool(s). However, in the unlikely event that an appropriate measurement instrument had not been made available by the author, a questionnaire would have been prepared, tested, and validated for the data collection. The sampling method used was informed by the need to include in the study, organizations that were likely to have significant investments in ICT and that were likely to have been maintaining (or deemed capable of providing) reliable OP indicators.

A detailed explanation of the research design, key variables, and study methodology are provided in Chapter 3.

Definition of Terms

Data quality: Data quality is the availability of data that meets user specific requirements, and is accurate, timely, complete, understandable, and accessible to those who need to access it; "it is the fitness for us" with the attributes of utility, objectivity, and integrity (Tupek, 2006 p. 1).

Decision-making performance: The precision with which the decision-making process is undertaken. It is the measure of the strategic decision-making process effectiveness (Dean & Sharfman, 1996, p. 370).

Decision-making process: It is the action of appropriately identifying what should be done in a decision-making situation and ensuring that the chosen criteria are relevant (Hou, 2013 p. 39).

ICT: Being an abbreviation for information and communications technologies, generally refers to technologies used in the process of accessing, gathering, manipulating, and presenting information, and may include computer hardware, software systems, and connectivity (Lloyd, 2005). Zhang, Aikman & Sun (2008) defined ICTs as "technologies used by people and organizations for their information processing and communication purposes" (p. 628).

Investment decisions: These are commitments of current resources in anticipation of generating future payoffs (Woolridge & Snow, 1990, p. 355).

OP: This refers to the achievement of organizational objectives, financial and non-financial, and the promotion of organizational efficiency and effectiveness (Kaplan & Norton, 1992).

System Usage: This refers to the nature and extent to which an information or IT system is put to actual utilization (Robey, 1979).

Assumptions

In this study, the following assumptions were made:

1. The research population provided a representative sample that may enable generalization of study findings. The determination of the minimum study sample size was based on a population as provided by the Kenya NGO

Council at the time. It is possible that the population may have changed but the Council's records not duly updated.

2. The participating managers were knowledgeable enough and/or had access to and genuinely provided accurate data on ICT investments broken down into the various ICT elements under study and their respective contribution to OP. It is possible that some participants, though qualified as managers, may not have had sufficient knowledge to competently respond to all survey questions.
3. The participants were not biased in their responses to the research questions. There is a possibility of certain systems users, e.g. ERP users, to associate improved organizational performance with investments in systems in their domain.
4. All organizations in the population of study made use of the ICT systems included in the study. Not all organizations that participated in the study may have been using ERP, MIS, BIS, and IIS systems.
5. Investment decisions in ICT led to eventual procurement and usage of appropriate ICT in the organization. Such investments may not necessarily translate to effective usage of systems; however it was necessary to make this assumption for purposes of gathering data necessary for the measurement of the relationships sought in the study.

Scope and Delimitations

As noted in prior research, OP is determined by a myriad of factors and their combinations, among them the type, extent, and proportion of ICT relative to industry

and other determinants of OP. It was therefore necessary to define the boundaries of the study. This study focused on investment decisions in only four ICT systems (ERP, MIS, BES, & IIS) to estimate the impact of ICT investment decisions on OP.

The scope of the study was limited to the impact of investment decisions in ICT on OP and did not delve into the impact of each of the other individual factors that contribute to OP. The study was specific to major nonprofit organizations in Kenya only and presented feedback from a few managers in each of the sampled organizations which made up only a fraction of the population in question. Pitts (2009) as cited in Shibeshi (2012), noted the challenges inherent in objectively measuring OP, and the different parameters used in measuring OP by different organizations, a fact that may make generalizability of study findings a challenge.

Limitations

Leedy & Ormrod (2005) aptly stated that one's research is worth their effort and time only to the extent that it allows them to draw meaningful and defensible conclusions from their data (p. 97). While adequate techniques and measures were put into place to ensure only meaningful and defensible conclusions were drawn, this study was subject to the following limitations or weaknesses: (a) the research study was limited to data from non-profit organizations with, among other factors, minimum annual budgets of US$10 million. It was possible that organizations with lesser annual budgets may have been beneficiaries of proper ICT investment decisions hence able to provide data relevant to the study, however such organizations were not considered, (b) the study only focused on organizations based in Kenya and it was conducted over a short period, (c) even though a

tested and validated measurement instrument was used for data collection, the instrument may have had inherent limitations; for example, it is possible respondents may have interpreted or understood the survey questions differently due to language or professional background disparities, (d) not all ICT investment options, e.g. ICT infrastructure, technical training, employee quality, library information systems, scientific systems, early warning systems, etc., that an organization may invest in for improved organizational performance were considered in this study.

The correlational analysis design was extensively used in this study. While it would have been desirable to understand the cause and effect relationships between ICT investment decisions and organizational performance, the correlation statistical approach imposed this limitation. Another limitation is that only employees at management level were considered for participation in data provision yet there may have been lower level employees able to provide useful data for the study.

In recognition of the inherent limitations in this study, I do not make claims of generalizability of the study findings beyond the studied population. However, I am confident that weaknesses, e.g. bias, that could result in data with the potential of invalidating or introducing reliability concerns in the study results were appropriately addressed and that the data obtained adequately represented the perspectives of the non-profit organizations in Kenya.

Significance of the Study

The study results are expected to (a) have positive social change implications, especially to organizational leaders, policy makers, students, teachers, and scholars, (b)

demystify the general notion of existence of a positive correlation between OP and investments in ICT, (c) help to explain the intensity of contribution to OP of the ICT elements that shall be studied, and (d) help to identify any salient differences in the impact of ICT investment decisions and OP among nonprofits organizations.

An understanding of a model that could help decision making in ICT investments (a) could result in more efficient and effective use of the limited and competing resources available to nonprofits, (b) could lessen the justification effort ICT managers undergo to gain approval of their investment proposals from business leaders, and (c) could raise the confidence levels of boards and top leadership in nonprofits when faced with competing priorities for investment decisions.

Summary and Transition

This chapter illustrated the justification for the study on the understanding of the relationship between investments in various elements of ICT and OP. It started with an introduction to the study and a statement of the research problem. The purpose of the research study was explained and its significance outlined. In addition, the research questions and their associated hypotheses were presented in Chapter 1. The theoretical framework underpinning the study was covered followed by an explanation of the nature of the study. The chapter concludes with a description of the study variables, a summary of the study methodology, definition of some terms, assumptions, scope and delimitations as well as limitations, an articulation of the study's significance and implications for social change before closing with this chapter summary.

In Chapter 2, a discussion of peer-reviewed literature relevant to the problem statement is provided. In addition, the library search strategy, framework of the study and the rationale for the framework are substantiated. Chapter 3 presents the research design, rationale, and methodology for the study. The chapter also covers procedures for data collection and a discussion on the instrument used for the study as well as the data analysis plan. A discussion of treatment of threats to validity and ethical concerns is also covered in Chapter 3. Research data analysis and explanations of research findings are presented in Chapter 4 while Chapter 5 contains interpretations of the study findings, limitations of the study, recommendations for further research, and implications for social change.

Chapter 2: Literature Review

Introduction

The purpose of this study was to explore the relationship between ICT investment decisions and OP. In the literature review, I gathered information that would offer a deeper understanding of work done as at the time of this study on the subject and provide support for the assertion that there was a continued lack of a solid basis upon which leadership justified expenditure of organizational resources in ICT. The justification for this study is backed by preliminary findings (Sirirak, Islam, & Khang, 2011; Tiamiyu, Bankole & Agbonlahor, 2012) that leadership in organizations, for-profits as well as nonprofits, have struggled over the years to make financial commitments to ICT investments because they lacked a mechanism for measuring the contribution of ICT to OP.

The literature review covered the following: - (a) the search strategy, including the databases searched, the keywords used, and a description of scope of literature review undertaken, (b) a discussion of the theory underpinning the study, (c) a description of recent studies and the approaches used in order to understand the relationship between the variables and to justify their selection, and (d) summary of the literature review exercise as well as transitioning remarks into the method chapter.

Search Strategy

To identify prospective, peer-reviewed articles and books, the following databases were searched for the past 5–10 years: ABI/Inform Complete, Academic Search Complete, ACM Digital Library, Business Source Complete, Computers and Applied

Science Complete, Education Research Complete, ERIC, Health & Medical Complete, ProQuest Central, ProQuest Computing, SAGE Premier, Scholar Works, Science Direct, The World Bank Open Knowledge Repository, and other databases accessible through the Google Scholar portal. To identify recent work on the subject under study searches, the search was initially limited to the past 5 years. However, the lack of recent, relevant literature—along with the need to take into account seminal work done on the topic of study—required that the search be expanded to the past 10 years.

To ensure that the searches yielded as much relevant content as possible, I used the Boolean operators, AND and OR to optimize the results. Abstracts were used to judge an article's relevancy to the research questions., the following keywords were used in all possible logical combinations: *investment, OP, information technology, information communications technology, information communications technologies, decision making, investment decisions, decision theory, performance, decision, nonprofit, nonprofit organization, nonprofit performance, IT, ICT, IT use, impact of ICT, productivity, correlation between ICT and OP, IT business value, business value of IT, and IT capability*. Though relevance was limited, the search yielded significant referred journals within the prescribed parameters. Those deemed suitable were scrutinized in detail, their relevance documented. All of the literature used in the study appears in the reference list.

Theoretical Foundation

As stated earlier on in Chapter 1, this study is founded on the resource-based view of the firm (RBV) theoretical framework. The RBV theoretical framework is traceable way back to the works of Penrose (1959), and later on advanced by Wernerfelt (1984). A

tenet of RBV is that it is the leveraging of an organization's unique capabilities and resources that positively impacts OP. It is in this context that research on information systems has associated the value created out of IT as being a critical determinant of OP (Penrose, 1959; Newbert, 2007). It is my view that it is the knowledge, flexibility, and complementarity with which IT is employed in an organization that determines IT's eventual contribution and influence on other organizational resources to positively impact an organization. My view is supported by Camison & Villar-Lopez (2014) who noted that only organizations that are able to uniquely manage the resources at their disposal have the highest chances of achieving benefits out of such resources and possibly achieve a competitive advantage over others. The same view was advanced by Sanchez & Mahoney (2012), Camison & Villar-Lopez (2014), and Wiengarten, Humphreys, Cao, & McHugh (2013). Therefore, investment decision making, which prioritizes resources allocation and manages their deployment is critical in determining the effectiveness and value a resource offers to an organization. The RBV framework is relevant to my study as it is the very foundation upon which my research questions may be answered. The RBV recognizes resources as the building blocks of OP, it recognizes the importance of informed decision making and management of resources in a mix to deliver best value to an organization. My study extends the RBV framework by examining the best mix of ICT resources, in combination with other organizational resources, in an effort towards effective ICT investment decision making for performance improvement.

The Resource-Based View (RBV) of the Firm

The RBV emphasizes that organizations that are well endowed with a complement of resources are best placed to remain competitive in the market (Melville, Kraemer, & Gurbaxani, 2004). The RBV is traceable back to the seminal work of economists whose interest was firm's heterogeneity and imperfect competition (Chamberlin, 1933 and Robinson, 1933 as in Melville et al., 2004) through their theories of monopolistic competition and imperfect competition respectively. Penrose (1959) advanced the thinking behind RBV by conceptualizing the firm in a different way – "as a bundle of resources within an administrative framework" (Penrose, 1959). Wernerfelt (1984) is a seminal contributor to the RBV thinking who postulated the idea of barriers to imitation and associated attributes of resources to a firm's profitability. Further on, Dierickx & Cool (1989), Amit & Schoemaker (1993), and Peteraf (1993) explored how attributes of resources could contribute towards competitive advantage (Melville et al., 2004). Barney (1991) went ahead to assert that a necessary condition for a firm to maintain a competitive advantage position is to ensure the resource that gives it the competitive advantage is rare, and that competitors are unable to duplicate it (p. 102).

Basis for Selection of the Framework

The RBV has been used in the past to examine the impact of organizational resources on firm competitiveness and efficiency (Melville et al., 2004), for example, by Rumelt (1987) on entrepreneurship, Barney (1986a) on culture, and Nelson & Winter (1982) to explain competitive advantage on organizational processes. This therefore lends

the framework as ideal for examining the impact of the resource IT in contributing towards OP.

Respected researchers such as Mata et al. (1995) and Melville et al. (2004) used RBV to theorize about IT's implications on a firm's competitive advantage; Powell & Dent-Micallef (1997) used RBV to evaluate the levels of complementarity between IT and firm resources for competitive advantage; IS research aimed at deepening the understanding of the business value of IT have been based on RBV (Bharadwaj, 2000; Caldeira & Ward, 2003; Clemons, 1991; Jarvenpaa & Leidner, 1998; Santhanam & Hartono, 2003; Melville et al., 2004).

In framing the research, I selected the RBV theoretical framework, one of the frameworks that I studied, due to its suitability and appropriateness in enabling guided study. A study ought to have a genealogy, and even though the use of more than one framework in a study may be employed, a "framework" provides focus and sense of direction for a researcher and the theory on which a study is grounded. The choice of the framework to use is dictated by the research topic and problem under study as well as the research approaches supported by the framework. A framework that incorporates variables, similar to or closely related to those applicable in a study or one which may have been employed to study a problem closely related to one's dissertation topic would be a driver to its selection. In situations where two or more frameworks complement one another, use of a mix of the relevant frameworks is recommended (Walden University, 2014).

A framework that helps one test an existing theory in a new environment, extends a theory or theoretical framework in a significant way or helps in creating a new theory offers the menu for the selection of a particular framework (Anfara, 2008). Melville et al., (2004) summarizes of RBV thus "due to its firm roots in microeconomics, its focus on resource attributes, and its usefulness in examining the IT resource" (p. 291), hence the resource-based view of the firm will be the primary theoretical foundation for this study.

Literature Review

The subject of the relationship between investments in information technology and OP has attracted research interest over the last two to four decades. A variety of approaches, scale, emphasis, and terms have been used in the various literature reviewed but with a shared aim of establishing the real benefits the category of organizations involved in the studies would derive out of ICT investment and/or use. While much of the literature related to OP of profit oriented enterprises, limited literature was found on the contribution of ICT towards performance of nonprofit organizations. In fact, as noted in an earlier study by Piget and Kossaï (2013), there was limited literature on the role of ICT in the performance of organizations as relates to developing countries, more so to organizations in Africa. Literature on the business value of IT is even more lacking in relation to the nonprofit sector. The question therefore arises: Is there a difference in the value IT renders to profit and nonprofit organizations? The drive to better respond to such a question further solidifies the basis for this research.

The complexity involved in the measurement of OP has been appreciated repeatedly in past research work, such as in the works of Brynjolfsson (1993), Mo &

Mann (2000), Brynjolfsson & Hitt (2000), Dewan & Kraemer (2000), Sara. Boni, Ildeberto Aparecido, & Silvia Inês Dallavalle de (2014), and Aboal & Tacsir (2015) among others. There is consensus that such complexity is brought about by the fact that OP and productivity may be attributable to factors other than ICT (Brynjolfsson & Hitt, 2000). This is even more sophisticated for nonprofits who, unlike their for-profit counterparts, do not measure economic and financial productivity gains for the firm but are more interested in the number and amount of grants attracted, donor funding retained, percentage of target population reached, impact on the communities they serve, and the program efficiency of the organization. It is therefore ever more important to undertake a study that would help informed decision making on investments in ICT specific to nonprofit organizations.

This study aimed to build on the propositions advanced by Albadvi, Keramati, and Razmi (2007) that emphasize the role of the two variables of organizational infrastructure and business process redesign as being key to explaining the relationship between IT and OP. The study by Albadvi, Keramati, and Razmi (2007) explains the relationship between IT and OP from the perspective of intervening factors. According to Albadvi, Keramati, and Razmi (2007), the contribution of ICT in OP may be enhanced by beefing up investments in other intervening factors as a means of enhancing and complementing efforts towards proper IT implementation.

IT investments result in reduction in the cost of doing business as well as in the improvement in quality, increased variety of outputs, and avails opportunities for innovations (Albadvi, Keramati, & Razmi, 2007). Studies by Brynjolfsson and Hitt

(1998), among others, that found out that across organizations, investments in similar amounts of resources in IT did not result in automatic increases in firm performance. Such results may explain the interrelationship between investments in IT and other organizational investment options in order to trigger changes necessary for the attainment of increased organizational productivity (Brynjolfsson & Yang, 1996; Brynjolfsson & Hitt, 1998).

Recent research studies support the view that OP may be enhanced if IT investments are complemented with investments in other organizational areas such as capacity enhancement, organizational redesign, user training, and standards enforcement (Hunter & Lafkas, 2003; Pinsonneault & Rivard, 1998; Pinsonneault & Kreamer, 1997; Belleflamme, 2001), as well as inculcating work cultures and performance measurement systems to influence the contribution of IT to OP (Brynjolfsson, 2003; Davern & Kauffman, 2000). Such broader thinking in investment decision making is likely to enable an organization achieve levels of firm performance unattainable by concentrating on investments in IT alone.

Although Brynjolfsson and Hitt (1998) are emphatic that for investments in IT to result in highest contribution towards OP, I support the argument that such investments ought to be integrated with complementary investments such as new business processes, new organizational strategies, new working practices, and an organizational structure befitting the new organizational processes (Brynjolfsson & Hitt, 1998). The current study therefore aims at advancing the thinking by Brynjolfsson and Hitt (1998) by critically examining the variables that influence ICT's contribution to OP and making an attempt at

explaining their interrelationships with an aim of arming decision makers with tools necessary for informed ICT investments for increased OP. The study will make an attempt at advancing the thinking behind Boyer, et al.'s (1997) work on "the relationship between IT and performance between IT and performance in organizations considering the role of organizational infrastructures" (Boyer et al., 1997), and the research work by Grover et al. (1998) on "the relationship between IT and performance through the mediation of business process reengineering" (Grover et al., 1998).

Gargallo-Castel & Gave-Gorriz (2007) used the theory of complementarities, to explain the productivity paradox, which emphasizes the role played by complementary elements such as adequate employee qualifications, and appropriate culture, among other organizational resources and capabilities in enabling positive ICT contribution towards performance. The results of their work concluded that improvements in OP attributable to the organization's utilization of ICT was directly related to the organization's investment in commentary resources within the organization (Gargallo-Castel & Gave-Gorriz, 2007). This is a significant finding however the studies mainly concentrated on organizations in the 'for-profit-making' environments and the public sector. At the time of undertaking the literature search and review for this study, similar research work particularly concentrating on the nonprofit sector was found lacking hence offering more support for the study in question.

Conceptualizations of ICT (or IT)

The understanding of the contribution of information technology to OP may not be clear without first clarifying the context and content of our reference to the term. Our

conceptualization of IT is in line with seminal thinking by Orlikowski & Iacono (2001) in which was presented what they called “the five conceptualizations of the IT artifact” (p. 285), to imply the five broad views of IT, namely: - (a) IT being viewed by some as a tool for accomplishing a set(s) of well-defined tasks, (b) IT as a proxy, (c) Ensemble view, (d) Computational view, and (e) Nominal view (Orlikowski & Iacono, 2001). The table below summarizes the relevant commonly held perceptions of IT for business impact.

Table 1

IT Artifacts Conceptualizations

Perception/View	Explanation/Understanding
Tool	IT is a tool meant for generating business value, e.g. business process improvement, creating a competitive edge, efficiency improvements, etc.
Proxy	IT is conceptualized by its essential characteristics, which are defined by individual perceptions of its usefulness or value out of it
Ensemble	It is the interaction of technology and human beings that creates value of IT to business
Nominal	IT is not conceptualized at all as having business value, at most, it is considered an implicit factor in business value contribution.

Note. Adopted from “Research commentary: Desperately seeking the “IT” in IT research - A call to theorizing the IT artifact,” by W. J. Orlikowski and Iacono, C. S., 2001, *Information Systems Research*, *12*, p. 121-134. Copyright 2001 by the Institute for Operations Research and the Management Sciences (INFORMS).

Impact of ICT on OP. Literature reviewed likens the impact of ICT on OP to the value of ICT to business (Mukhopadhyay et al., 1995). The contribution of ICT to business value creation is therefore associated with cost reduction, enhanced productivity, and profitability enhancement among other related performance measures (Devaraj & Kohli, 2003; Hitt & Brynjolfsson, 1996; Kriebel & Kauffman, 1988). The term “performance” has been used to connote a measure at both intermediate process level and

organizational level; this led Barua et al., (1995) to refer to first-order and higher-order level effects representing operational/process level variables and business-wide level variables respectively. I ascribe to Melville et al.'s (2004) definition of OP impact of IT as IT's ability, in its diversity and multiplicity, to create value to a business, directly or indirectly.

The Link between Investments in ICT and OP

Since the introduction of computers about five decades ago, there had been no doubt that computers added value to businesses and government. The use of computer technology drastically changed the way business had been carried out, initially through the automation of production processes, then the computerization of office systems such as accounting and payroll systems. Today, computer technology, popularly referred to as ICT has transformed, not only the manner in which business is carried out, but it has become a 'tool of life'. The need for competitiveness, the desire for greater market share, and the drive towards efficiency and effectiveness while conforming to the rest of the world, has made investments in ICT inevitable.

Early studies by Brynjolfsson & Yang (1996) pointed out the raging debate of the 1980s on the justification for investments in ICT from the perspective of a positive relationship between investments in IT and productivity. The debate was a result of assertions by some researchers of a positive relationship between investments in IT and productivity at economy, industry and firm levels (see Brynjolfsson & Hitt [(1993, 1995); Lichtenberg (1995), Bharadwaj et al. (1999), Devaraj & Kohli (2000), Menon et al. (2000), Dewan and Ren (2011), and Mithas et al. (2012). Others, including earlier studies

by Roach (1988), Kauffman and Weill (1989) and lately by Mazidi, Amini, and Latifi (2014), did not find a significant contribution of IT toward productivity or firm performance that could be verified.

A more recent study by Cardona, Kretschmer, & Strobel (2013) argued of the majority of recent studies as being in agreement with the view of the existence of a significant positive productivity effect of ICT. Cardona, Kretschmer, & Strobel (2013) noted the productivity effect of ICT to be different between countries, especially between Europe and the USA, but found no such difference among firms within the two regions. However, there still are recent skeptics about the existence of an obvious positive relationship between ICT and productivity or the ability to measure such a relationship with precision, such as Gordon (2010) and Holt & Jamison (2009). While the studies cited above make significant contribution to knowledge in the area of the relationship between ICT and productivity, their emphasis was at the broader economy level, where performance indicators were more universally agreed upon and usage and performance data much easier to obtain.

The study by Benitez-amado and Walczuch (2012), guided by the resource-based theory, the dynamic capabilities theory, and which used structural equations modelling, found out that IT capability played a significant role in enabling proactive environmental practices, and that the decisions of executives influenced environmental sustainability and that such decisions had significant mediating effects of IT on firm performance. Benitez-amado and Walczuch (2012) did a notable job in the identification of the relationships between environmental organizational issues, IT, and firm performance.

The researchers however recognized the limitation of their study due to non-generalizability. The sample used at 50 was good enough to be able to estimate the proposed model but not sufficient enough to allow generalization other than in the 22 sectors of Spanish firms that they studied. The study recognized IT as an enabler of business processes, a finding that has been a common believe in organizations for quite some time. However, the study's problem statement makes my research problem still remain unanswered. It only went as far as affirming the standpoint of resource-based theorists of asserting the set of attributes that resources ought to have to positively create a competitive advantage for a firm.

A study that is quite relevant to my research was undertaken by Ghobakhloo & Hong (2014) who investigated the relationship between IT investments and business performance improvement. In their research, the focus was to gain a deep understanding of the complementarity of IT investments and the application of the principles of lean manufacturing in the delivery of improved business performance (Ghobakhloo & Hong, 2014). Similar studies based on the resource-based view of the firm have been undertaken by various researchers, and a common view has been upheld that IT is an enabler of organizational capabilities in the various areas studied. Such studies included those of, for example, Benitez-Amado &Walczuch (2012) who linked proactive environmental strategies, and Ghobakhloo et al. (2013) who noted new product development, as capabilities that complement IT in the creation of value to business performance. While all these and such other studies are very useful and add value in the understanding of the hugely discussed topic of the contribution of ICT/IT towards organizational or business

performance, much focus has primarily been on profit geared business enterprises in which IT is viewed as not being a key driver of business performance but as one that requires other enabling factors for it to contribute towards business performance. There is therefore a need to understand the real relationships between IT investment choices and a firm's performance from the perspective of a nonprofit organization.

Another resource-based view study, that lends room for my study, was undertaken by Perez-Arostegui, Benitez-Amado, & Tamayo-Torres (2012). The study employed the resource-based theory in analyzing the impact of IT competencies, namely IT infrastructure, IT technical expertise, and integration with organizational strategy, on quality performance. The researchers affirmed the existence of a partial impact on quality performance resulting from IT competence while IT knowledge did not influence quality performance and that it is the complement of leadership practice and IT dimensions that impacted on performance. The article brings out some important lesson that managers ought to be aware that the impact of IT on competitive advantage may not be direct but may be realized through its complementarity with other organizational capabilities (Perez-Arostegui, Benitez-Amado, & Tamayo-Torres, 2012). In this study, I sought to build on the results of Perez-Arostegui, Benitez-Amado, and Tamayo-Torres (2012) to better explain the relationship between ICT investments and OP. I endeavor to gain some insights on the interaction between IT resources/capabilities and other organizational resources for quality OP.

Huang et al. (2014), in their study on "the effects of knowledge management on OP of Taiwan's listed communication network companies: using cloud technology

investment as the moderator." the researcher used the Structured Equation Modelling (SEM) approach to verify the research model employed and its fitness with the measurement model. The study found out that good knowledge management and investment in cloud computing has a significant positive effect on OP among the organizations studied. The study findings are indeed in line with general perception and previous research assertions that investment in ICT has a positive impact on OP. Even though the study was restricted to Taiwan's listed communications network operators, and that the study only concentrated on the very limited and largely new area of cloud computing, and may not be deemed to have resulted in real groundbreaking findings, the article reaffirmed the generally held believe in the value-addition of ICT on OP. Such findings may be quite beneficial for existing and potential shareholders of the Taiwan's listed communications network companies, but may not be wholly applicable to the nonprofit sector.

A study similar in approach to Huang's (2014) is that of Hsu (2014) who explored the relationship between and among IT strategy, organizational culture, organizational learning, and knowledge management and their relationship with OP. The study employed a conceptual framework to explain the relationships and utilized descriptive statistics and multiple regression analysis to explain the relationship among the various variables. The study affirmed that OP is dependent on organizational culture, learning, knowledge management, and IT strategy. While the research design, which used descriptive statistics and multiple regression analysis, may be useful in my study, Hsu (2014) concentrated purely on IT strategy and did not explore other components of ICT,

which I believe, have a significant influence on firm performance. Nonetheless, Hsu's (2014) recognition of the contribution of variables other than ICT towards OP is useful in supporting my study.

The role of board level IT governance cannot be overemphasized. This was a finding by Turel and Bart (2014) who employed the resource-based and contingency views of MIS together with corporate governance theories to examine the antecedents and consequences of board-level IT governance through the use of a multi-method approach and the Structural Equation Modelling approach in their data gathering and analysis. The study established a positive correlation between the level of IT governance involvement and OP. Board level IT governance being one of the mediating variables to be used in my study, Turel and Bart (2014) offer useful insights, especially the data collection and analysis methods that may be used to study such a variable.

The study by Piget and Kossaï (2013) introduced some very useful analysis approaches, and offers a developing country perspective of a study very closely related to mine. The application of different econometric methods of linear regression, Granger causality, Kruskal-Wallis test, Welch ANOVA test, and post hoc tests address some issues relevant to my study. The study, whose results depicted a significant statistical relationship between IT use and OP, provides insights on econometric models that may be very useful in this study while aptly cautioning on issues of data availability on ICT use in developing countries as a point worth noting as one prepares to engage in such a study.

Salge, Kohli, and Barrett (2015) in their study which used behavioral theory and neo-institutional theory to identify influencers of information systems investment decisions among hospital managers revealed the need to find solutions to performance, achieve continuity, predictability, and conformity with regulations as being key in information systems investments. The research findings are a significant contribution to knowledge, their use of appropriate research methods, the clarity with which their findings were communicated, and the research theories employed are worth exploring.

Kohli, Devaraj, and Ow (2012) asserted that "managers make informed information technology investment decisions when they are able to quantify how IT contributes to firm performance". In their study to determine if information technology investment influenced a firm's market value, Kohli, Devaraj, and Ow (2012) employed a theoretical model in their examination of the components of a firm's value and IT investments. Their finding that IT investment did not have a significant relationship with return on assets and operating income in the hospitals studied is worth revisiting, and their model would be a very good guide in the development of a model to explain the relationship between IT investments and OP for the nonprofit sector. A study related to Kohli, Devaraj, and Ow's (2012) is that of Ong, C., and Chen, P. (2013), which, utilizing the resource-based view, made use of secondary data for a sample of 480 firms from a reliable data source (information Week), confirmed the assertion that IT capability, made available through appropriate IT investments, had a significant effect on OP. However, their consideration of the construct of future firm performance and its relationship with firm value as a measure of the effects of IT capabilities and their corresponding

managerial implications (Ong & Chen, 2013) brings to the fore a new perspective of my study, specifically the introduction of the effect of time.

Krishnan, Teo, and Lim (2013), in their study on the impact of ICT development, measured through the level of e-government maturity, on economic prosperity and corruption established an inverse relationship between e-government maturity and corruption practices. While the study offered important insights on the role of ICT in addressing a critical issue that bedevils the public, nonprofit, as well as the private sector, it does not address the subject of the relationships sought in the current study.

Other past studies reviewed on this subject have primarily made reference to investments or use of IT and its influence on OP. This study will make use of the more encompassing term ICT but for reference purposes, ICT, IT, and IS shall all be taken as synonymous. It was observed that different researchers have approached the subject on the value of ICT in shaping OP from the various angles of complementarity and mediation effects. It was also observed that generally there is a lack of a general measure of ICT value to an organization, attributable to the complex nature of ICT, the diversity of organizations, and the multiplicity of factors that may influence OP other than ICT. For example, while a multitude of scholars have affirmed a positive correlation between ICT investments and firm performance, others such as Mazidi, Amini, and Latifi (2014), through the use of the matched sample comparison group research method undertook an empirical study that found no apparent link between IT capability and OP. This is the very reason that a model that defines the relationship between all variables that impact on

OP and ICT, though complex and time-consuming, is necessary so that, finally, the debate may shift from ‘whether a relationship does exist’ to ‘validating the model’.

Revisiting the Productivity Paradox of Information Technology

The productivity paradox of information technology (also referred to as the productivity paradox of information systems) is explained as the difficulty to understand the continued failure to realize the benefits of investments in information technology despite advancements and increased expenditure by organizations and/or governments in information technology and the widely held belief in its potential to cut costs and enhance competitiveness (Brynjolfsson & Hitt, 1996). The debate on the IT productivity paradox gained ground following the immense investments, in the US economy in the 1970s and 1980s, in computer technology yet over the same period productivity growth rate was at less than 50% of that experienced in the 25 years prior to the period with increased computing capacity in the U. S. economy (Jones, Heaton, Rudin, & Schneider, 2012). This phenomenon led the Nobel Laureate Economist Robert Solow to observe that one could see computers everywhere else other than in statistics relating to productivity (Jones, et al, 2012).

Following Solow’s (1987) infamous observation on the IT productivity paradox was a renewed research interest by IT researchers to understand the explanation for the phenomenon. As pointed out by Jones, et al (2012), the earlier findings on the relationship between IT and productivity may not have been correct, and that in fact, IT could result in increases in productivity given favorable conditions. The studies that led to the conclusion of existence of a paradox between IT and productivity have since been

attributable to the application of inappropriate measures for productivity. For example, Jones, et al. (2012) offered the example of measuring productivity in the banking sector where they pointed out standard measures of productivity improvement as being unable to pick customer service convenience and satisfaction as adding to productivity.

Though Brynjolfsson and Hitt (1996) pointed out that, according to their study, the IT productivity paradox had disappeared by 1991, recent studies by Acemoglu, Autor, Dorn, Hanson, and Price (2014) sounded an alarm at the possible resurfacing of a flavor of Solow's paradox; they found out that labor productivity increases resulting from intensive IT use resulted in corresponding declines in employment numbers (Acemoglu et al., 2014), a perspective hitherto not looked into keenly. Acemoglu et al. (2014) rightly argued that if indeed IT increased productivity and reduced costs, one would expect an increase in outputs in industries where IT was intensively utilized. This point of view contradicts the view of those in resonance with what the adherents of the so called "technological discontinuity view" (Acemoglu et al., 2014) had in mind when they declared the disappearance of the IT productivity paradox in the early 1990's (Brynjolfsson & Hitt, 1996).

It is on the backdrop of these past studies, which though in manufacturing (Acemoglu *et al*, 2014), publicly-traded and non-publicly (Jones, et al, 2012; Kohli, Devaraj, & Ow, 2012) traded healthcare, and for-profit organizations (Perez-Arostegui, Benitez-Amado, & Tamayo-Torres, 2012) among others that I take the study to the nonprofit sector which, according to literature obtained thus far, remains unattended.

ICT Infrastructure and Usage in Kenya

A review of literature on the state of ICT infrastructure and usage in Kenya is important to this study due to the crucial role played by the two factors in the capability of ICT to influence the performance of organizations working from within the country. A study by Muriithi, Horner, and Pemberton (2016) identified ICT research environment at the national and institutional levels as well as the availability and access to ICT resources as being key factors that influenced the penetration of ICT in Kenya. The study, which contributed significantly towards the knowledge on the impact of ICT on collaborative research work, recognized the role ICT infrastructure and internet connectivity, in promoting ICT use (Jowi & Obamba, 2012; Muriithi, Horner, & Pemberton, 2016; Ynalvez & Shrum, 2011). As echoed by Kashorda and Waema (2014), ICT Infrastructure is a facilitating condition for choice of approach to organizations in their endeavor to facilitate and promote the use of ICT.

The government of Kenya has developed an ICT masterplan to exploit the potential of enhancing economic growth through an enabling ICT environment (Government of Kenya, 2012). This initiative has been well backed by increased fast internet connectivity available in Kenya through undersea fiber cables offering consumers in the country a combined international bandwidth of about 1.6 terabits per second as at September 2015 and the availability of 3G/4G network technologies (Communications Authority of Kenya, 2016). The cost of international internet bandwidth also reduced significantly from an average of US$500 per megabit in 2008 to US$160 per megabit in 2013 (Kashorda & Waema, 2014). In 2015, the country ranked

(globally) 126 out of 167 on the ITU's ICT Development Index (ITU, 2016) while the World Economic Forum's Network Readiness Index (World Economic Forum, 2015) ranked it 86 out of 143 economies.

Table 2

International Internet Available Bandwidth in Kenya as at September 2016

International Connectivity Bandwidth	*Sep-16*	*Jun-16*	*Quarterly Variation (%)*	*Sep-15*
SEACOM	1,250,000	950,000	1.6	770,000
TEAMS	700,000	702,000	-0.3	700,000
EASSY	39,060	39,060	0.0	39,063
Lion 2	39,210	39,210	0.0	39,210
Satellite Internet Bandwidth	473.43	475.43	-0.4	348.2
Total International Internet Bandwidth (Mbps)	2,028,745.43	1,730,745.43	17.2	1,548,621

Note. International connectivity bandwidth in Kenya as of September 2016. Retrieved from http://www.ca.go.ke/images/downloads/STATISTICS/Sector%20Statistics%20Report%20Q1%202016-2017.pdf. Copyright 2017 Communications Authority of Kenya.

Nonprofit organizations in Kenya have the enabling environment necessary for utilizing ICT (see Table 2) for achieving their organizational objectives through the intiative of the Kenya ICT masterplan of stimulating service sector businesses through the use of ICT (Government of Kenya, 2016). In fact the establishment of digital villages and the availability of grants for the developments of local digital content coupled with the Kenya Data Open initiative (IST Africa, 2015) lay an ideal foundation for nonprofits to optimize their OP through informed ICT investment decisions.

As at end of 2013, ICT infrastructure diffusion, in comparison with global averages, was quite low for fixed-telephone, fixed-broadband, and mobile-broadband, among other indicators as depicted in Figure 2 below. However, interestingly, mobile cellular subscriptions per 100 inhabitants was at 70.6. Households with internet access at home stood at 14.2%, a figure that was at about 50% of the average for developing countries globally (see figure 3), and incomparable with the developed countries' penetration of rate at 77.7% in the same year (ITU, 2013). While these numbers may not reflect the reality of ICT infrastructure in Kenya as at 2016, the general outlook still remains far below the developing countries' ratios at the overall Kenyan economy level, a picture that is not depictive of the situation at the organizational level. The fact that Africa offers the lowest household Internet penetration compared to the rest of the world (ITU, 2013), portents existence of opportunities for the nonprofit sector to play significant roles in the provision of access and availability of ICT infrastructure in an effort towards improving the livelihoods of households in Kenya, and indeed in Africa. The decision to invest in ICT would be informed by a better understanding of the impact such technologies would have on OP, which for nonprofits would ideally be partly measured on the basis of ICT's role in reducing poverty, improving livelihoods, improving information access and accountability, fighting disaster, and reducing mortality rates among others (Bilbao-Osorio, Dutta, & Lanvin, 2013; ITU, 2013).

Table 3 below provides an indication of ICT infrastructure penetration in Kenya. It is observed that the uptake of mobile-cellular technology was highest with a

subscription base of 70.6% in 2013 (ITU, 2013). At the same time (2013), 39% of the population was active in internet usage.

Table 3

Kenya's ICT Readiness Profile (Data Available as at End of 2013)

Various statistics (Latest data available: 2013)	
Fixed-telephone subscriptions per 100 inhabitants	0.5
Mobile-cellular subscriptions per 100 inhabitants	70.6
Fixed (wired)-broadband subscriptions per 100 inhabitants	0.1
Mobile-broadband subscriptions per 100 inhabitants	3
Households with a computer (%)	10.8
Households with Internet access at home (%)	14.2
Individuals using the Internet (%)	39

Note. Core indicators on ICT infrastructure and access for Kenya as at end of 2013. Retrieved from http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx. Copyright 2013 International Telecommunications Union.

Comparing Table 3 above and Figure 3 below, there is a marked increase in the proportion of Kenya's population with internet access at 85.3% (CA, 2016) up from 39% in 2013 (ITU, 2013). The high proportion and uptake of internet usage is an indication of the potential impact that nonprofits may put to use for the attainment of their mission. Infact internet usage in Kenya compares favorably with internet average usage in the developed countries which stood at 77.7% in 2013 (ITU, 2013).

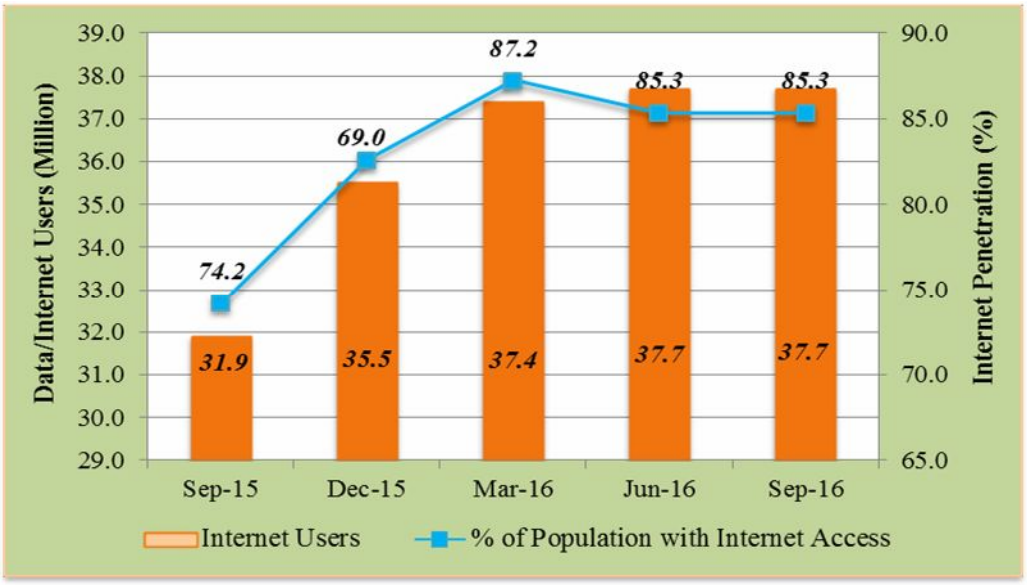

Figure 1. Estimated number of internet users and internet penetration (Sept 2016).

Note. The trends on internet/data usage and penetration in Kenya. Retrieved from http://www.ca.go.ke/index.php/component/content/article/94-news/421-kenyans-increasingly-adopting-broadband-internet-use-report-shows. Copyright 2017 Communications Authority of Kenya.

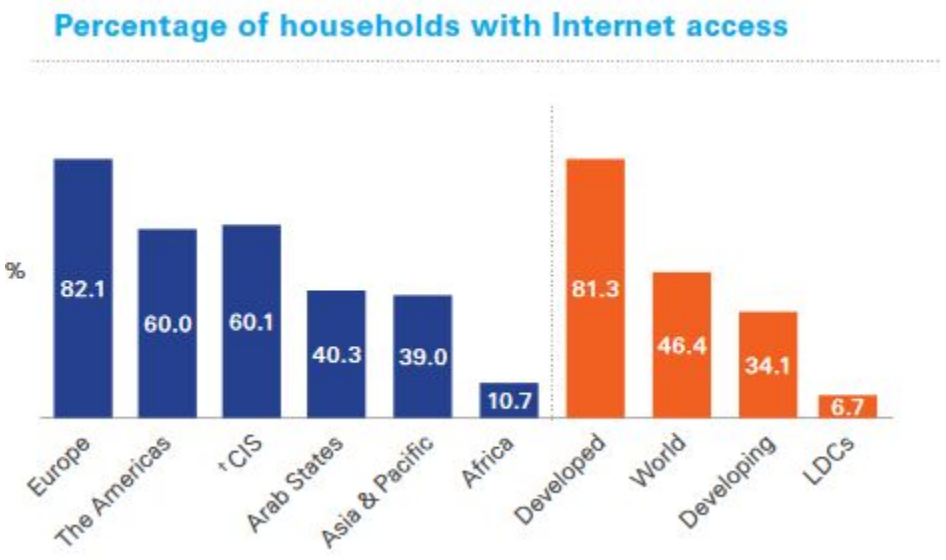

Figure 2. Households with Internet Access, by region and level of Development (2013).

Note. ICT facts and figures: ITU World telecommunications/ICT Indicators Database. Retrieved from https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf. Copyright 2016 International telecommunications Union.

ICT and Humanitarian Efforts

Nonprofit organizations account for a significant share of Kenya's economy, and this is growing in size, reach, scope and impact (Hoque & Parker, 2014). As Hansmann (1980) partly spelled out, it still stands true that in Kenya, nonprofit efforts are geared primarily towards education, healthcare, research, advocacy, poverty reduction, media, advisory, and welfare – which all are vital elements of a modern economy (Hansmann, 1980).

The global community recognizes the impact of ICT as going well beyond productivity gains (World Economic Forum, 2015). In reference to the impact of ICT for economic development, the World Economic Forum (2015) underscores the importance of ICT investment by stating that:

> Policymakers must work with other stakeholders to swiftly adopt holistic long-term strategies for ICT development, implement sound legislation, and make smart investments. Under the theme "ICTs for Inclusive Growth," *The Global Information Technology Report 2015* offers many solutions and examples of enabling policies and investments to help countries to better leverage ICTs for shared prosperity. (p. 1).

The first goal of the United Nation's (UN) Millennium Declaration is to "eradicate extreme hunger and poverty" as adopted by the UN's member countries in 2000 (UN Millennium Development Project, 2000). The establishment of rural telecentres, such as the Cisco sponsored Community Knowledge Centers (CKCs) in support of the Clinton Global Initiative (Clinton Foundation, n.d.) in Africa has positively impacted the lives of rural communities by providing opportunities for education and connections to the global community through the provision of ICT to the rural unconnected. This is demonstration that if ICT investment decisions are directed towards

the right causes, with over 2 billion people globally living in remote communities without access to telephones, computers, or the internet, there is potential to deliver positive contribution to humanitarian efforts, initiatives that are core to nonprofit mandates.

Summary

Literature search and analysis revealed that the issue of the contribution of IT to OP has drawn lots of interest, and in fact from researchers in diverse fields, beyond information systems, including economics, strategy, operations research, and accounting (Melville, Kraemer, & Gurbaxani, 2004). The impact of IT on OP has in fact popularly been referred to a 'business value of IT' or 'IT business value' (Melville, Kraemer, & Gurbaxani, 2004). Previous research appreciates the position I hold regarding the contribution of IT to OP that IT or ICT is only a set of factors among others that may impact OP, including management practices, organizational structure, nature of IT systems, competition, and the external (macro) environment ((Brynjolfsson et al. 2002; Cooper et al. 2000; Dewan and Kraemer 2000; Melville et al., 2004).

Recent studies supported the widely held view that increased investments in, hence use of, ICT have led to general improvement in OP (Bloom et al., 2010; Hussain & Oshikoya, 1998; OECD, 2008; Oshikoya & Hussain, 1998; Piget & Kossaï, 2013; Salge, Kohli & Barrett, 2015;). However, there are descending findings suggestive of the fact that investments in ICT may not necessarily be a guarantee to achieving improvements in OP rather other enabling factors are required to complement its value towards the achievement of meaningful performance improvements (Oliner & Sichel, 1994; Jorgenson & Stiroh, 1995; Jacobsen, 2003; Van Reenen et al., 2010). Surprisingly still, a

few voices allude to the fact that ICT may not have any positive contribution towards improved OP (Kohli & Devaraj, 2003; Carr, 2003). While reviewed studies have concentrated on the contribution of ICT use in commercial enterprises (Hussain & Oshikoya, 1998; Oshikoya & Hussain, 1998; Piget & Kossaï, 2013; Salge, Kohli & Barrett, 2015), primarily in the developed economies, there is little effort found devoted towards research on the influence of ICT in nonprofit performance. It is on the basis of the afore-discussed that a study on the relationship between investment in ICT and OP, specific to the nonprofit sector in a developing economy perspective, is deemed a valuable addition to the common body of knowledge.

The literature review set out in this chapter brought to light important facts that made the study of the interrelationship between investing in IT and OP complex. A review and understanding of the IT productivity paradox was explored. Having looked at literature from different perspectives, industries, theoretical orientations, sectors, and regions, while there is general consensus on the positive contribution of ICT to productivity, hence OP and value, there still exist grey areas and instances where ICT may not contribute positively or in line with much of typical expectations. It was observed that, much as with other factors of production, ICT is subject to the influence of external and internal factors in its contribution towards OP.

The problems that researchers and practitioners wrestled with in the 1980s and 1990s, in their effort to explain how best to employ IT for optimal OP still persist to-date. It is widely accepted that measurement of value of IT investment may not be generalizable but specific to an industry, and even to the specific software elements that

may also be specific to a practice domain. Despite much research to-date, it is not clear what the specific contribution IT would offer to an organization. Standardized measures for ICT investment are difficult to establish much the same way it is difficult to agree on uniform measures of OP. There is little, if any, literature on the relationship between ICT investment decisions and OP as relates to nonprofit organizations.

Some literature though does exist suggesting the need for corresponding changes in the culture and institutions of a country that will enable IT investment to be more effective. Education and culture can be important enablers at both organizational and national economy levels. Some studies suggest that public policy promoting ICT investment without corresponding changes in these complementary areas may end up being costly with poor results (Edwards & Ford, 2001). More recent literature has emphasized the contribution of increased IT investments, strategic planning, scientific innovations, and technology adoption as being drivers of rapid economic growth and development (see, for example, Jalaee & Zeynali, 2013).

The present study would contribute significantly towards extending the knowledge in the discipline under study by bringing to light the variables that need to be optimized to achieve desired levels of OP. The study would in fact empower decision makers in their efforts towards effective resource prioritization and allocation efforts. It would offer insights on the applicability of the IT productivity paradox in nonprofit organizations, even if specific to a subsector within the universe of the nonprofit domain.

Chapter 3, which follows, discusses the research method used for this study. The quantitative research design method has been applied by researchers in the study of

related topics in the past with considerable success. The exact method and rationale for the design choice will be explored deeply in the chapter that follows, in addition to the research methodology while explaining how threats to validity are addressed in the study before moving on to the data analysis and reporting chapter.

Chapter 3: Research Method

Introduction

In this chapter, I cover the following topics: the rationale for the selection of the study's design; the target population, sampling frame, and sample size; data collection process and an explanation of analysis technique(s); a discussion of the instrumentation, ethical concerns and threats to validity.

Purpose of the Study

The purpose of this study was to explore, understand, and explain the relationships between investment decisions as they relate to ICT and OP. Over the years, it has been difficult to justify ICT investments, in for-profit as well as nonprofit organizations, ICT organizations have continuously faced challenges in articulating to organizational leaders the benefits likely to result from investments in ICT. Decision making for ICT investments has therefore remained clouded by uncertainties. While there is consensus that the effective use of ICT improves OP, the extent of the impact ICT has on OP remains unclear. The results of this study could change how ICT decisions are made, especially in nonprofit organizations in Kenya, the study's main population. This chapter explains the research design and rationale for this study, the study methodology and how threats to validity are dealt; the chapter also includes a statement of ethical concerns and an explanation of how such challenges were dealt with.

Research Design and Rationale

To better understand the possible relationships between ICT investments, decision-making performance, and OP, a quantitative, correlational design was used. Numerical data were collected and then analyzed using statistical modelling techniques.

Study Variables

There is limited research in the nonprofit sector on the impact of investing in and using ERP systems, MES, MIS, and BI systems as an organization's core enterprise architecture. Therefore, this study examined whether organizations improved their decision making performance after using these four key elements of contemporary ICT. This study also explored the relationship between decision making performance and OP.

The independent variables for this study were ICT investments in the four ICT systems that make up the core enterprise systems' architecture and decision making performance. Due to the limited financial and time resources available for conducting this research, the value of ICT investments was measured by examining the value of investments only in ERP, MES, MIS, and BI systems. For a nonprofit, an ERP would be expected to incorporate financial management systems, grants management systems, and other process and policy enforcement systems such as procurement, inventory, audit, etc. Over the years, MES and MIS, and more recently, BI systems, have become important components of an effective ICT environment. Thus, they are included as independent variables in this study. Even though infrastructure is key to an efficient and effective ICT environment, for the purposes of this study it was assumed that core infrastructure would be a fundamental prerequisite hence in place for organizations to devote resources in

ERP, MES, MIS, and BI systems and shall therefore was not considered a construct for this study.

Decision making performance shall be explored through the lens of the quality of information maintained in or retrievable from the various systems for decision making, the quality of the systems from the perspective of user friendliness and relevance to the needs of the organization, and the value of the systems in enabling effective and efficient decision making process and the subsequent communication of the decisions to relevant stakeholders.

The dependent variable, OP, was measured from four perspectives, finance (Holmberg, 2000; Kaplan & Norton, 1996b; Tangen, 2003; Hunton et al, 2003; Nicolaou, 2004), as well as customer/user, internal processes, and learning and growth perspectives, as introduced in the acclaimed balanced scorecard (BSC) instrument developed by Kaplan and Norton (2001).

External economic climate would have a mediating effect on OP as would political climate, actions by the competition, donor priorities as well as innovativeness of the organization; these factors may have intervening effects between the endogenous and exogenous variables but due to time and financial resources constraints, these were not considered for the current study.

The level of education and ICT expertise of ICT investment decision makers, ICT personnel and the general user population, coupled with, not only the understanding of organizational culture but the culture of the general population, within which the organizations thrive, towards ICT is seen as an important element that may determine

decision making performance. Organizational culture may have an impact on trust levels that organizational leaders may have on the abilities of the organization to make effective use of ICT resources. Trust for leadership decisions by staff may equally influence the zeal with which staff may make positive use of ICT investments for the benefit of the organization. The above indicators are assumed to be adequately addressed through the decision making process, and the usage perspective of the ICT systems invested in.

Control variables for the study was the number of employees in the organization and annual organizational revenue/budget; this data was collected at the pre-sample selection stage. The research framework depicting the variables discussed above is represented in Figure 4 below.

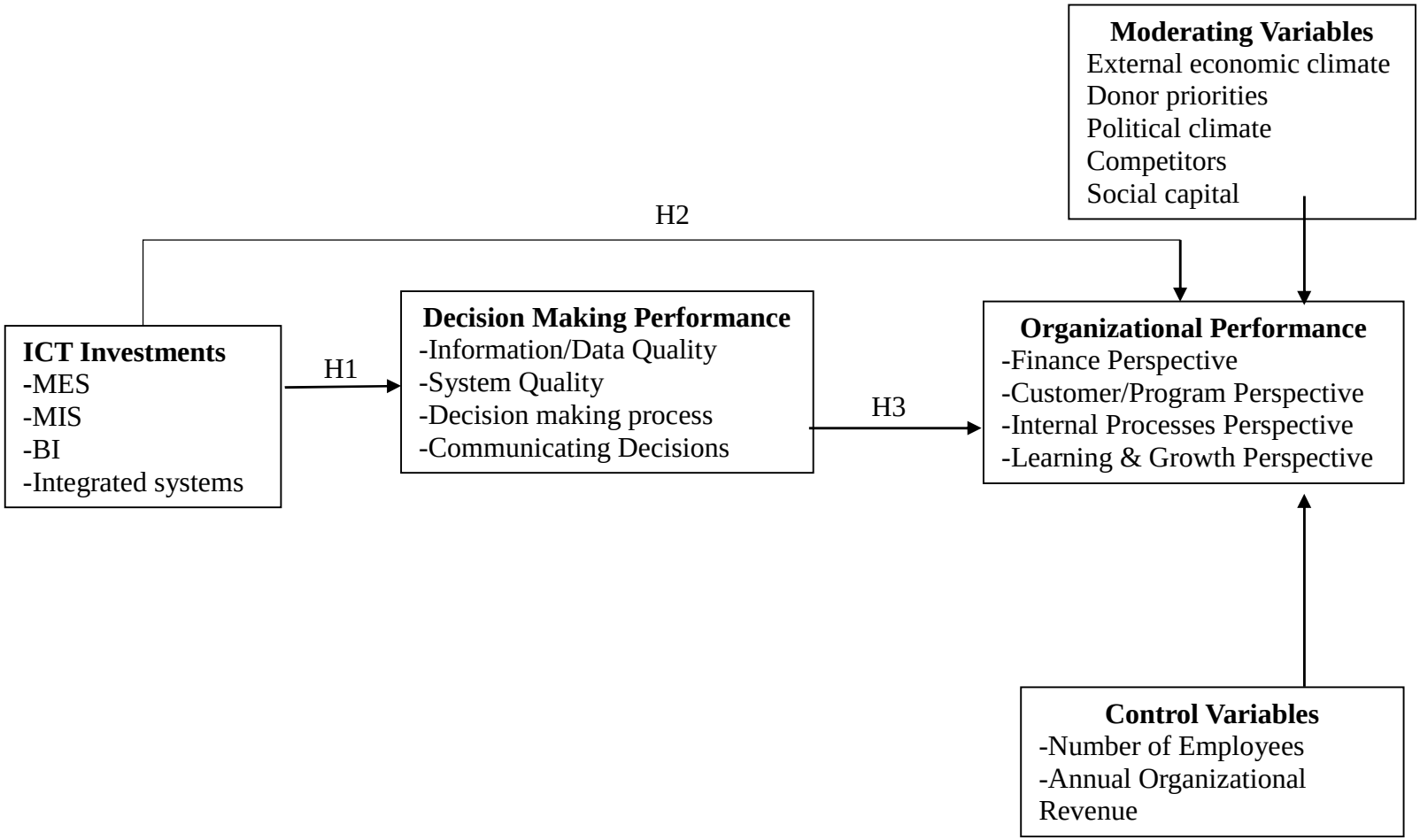

Figure 4: Research Framework

Note. ICT Decision making performance assessment framework. Adopted from "Measuring the impacts of the integrating information systems" by C-K Hou, 2013, *International Journal of. Technology, Policy and Management,* 13, p. 37.Copyright 2013 by InderScience Publishers.

Research Design and its Relationship to the Research Questions

As stated above, the correlational quantitative research design was selected for this study. The purpose of the study, was to determine the relationship, if any, between investments in ICT and OP, guided the selection of the research design. The deductive approach and the research framework presented in Figure 4 above are deemed as most appropriate in providing a deep understanding of the research question on the extent to which ICT contributes towards OP. The research questions guiding this study dictate the suitability of correlational quantitative techniques. It is through correlational and regression statistical techniques that the questions on the interplay between the different ICT use variables and their influence on OP as well as the extent to which investments in different components of ICT may lead to the attainment of desirable levels of OP would be addressed.

The six research questions that guided this study were: -

1. How is decision making performance in an organization related to investments in ICT?
2. What is the correlation between investments in ICT and OP?
3. What is the correlation between decision making performance and OP?
4. How does a firm's investment in ICT affect OP and decision making performance?
5. How is decision making performance affected by information quality compared with system quality?

6. What is the correlation between investments in ERP, MIS, BI or an integrated system and OP?

It is out of the six questions above that the research hypotheses for this study were developed. In order to effectively respond to the questions and either accept or reject each of the hypotheses, quantitative-type data were collected and analyzed. These would not be achievable using a qualitative design approach, and mixed methods design would not be suitable. The constructs under study call for numerical measures and the use of advanced correlational and regression statistical techniques hence the selection of the quantitative research design approach.

The quantitative research design uses statistical analysis techniques that allow for use of sampling to estimate population characteristics. The use of sampling techniques is consistent with the time and financial resources that would otherwise be required had one to use entire populations for a study.

As stated by Thomas (2003), every research design approach has merits and demerits, and a researcher is called upon to select one from among other design approaches. In addition, each research design works under certain assumptions about the nature of knowledge (Thomas, 2003). In social science research where quantifying research responses and use of statistical analysis of such responses is necessary, quantitative designs, which offer a more structured scientific approach are called for in order to facilitate understanding of constructs relationships (Creswell, 2013).

The selection of the quantitative research design over qualitative or mixed methods designs was informed by, as guided by Creswell (2009), the research question,

purpose and context of the study's research inquiry. This research design approach is not only advanced by those holding the postpositivist view but proponents of the mixed methods approach as well who appreciate the strength of the quantitative worldview in developing a deep understanding in a phenomenon of interest (Venkatesh, Brown, & Bala, 2013). Since the purpose of the study was not to gain divergent views of some phenomenon (Chang, 2006) or to understand human behavior in its natural setting (Venkatesh, Brown, & Bala, 2013), the utility of a mixed methods or qualitative approaches, appear limited hence not considered.

In addition, the correlational research type of quantitative design was selected over descriptive, causal-comparative (quasi-experimental) and experimental research for this study since the objective of the study was not to manipulate any variables but purely to attempt to gain an understanding of the extent of relationships between the variables being studied using statistical data and analysis techniques.

Methodology

The research design for this study was correlational, and used an online survey data collection instrument. Potential participants for this study were senior managers who had worked with the qualifying firms for a minimum of five years. The organizations were those that utilized ICT for their operational efficiency and management decision making. The survey targeted, from each participating organization, two ICT and two non-ICT leaders, for data collection.

Study Population

This study aimed at making use of data from major nonprofit organizations in Kenya. The nonprofit sector was selected for this study because it had played a significant role in the economic development of Kenya as a country over the past couple of years (Fowler, 2016). Major nonprofits were defined as those that had staff populations of at least 10, have had an annual budget of at least US$10 million over the past five years, and had invested in and been using ICT over the past five years. The body of nonprofit organizations in Kenya therefore made up the study's population. From the entire population, criterion-based sampling was undertaken to eliminate those nonprofits that did not fit within the set criteria. It was the qualifying list of nonprofits from which a suitable sample was drawn. From each of the major nonprofit organizations, a targeted sample of four management staff were drawn up, with two being senior ICT management staff and the other two being executive management staff. In organizations where it proved difficult to obtain e-mail contacts for the required number of leaders, the informed consent which contained the link to the online questionnaire, was e-mailed to the general organization's e-mail address or the receptionist who volunteered to distribute the request to appropriate colleagues. According to the National Council of NGOs Kenya, at the time of this study, there were just over 8500 nonprofits registered in Kenya (National Council of NGOs, 2016).

Sampling and Sampling Procedures

Sampling Procedure. The sampling frame was based on the register of nonprofits obtained from a report generated by both the National Council of NGOs

Kenya (National Council of NGOs Kenya, 2016) and the NGO Coordination Board Kenya (NGO Coordination Board Kenya, 2016). An invitation letter with short questions was e-mailed to or shared with, via the LinkedIn social media platform, all nonprofit organizations with a reachable address. The invitation letter aimed at gathering information on the suitability of the organization for the study and asked the three questions to determine if the organization had an employee base of 10 or more, had an annual budget of US$10 million or more, and had invested in and used ICT over the past five years. In addition, an informed consent letter was attached. The informed consent letter sought to inform the potential research participants of the purpose of the study, request them to participate, articulate the participant's right of refusal or termination of participation in the research process at any point within the research process, and provided an outline of the confidentiality of their participation.

Data was collected on the size of organization in terms of total number of employees, annual operating budget, annual ICT budget, number of ICT full-time personnel, and years of use of ICT. The annual budget requested was expected to be the country budget; this was an important element because a sizable number of nonprofits in Kenya, at time of study, had global presence and hence only budgets meant for each country may have a direct impact on OP in the specific country. All nonprofit organizations in Kenya that could be reached were provided with an online link to the web-based questionnaire where they could be able to proceed with providing responses to all the research questions. It was after all the data was gathered that organizational data that did not meet the set criteria was eliminated.

Nonprofits are classified into various categories depending on their mandate; these include education, healthcare, research, advocacy, poverty reduction, media, advisory, food security, funding, and welfare organizations. Data was therefore collected on the category of the various nonprofits from the data provided by the Kenya's NGO Coordination Board and the National Council of NGOs. Organizations that had not been using ICT for at least five years, did not meet the threshold of 10 employees and did not have an annual budget of at least US$10 million over the past five years were excluded from the study. According to studies done by Matolcsy et al (2005) and Nicolaou (2004), organizations need to have used ICT for a certain minimum number of years for their feedback to be of value to a study such as this one. Out of the list that met the above set threshold, stratified sampling was then used to pick out the sample items on the basis of the years the respondent had been working with the organization in relation to which they provided data. Organizational size was determined on the basis of total number of employees and annual budget.

Sample Size. The type and amount of data to be collected was based on its relevance in resolving the research question(s) at hand (Leedy & Ormrod, 2005). The exact number of interview participants for use in this study was determined, as guided by Marcoulides & Chin (2013), using power analysis guided by the part of the model with the highest number of predictors. Candidate tools for computing the appropriate sample size include the G*Power version 3 software (Faul, Erdfelder, Bucher, & Lang, 2009); G*Power software requires the input of a predetermined level of significance, effect size, and power to determine a suitable sample size of the statistical research study (Field,

2013). Hair, Hult, Ringle, & Sarstedt (2017) also assert that since sample size recommendations are built on regression logic, researchers may comfortably reply on Cohen's (1992) rules of thumb for statistical power analyses for multiple regression models.

The power of a research study is defined as the ability of statistical analysis to find a significant difference when the null hypothesis is in fact false (Field, 2013). The power is determined by the sample size, the alpha level, and the effect size. Therefore when one is interested in determining the sample size, they need to know the alpha level and the effect size but in a logistic regression, the use of the number of predictor variables in the study improves accuracy of estimation (Field, 2013). Determination of effect size is guided by a power analysis expert (Cohen, 1977, 1988), who offers appropriate effect sizes for the various tests. For example, for an F-test regression, a medium effect size of 0.15 is recommended while for a chi-square test or t-test on correlations, a medium effect size of 0.30 is regarded as ideal. Alpha level is simply the significance level, i.e. the odds that the observed result is due to chance (Field, 2013).

Sample size considerations should be based on model and data characteristics (Hair, et al., 2011; Marcoulides & Chin, 2013 as in Hair, Hult, Ringle, & Sarstedt, 2017), hence sample size requirements should therefore be determined through power analyses based on the part of the model with the highest number of predictors (Hair, Hult, Ringle, & Sarstedt, 2017 p. 25).

Power analysis has typically been used in computing suitable sample sizes for social science research. Hair, Hult, Ringle, and Sarstedt (2017) recommend that

researchers use programs such as G*Power to undertake power analyses for the determination of suitable study sample sizes. To make sample size determination even much easier, Cohen (1992) provided a tabulation for different significance levels, statistical power, R^2 value, and complexity levels. The table provided by Cohen (1992), is replicated by Hair, Hult, Ringle, and Sarstedt (2017 p. 26), and that is what was used to determine the minimum sample size required for this study. Therefore, the minimum sample required to detect a R^2 value of 0.10 in any of the endogenous variables in the structural model for a significance of 5%, a statistical power of 80%, and the number of predictors in the model being 4 would be 113. This sample size resonated well with the number obtained using power analysis software for a medium effect size of 0.3, alpha value of 0.05 and a power of 0.95 at 111 as shown below.

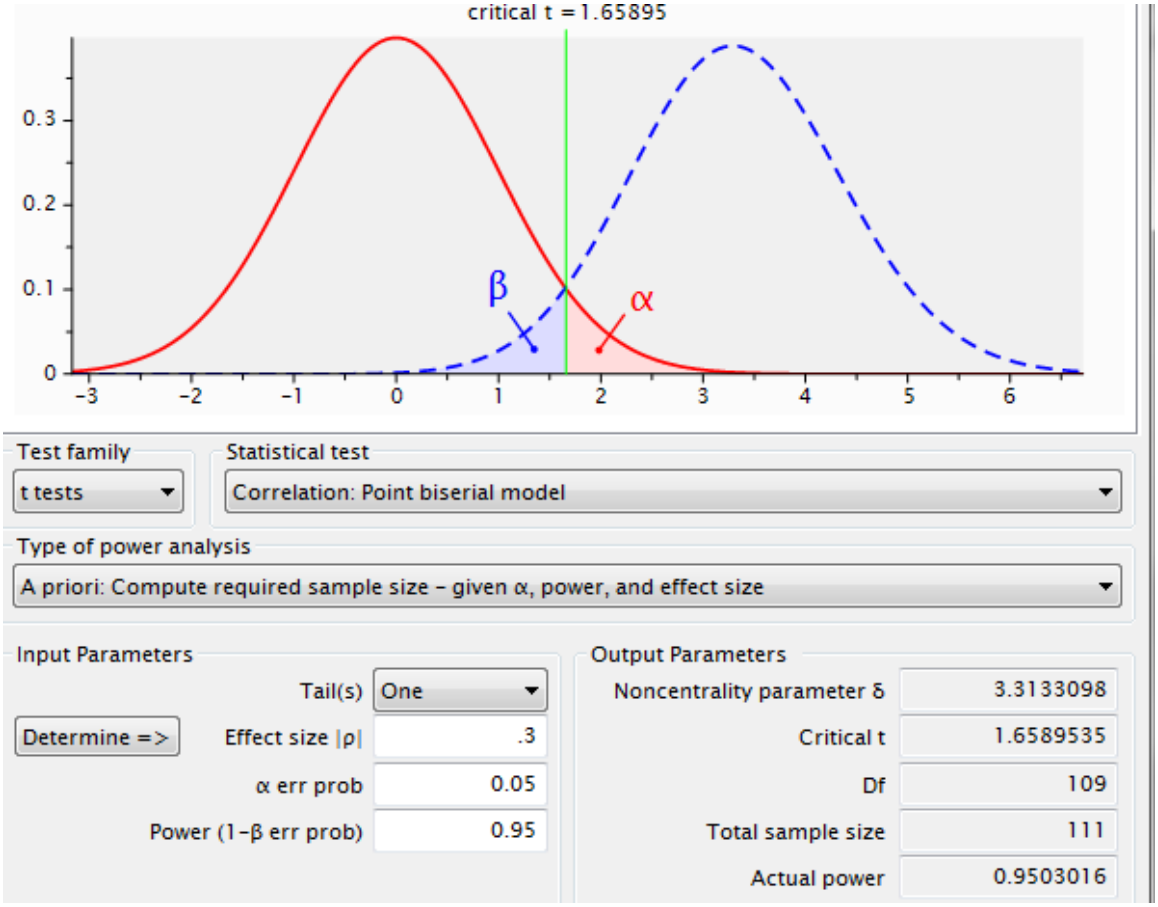

Figure 5. G*Power 3.1 software sample size calculation.

Procedure for Recruitment, Participation, and Data Collection

The first step in this phase of the research, prior to the recruitment campaign, was to seek Walden University's Institutional Review Board's (IRB) approval to proceed with the recruitment, participation, and data collection exercise.

Once the IRB's approval was obtained (Approval No. 05-15-17-0441590), and the organizations to be included in the study were identified, the e-mail addresses of two senior ICT management staff and two non-ICT management staff were sought either through their corporate websites, popular social media networks, specifically LinkedIn

and/or Facebook, or telephone calls to the participants' office telephone lines to seek e-mail addresses for initiation of recommended communication. Initial e-mails were sent out to potential research participants explaining the purpose of writing to them, clarifying expectations, and seeking their willingness to participate in the study. It was on the basis of their acceptance that they were expected to proceed to access the research questionnaire made available to them through a web-link at the bottom of the informed consent letter. The process was repeated until the required sample size requirement was met. Since previous research shows that the number of interview participants that return fully completed questionnaires is usually lower than 100%, our research questionnaires were shared with all reachable qualifying organizations to increase the chances of reaching the target of 113 fully completed responses.

A key component in this stage was obtaining informed consent from each of the potential research participants. The informed consent letter, which stipulates the terms and conditions of participating in the research study was provided with the initial communication to research participants and also in the introductory part (on the landing page) of the online data collection questionnaire.

Data collection, as indicated above, was administered through the online questionnaire via surveymonkey.com. The internet link was made available to all potential research participants but the research participants were only expected to click on the link upon assenting to the informed consent. At the end of the questionnaire, participants were thanked, and follow up actions communicated. Research participants were given the opportunity to exit and return to the data collection site until they had

responded to all questions or until they opted out of the exercise. Once exited, participants did not have further access to the data collection tool. In the data collection, general demographic information, such as gender, age, professional affiliation, employee position, staff size, and highest level of education were sought.

This data collection approach was quite economical in terms financial resources requirements, it was efficient in respect to time constraints, and convenient to handle for both researchers and participants.

Instrumentation and Operationalization of Constructs

Instrumentation

This study used an on-line based Likert-type questionnaire instrument that was developed by Prof. Chung-Kuang Hou of (at the time of this study) the Department of Information Management at the Chia-Nan University of Pharmacy and Science. The instrument was published in the International Journal of Technology, Policy and Management in 2013 (Hou, 2013).

The instrument was very appropriate for the study as it captured all the variables that the study to use in the determination of the influence of ICT on OP. Hou (2013) embarked on the journey of developing a model for measuring the impact of ICT on decision making, which in turn impacted OP following a thorough review of existing literature on existing measures of OP attributable to ICT though he narrowed his study to the impact of integration of ERPs and BI systems, which are typical components of ICT investments, on OP. Though the empirical study focused on the Taiwan Semiconductor industry (Hou, 2013), the logic of the instrument development, and both the dependent

and independent variables are similar to those my study centered on. The foundation of the development of the instrument that "business goals that drive an investment in ERP (read ICT) initiatives include improving organizational efficiency, effectiveness, and OP" (Hou, 2013 p. 35) and the assertion that organizations continued to struggle with the measurement of the impact of information systems on OP further strengthens the justification for my study to better respond to the research questions herein that still remained answered.

Operationalization

The questionnaire is divided into two sections, A and B. Section A is made up of general questions about the participant and the organization represented by the participant while section B is made up of specific interview questionnaire items regarding decision making and OP. Section A, meant to collect general organizational information for the determination of the sampling frame, was not part of the instrument developed by Hou (2013). For each of the questionnaire items, participants were asked to rate the impact of investing in ERP, MES, MIS, and BI systems individually, and in all the four ICT systems under consideration (ERP, MES, MIS & BI) in one integrated system on the decision making process as well as on overall OP. Responses to all the questionnaire items in section B were measured on a 7-point Likert-type scale that ranged from '*strongly disagree*' represented by a score of 1 to '*strongly agree*' represented by a score of 7. A response with a score of 1 (*strongly disagree*) implied total dissatisfaction with the contribution of investing in, say an ERP, towards the specific question area while a

score of 7 implied total satisfaction with the contribution attained from investing in, say an ERP, towards the specific area covered by the particular question.

Table 4 below provides a summary of the constructs used for this investigation, the specific factors used to measure each of the constructs, the number of questions used to measure each of the factors, and a brief description of each of the factors.

Table 4

Measurement Instrument Constructs and Factors

Study construct	Factors	Number of items	Description of the scale
Decision making performance (DMP)	Decision-making process	14	Measures the action of appropriately identifying what should be done in a decision-making situation and ensuring that the chosen criteria are relevant.
	Decision-making communication	6	Measures the precision with which the decision-making process is undertaken. It is a measure of the strategic decision-making process effectiveness.
	Data quality	10	Measures the availability of data that meets user specific requirements, and is accurate, timely, complete, understandable, and accessible to those who need to access it.
	System quality	12	Measures the overall performance of the information systems used in an organization in terms of their flexibility, reliability, response time and ease of use.
OP (OP)	Learning & growth perspective	8	Measures how organizations align their intangible assets of human, information, and organizational capital to strategy.
	Financial perspective	5	Measures how organizations increase stakeholder value through productivity improvement, revenue growth and cost reduction structure.
	Customers perspective	4	Measures how organizations focus on the external environment and helps in the understanding, discovering and emphasizing customer needs in product development.
	Internal processes	10	Measures how organizations capture the critical organizational activities (operations management processes, customer management processes, and innovation processes).

ICT investments	MIS	1	Measure the level of perception of value of use of MIS systems in organization.
	MES	1	Measure the level of perception of value of use of MES systems in organization.
	BIS	1	Measure the level of perception of value of use of BIS systems in organization.
	IIS	1	Measure the level of perception of value of use of IIS systems in organization.

Note. List of dimensions for DMP, OP and ICT measurement factors. Adopted from "Measuring the impacts of the integrating information systems" by C-K Hou, 2013, *International Journal of. Technology, Policy and Management*, 13, p. 39.

Instrument Reliability and Validity

Factor analysis was used to test the construct validity of the measures used and to establish the constructs that had an impact of decision making and OP (Hou, 2013). In order to measure the degree of correlation between the instrument items and to confirm the appropriateness of using factor analysis as a test of reliability and validity, the researcher used two statistical techniques, the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy and the Bartlett's test of sphericity. The KMO measure for the decision making performance (DMP), one of the constructs in the model, gave a significance level of 0.912 while the Bartlett's test of sphericity of the DMP construct was also significant with chi-square of 4715 and a $p<0.001$ (Hou, 2013). The KMO measure of the OP (OP) construct was 0.936 and a Bartlett's test of sphericity of the same construct also being significant a chi-square of 2658 and $p<0.001$. The two measures above indicated the appropriateness of the use of factor analysis (Hair *et al*., 2006 as in Heu, 2013). Convergent validity was confirmed as all variables with loadings of less than 0.5 on all the factors (Hair et al., 2006; Sethi and King, 1991), or loadings greater than 0.5 on two or more factors were dropped, arguments supposed by early studies by Churchill (1979) and Hair et al. (2006), leaving only four factors in the factor analysis of DMP which generated eigenvalues greater than 1 and accounting for 72.43% of the total variance among the 38 variables (Hou, 2013).

From the factor analysis undertaken for the DMP and OP, all correlation coefficients were less than 0.80, implying that the multicollinearity condition was met (Gujarati, 2003, Field, 2013). Likewise, the Cronbach's alpha measure of reliability for

each of the constructs under consideration was sufficient at above 0.70 (Hair et al., 2006; Field, 2013). As recommended by Gaski and Nevin (1895) and Field (2013), discriminant validity was also tested for, revealing that inter-factor correlations to be less than reliability scores in each scale implying that the factors had acceptable levels of discriminant validity. The statistics presented therefore confirmed validity and reliability of the scales in the instrument.

The population used to test the instrument was the Taiwan's semiconductor companies, initially in a pilot study with 30 executives from 4 semiconductor companies (Hou, 2013) and subsequently, another 200 participants were targeted, out of which 120 participated and 108 being responsive (Hou, 2013). Tests conducted in accordance with statistical tests of validity and reliability affirmed the instrument to meet required reliability and validity checks. There is no doubt the instrument would gain popularity with time; the failure to find literature where others, different from the developer, have used the instrument is consistent with the lack of recent literature on the specific topic.

Variables in the Study

The variables whose relationships were investigated in this study are ICT investments (and usage, as a follow-up to the decisions to invest in ICT), decision making performance, and OP. Hamilton and Chervany (1981) stated that an evaluation of the value of information systems (IS), hence ICT, to organizations, benefited significantly from a review of IS's intangible contribution towards improved decision making performance and OP.

Decision-making performance is a measure of the extent to which appropriate actions are identified and taken in response to a situation requiring decision-making (Hou, 2013). According to Hou (2013) and prior literature, the dimensions from which decision making performance may be measured are data quality, system quality, decision-making process, and decision-making communication. Hou (2013) defines data quality as "the availability of data that meets user requirements" and refers to data that is timely, accurate, complete, understandable, and accessible. System quality is a measure of the overall performance of an IT system in terms of its flexibility, reliability, responsiveness, and ease of use (Hou, 2013) while decision-making communication is a measure of the ease and speed with which members of an organization are able to access and exchange information resources needed for effective decision making (Hou, 2013).

Kaplan and Norton (1992) aptly argued that measuring OP (OP) was a complex undertaking that required a multidimensional approach as opposed to the hitherto traditional approach of relying only on financial indicators. Kaplan and Norton (1992) therefore developed the balanced scorecard (BSC) which incorporated an additional three dimensions for measuring OP namely customer, internal business processes, and learning and growth, in addition to the financial perspective. This study, as was the case with Hou's (2013) follows the definition of OP as put by Kaplan & Norton (1992).

ICT Systems usage refers to the extent and nature of application of an IS/IT system (Robey, 1979 as in Hou, 2013), measured in terms of frequency of use (Davis, 1989; Davis et al., 1989; Leidner and Elam, 1993; Udo, 1992 as in Hou 2013) and/or non-use by individuals in organizations (Alavi and Henderson, 1981; Elam and Leidner,

1995; Hung et al., 2007; Moore and Benbasat, 1991; Sharda et al., 1988 as in Hou, 2013 p. 10).

The measures of the various elements, with literature supporting the development of each of the elements in the construct, are broken down according to the dependent variable that they measure. For the measures of the decision making dimension, Hou (2013) stated that

> The first dimension of DMP, data quality, was measured with a 10-item scale from previous researchers (Bailey and Pearson, 1983; Lee et al., 2002; Nelson et al., 2005; Wang and Strong, 1996). The second dimension of DMP, system quality, was measured with a 12-item scale adapted from Nelson et al. (2005), Bharati and Chaudhury (2004) and Gable et al. (2003). The third dimension of DMP, decision-making process, was measured with a 14-item scale based on the questionnaire items suggested by Leidner and Elam (1993), Holsapple and Sena (2005) and Turban et al. (2007). The fourth dimension of DMP, decision-making communication, was measured with a 6-item scale based on the literature of Teng and Calhoun (1996) and Holsapple and Sena (2005) (p. 44).

As asserted by Kaplan and Norton (2004), and supported by Hou (2013), measuring OP was multi-dimensional, and that in order to measure an OP effectively, one had to approach the subject from the four perspectives of financial, customer, internal business processes, and learning and growth. The OP perspectives and measures with their respective items incorporated in Hou's (2013) instrument and the initial developers of each of the measures and data items were enumerated by Hou (2013) as follows: -

> The first dimension of OP, financial perspective, is further defined by the three measures of productivity improvement, revenue growth, and cost structure reduction (Kaplan and Norton, 2004). 6 items utilised by Hoque and James (2000) and Yeniyurt (2003) were also adapted to measure the financial perspective in organisations. The second dimension of OP, customer perspective, is further defined by three measures of product attribute, customer satisfaction and firm image (Kaplan and Norton, 2004). 6 items were derived from previous research (Chand et al., 2005; Hoque and James, 2000; Kaplan and Norton, 2004). The third dimension of OP, internal process perspective, is further defined by three measures of operation management process, customer management process and innovation process (Kaplan and Norton, 2004). 11 items utilised by Solano et al. (2003), Hoque and James (2000) and Kaplan and Norton (2004) were adapted to measure the internal process perspective in organisations. The fourth dimension of OP, learning and growth perspective, is further defined by three measures of human capital, organizational capital and information capital (Kaplan and Norton, 2004). This study identified 8 items, derived from Kaplan and Norton, (2004) work to measure the learning and growth perspective (p. 44, 45).

Data Analysis Plan

Extensive use of multiple correlation and multiple regression quantitative research design techniques was made in this study. The combination of the two multiple correlation statistical design techniques was used to explore the potential relationships hypothesized in the research questions provided under the research questions and hypothesis section above.

The Pearson correlation coefficient or the Pearson product moment coefficient, as it is often referred to, is particularly strong and useful in informing whether there is a correlation between two or more study variables. The multiple regression coefficient (R) and its square (R^2) are used to provide an indication of the direction and strength of the association between the study variables. The significance *p*-value was used to determine whether the relationship was significant or not. Where the normality assumption may have been violated, the Kendall's tau b was used. In addition, the bootstrap statistical technique was used to check whether the lower and/or upper BCa (95%) confidence interval, i.e. the "bias corrected with acceleration constant method for confidence interval estimation" (Field, 2014), crossed zero.

As explained earlier, the PLS-SEM technique had initially been considered for use to complement the correlation and regression techniques. However further review of the required level of analysis and the data limitations did not require employing the PLS-SEM technique. PLS-SEM is also often used with small sample sizes and this was later found to not be a problem. The correlation and regression techniques had solely been used in similar past studies and were therefore deemed sufficient in explaining the required relationships between investments in ICT, decision-making performance, and the OP dimensions of this study. The use of the PLS-SEM technique was therefore dropped. The correlation and multiple regression statistical analyses techniques are ideal for developing statistical models that explain the correlation between an independent(s) variable and a dependent variable while a correlation coefficient helps in explaining the

strength and direction of a relationship (Field, 2013; Hair, Hult, Ringle, & Sarstedt, 2017).

After data collection was completed, the data was thoroughly scrutinized to ensure that it fully met the assumptions that enable the statistics computed using the relevant techniques to be reliable and valid. For example, responses that had missing data were subjected to "missing value treatment options" (Hair et al., 2010; Field, 2014). The use of statistical analysis tests results are valid only when certain assumptions are not violated by the data used (Field, 2014; Hair, Hult, Ringle, & Sarstedt, 2017). Therefore, to ensure that data used met required statistical compliance requirements, tests for multicollinearity, heterogeneity of regression, independence of errors, outliers, and linearity assumptions were tested for and corrective actions taken where found necessary.

Upon completion of data cleaning, the data was checked for sample size adequacy before being subjected to analysis using the various quantitative data analysis techniques deemed suitable. Descriptive statistical techniques were used to compute statistics relevant for demographic data interpretation, for example, median, standard deviation, mode, etc. For example, Pearson's correlation coefficients were used to examine existence or non-existence of relationships between investments in MIS, MES, BIS and IIS systems, decision-making performance and OP.

This study aimed to establish whether changes in the independent variables under study, when considered together, resulted in a change in the dependent variable(s), and this was achieved through the use of correlation analysis techniques. Correlation does not imply causation of a change in a dependent variable by a change in an independent

variable (Naoum, 2013). Researchers have frequently utilized the Pearson's correlation procedure to undertake multivariate correlational analysis, especially in the analysis of data involving quantitative variables where each of the variables was measured with the aim of producing raw scores.

In this study, descriptive statistics (mean, median, mode, and standard deviation) were used to explain demographics in the data collected. Then analysis of variance, Pearson correlations, and regression analysis were used to examine whether relationships existed between investments in IT, decision making performance, and OP. As is standard, the relationship between variables under study may be positive or negative. A strong positive relationship was deduced when a correlation coefficient of near or equal to +1 is obtained while a strong negative relationship was deduced when a correlation coefficient of near or equal to -1 is obtained. A correlation coefficient of 0 implies total lack of association between the variables under consideration. A statistical *p* value of 0.05 was used to either reject or accept a null hypothesis.

Research Questions and Hypotheses

This study aimed at making an attempt at gaining a deeper understanding of answers to the following questions: -

1. How is decision making performance in an organization related to investments in ICT?
2. What is the correlation between investments in ICT and OP?
3. What is the correlation between decision making performance and OP?

4. How does a firm's investment in ICT affect OP and decision making performance?
5. How is decision making performance affected by information quality compared with system quality?
6. What is the correlation between investments in ERP, MIS, BI or an integrated system and OP?

Following these questions, I hypothesized that investing in certain types of ICT systems, hence the usage, has an effect on the effectiveness of decision making, and subsequently OP in an organization. This thinking therefore led to the following hypotheses:-

H_{01}: There is no strong correlation between investments in ICT / ICT usage and decision-making performance.

H_{A1}: There is a strong correlation between investments in ICT / ICT usage and decision-making performance.

H_{02}: There is no strong correlation between investments in ICT / ICT usage and OP.

H_{A2}: There is a strong correlation between investments in ICT / ICT usage and OP.

H_{03}: There is no strong correlation between decision-making performance and OP.

H_{A3}: There is a strong correlation between decision-making performance and OP.

H_{04}: There is a no stronger correlation between investments in ICT / ICT usage and decision-making performance than between investments in ICT / ICT usage and OP.

H_{A4}: There is a stronger correlation between investments in ICT / ICT usage and decision-making performance than between investments in ICT / ICT usage and OP.

H_{05}: There is no stronger correlation between information quality and decision making performance than between system quality and decision making performance.

H_{A5}: There is a stronger correlation between information quality and decision making performance than between system quality and decision making performance.

H_{06}: There is no stronger correlation between investing in an integrated system and OP than between individual ICT systems and OP.

H_{A6}: There is a stronger correlation between investing in an integrated system and OP than between individual ICT systems and OP.

Using data collected with the instrument developed by Hou (2013), which is based on a 7-point Likert-type scale with responses for each item ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), multiple regression statistical techniques alongside Pearson's correlation analysis were used to determine the strength of relationships between ICT investment/usage, decision-making performance, and OP. Significance levels would help accept or reject the null hypothesis. Regression analysis

was particularly useful in reinforcing the understanding of the strength and direction of relationships among the three constructs under investigation. The interpretation of results was in accordance with guidelines offered by leading statisticians, such as Field (2014) and Hair Jr., Hult, Ringle, and Sarstedt (2017).

Threats to Validity

Validity is concerned with ensuring that one is measuring what they indeed intend to measure. In this study, content validity was addressed using an instrument developed and tested following a rigorous methodology of "item generation, pre-pilot test, pilot study, and large scale data collection and analysis" (Hou, 2013). Hou (2013) affirms that, to further assure content validity, the feedback of experts was sought and incorporated in the survey instrument. The measurement instrument used covered all the attributes that I intended to measure. Sampling validity was assured by avoiding being biased in the selection of sample study participants. Empirical validity was also addressed since the instrument used had already been tested for validity and reliability. The measurement instrument was developed to address the exact theoretical framework that my study was interested in exploring; therefore, construct validity was also addressed.

Internal and external validity were addressed using a well-tested instrument for data collection. The use of questions from a published instrument ensures that room for misinterpretation of questions is minimal, if any. The instrument's convergent and discriminant validity were also tested by the author (Hou, 2013) and support for such validity already addressed, hence not an issue in my study. As stated by Cozby and Bates (2012), the degree of construct validity associated with a data collection instrument is

established by ensuring that the definition of the variables under study reflects the theoretical meaning of such variables. The variables being measured in this study are all derived from the study's research questions and the data collection instrument was designed to collect data from research participants on the specific variables in the research questions, hence ensuring construct validity.

Ethical Procedures

To ensure ethical protection of research participants, this study was conducted in accordance with the Walden University Institutional Review Board's (IRB) research policies and guidelines. The basic principle is to ensure research participants are protected from any harm as a result of participating in the research study. In addition, research participants are supposed to be made aware of voluntary participation, informed consent, confidentiality, right to service, and anonymity (Cosby & Bates, 2012).

The ethical concern of informed consent was addressed by ensuring that the purpose of my research study was made very clear to all research participants, and that their willingness to participate in the study was voluntary and that one was aware that they were free to withdraw from the participation if they felt uncomfortable with the participation (Leedy & Ormrod, 2005). A consent statement, with IRB approval number 05-15-17-0441590, was included at the landing page of the online questionnaire, to which all participants were required to consent to as a precondition proceeding to the online questionnaire.

As it is standard practice, it was necessary to conceal the details of both the provider of organizational data as well as data pertaining to participating organizations.

This was achieved by ensuring total anonymity of participants. Disclosure of personal or organizational information was not requested as evidenced in the data collection questionnaire. It was also essential that research findings are presented to professional colleagues in a complete and honest manner, without any misrepresentations whatsoever, aimed at self-glorification or in support of a specific conclusion. At all times the professional code of ethics for social scientists was observed. The invitation letter sent out to potential participants, at the very minimum, explained how the information gathered was to be used and secured. In addition, an outline of any potential risks to participants as well as an indication of the estimated amount of time required to complete the survey were provided.

As required of social science research, and indeed any research where human subjects are involved, the research questionnaire used was presented to the IRB for permission to proceed with the research. The data collected was used purely for the intended research work. To ensure protection of data, more than one copies of the data will be maintained (for backup purposes), and the data shall be maintained for up to seven years after completion of dissertation or in accordance with any other requirements that may be imposed by the Walden university or as may be required by the Government of the Republic of Kenya. The said data shall only be accessible to the researcher, and the researcher's dissertation committee, if required, and no other parties shall have access to the said data.

Summary

This study sought to understand the influence investment decision-making, as relates to ICT, has on OP. It was noted that both mediating and moderating effects do exist however due to resource constraints, no effort was made to test for their effect sizes.

In this chapter, the rationale for the selection of the quantitative research design, which was logically derived from the research questions and the associated hypotheses, is provided. The target populated for the study was articulated and the determination of the study sample size was presented. The study variables and the method that was used to explore the relationships between the variables is discussed in this chapter.

The procedure for recruiting participants and how participants engaged in the study is documented. The data collection approach, using an online-based survey instrument, is discussed. The justification for employing the surveymonkey.com hosted questionnaire is also provided in this chapter. It was confirmed that sufficient data was indeed gathered with 170 valid responses received. While the nonprofits that made up the sampling frame were those in Kenya, the study results may be generalizable to those in other countries as most nonprofit organizations operating in Kenya are global in nature.

The reliability and validity of a survey instrument is crucial for study results to hold. In addition to providing instrument reliability measures, the chapter provides an explanation of treatment of threats to the validity of study results. This is preceded by a detailed discussion of the data analysis plan, with an explanation of the rationale for selecting the correlation and regression analysis techniques. The procedures articulated

in this chapter were therefore deemed sufficient to enable quality participant selection, data collection, analysis, interpretation, and reporting; these tasks are undertaken in Chapter 4, which follows below.

Chapter 4: Results

Introduction

The purpose of this quantitative study was to explore, understand, and explain the relationship between investments in ICT and OP. I explored the correlation (or lack thereof) between (a) investments in ICT systems that organizations would typically invest in, (b) the impact of such investments on the effectiveness of decision making, and (c) various elements through which OP may be measured. This study sought to understand the predictive power that making investments in certain types of ICT systems has on the effectiveness of decision making, and hence on OP in an organization. An online survey instrument was used to collect data to test the hypotheses (see Chapters 1). The 84-item questionnaire covered decision making performance and OP factors. Following the methodology articulated in Chapter 3, the data collected in the study was cleaned, coded, and then analyzed using IBM SPSS, version 21. The results of the data analysis and the study findings are presented in this chapter.

This chapter covers the following topics: a discussion of the validity and reliability of the instrument used in the study, the study population, the sampling frame and size, the data collection procedure, participants' demographic characteristics, and the study results, primarily using descriptive statistics and tests of hypotheses. A summary of the elements covered in the chapter and an introduction to chapter 5 conclude this chapter.

Data Collection

The study sample was drawn from nonprofit organizations operating in Kenya; data collection followed the process outlined in Chapter 3. Since it was difficult to identify, beforehand, the organizations and individuals that met all criteria for participation, invitations to participate in the study were extended to all nonprofit organizations registered with the NGO Coordination Board of Kenya. Respondents were asked to provide demographic information about themselves and the organization they worked for. This information enabled the selection of respondents only from those who met the original criteria. Some respondents were reached through main contacts within their organizations.

The data collection exercise took 28 days; 211 responses were received. Out of the 211 responses, 41 did not fully meet the set criteria and were dropped, leaving a sample of 170. Using G*Power software, the sample size was determined to be a minimum of 111. Thus the requirement for the study was met. Based on the 211 responses obtained out of the roughly 400 e-mail messages sent out, an overall response rate of about 53% was attained. Out of the 53% overall response rate, the valid response rate was about 42.5%.

Population and Sample

The data included in this study, as set out in Chapter 3, met the following criteria: - (a) the research participant had worked in the organization for at least five years, (b) the research participant was in a management position within the organization they were reporting on, (c) the organization the research participant worked for had used ICT for at

least five years, (d) the organization the research participant worked for had an average annual organizational budget of at least, over a 3-year period, US$10 million, (e) the organization the research participant worked for had a minimum of 10 full-time employees, and (f) the organization the research participant worked for was in the nonprofit sector in Kenya. The sample included major nonprofit organizations with operations outside Kenya as well although the data sought was that which related to the organizations' operations in Kenya.

The above criteria for qualifying for the study was partially articulated in the invitation to participate in the study, which also doubled as 'informed consent" letter. The researcher presented demographic questions to research participants to enable identification of nonqualifying participants. In order to increase chances of collecting informed feedback, only employees in the target organizations at management level were considered. The criterion-based sampling method was deemed suitable due to its appropriateness to the nature of study, and the level of skill and knowledge necessary for the provision of responses sought from research participants.

Instrumentation

The data collection exercise was undertaken using a questionnaire-based survey that was based on the measurement instrument developed by Prof. C. K. Hou (Hou, 2013). The research questionnaire, made available to research participants online, consisted of 68 items that measured factors affecting decision making performance and OP as well as 13 general demographic-type questions. The factors that were used to measure the effect of ICT investments on decision-making performance were system

quality, data quality, decision-making communication, and decision-making process (Hou, 2013). Data was also collected to assist in estimating the effect of investments in ICT towards financial perspectives, internal processes perspectives, learning and growth perspectives, and customer perspectives of an organization's health. Respondents were asked, through a 7-point Likert-type scale, to express their levels of agreement or disagreement with items that measured the four perspectives outlined above. The study responses ranged from 1 (*strongly disagree)* to 7 (*strongly agree)* with a score of 7.

Data Collection Procedure

The data collection exercise started after approval to proceed with research was obtained from the IRB. The procedure started with the gathering of potential participants' e-mail addresses. The addresses were obtained through publicly available channels and did not involve any direct contact with the potential participants; these included organizational websites, LinkedIn profiles or telephone calls to the various organizations' publicly available telephone numbers to seek e-mail addresses of ICT and non-ICT management staff. E-mail addresses were provided without much questioning, but where receptionists were hesitant to provide e-mail addresses of their managers, the option of sending the invitation message to a general mailbox or a single person's mailbox was used. In the latter case, the recipient already offered, or was asked, to distribute the invitation to participate in the study to relevant internal persons.

The online survey was hosted on the surveymonkey.net website. Surveymonkey.net is a secure website, and has been used to host similar research studies in the past. The data collection was purely anonymous and no personally identifiable

information was collected. Even the feature that collects participant's IP address information was turned off. At the close of the data collection period, the raw data was downloaded onto the researcher's computer, password protected, and copies stored in three different secure locations. As required by the University, the raw data collected will be maintained for at least 5 years then destroyed thereafter.

Data Screening

The data obtained from respondents was exported from the Surveymonkey.net online application into a Microsoft Excel file. The data file was then opened in Excel and examined for missing data and data that did not meet the qualifying set criteria, which were then deleted. After the non-qualifying data items were deleted, the data containing only valid responses was saved in another 'clean" Excel file. The clean file was then imported into IBM SPSS Statistics version 21 for statistical data analysis.

Demographic Characteristics

The study survey included 13 demographic questions. The demographic questions were meant to collect basic demographic data on research participants and the organizations they worked for. Such information, that included participant's tenure at the organization, category of management of the participant, number of fulltime employees at the organization, and organization's annual budget, among others, was necessary for the elimination of data that was not valid for the study. Demographic information was also collected on the nonprofit's organization's core mission, years of use of ICT, number of staff in ICT department, organization's annual operating and ICT budgets, participant's work section, gender, age group and highest level of education. As earlier

stated, the study resulted in 170 valid responses being collected. Since the data collection exercise was anonymous, it was neither possible to know the number of organizations represented in the study nor the number of participants per organization.

The valid responses represented organizations with annual budgets ranging from the minimum required of US $10 million to over US $100 million. Organizations with a budget range of between US $50 million and US $100 million represented the most frequently reported range at 63 (*n* = 63, 37.1%, see Table 5). Interestingly, 30% of the respondents' organizations had annual budgets in excess of U S$100 million (*n* = 51, 30.0% see Table 5).

Table 5

Participants' Organizational Average Annual Budget (US$)

		Frequency	Percent	Valid percent	Cumulative percent
Valid	$10,000,000 – $50,000,000	56	32.9	32.9	32.9
	$50,000,000 – $100,000,000	63	37.1	37.1	70.0
	Above $100,000,000	51	30.0	30.0	100.0
	Total	170	100.0	100.0	

The data gathered represented responses from managers working within the respective organizations. Even though the roles of the managers who participated in the study varied from general management, ICT management, general management with strong ICT expertise, and other management categories, it was noted that ICT management had the highest representation, accounting for 40% of the total responses (*n* = 68, 40.0%, see Table 6). The responses under the categories of ICT and general

management made up 87.1% of all respondents with the remainder falling under the category of Other Management (n = 22, 12.9%, see Table 6).

Table 6

Category of Management of Participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	General Management	50	29.4	29.4	29.4
	General management with strong ICT expertise	30	17.6	17.6	47.1
	ICT Management	68	40.0	40.0	87.1
	Other management category	22	12.9	12.9	100.0
	Total	170	100.0	100.0	

In order to ensure appropriateness of data for the research study, the researcher needed responses from managers in organizations with more than 10 employees. The data obtained revealed that the most common respondents worked in organizations with a minimum staff population of 21 and a maximum of 100, with between 21 and 50 accounting for 34.1% while between 51 and 100 employees had 57 responses accounting for 33.5% (*n* = 58, 34.1% and *n* = 57, 33.5% respectively, see Table 7).

Table 7

Number of Full-time Employees in the Participants' Organization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11 – 20	17	10.0	10.0	10.0
	21 – 50	58	34.1	34.1	44.1
	51 – 100	57	33.5	33.5	77.6
	Above 100	38	22.4	22.4	100.0
	Total	170	100.0	100.0	

Table 8 reveals that the organizations where all respondents worked had used ICT for at least 5 years (n = 170, 100%), hence the validity of the data.

Table 8

Years of Use of ICT by Participants' Organizations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5 or more years	170	100.0	100.0	100.0

Table 9 below shows the distribution of on years participants had worked in the organizations they provided data about. The data provided revealed that a slight majority, at 54.1%, of participants had worked with their organizations as at time of the study for more than 5 years (n = 92, 54.1%) while 45.9% had worked for between 4 and 5 years with their organizations (n = 78, 45.9%, see Table 9).

Table 9

Participants' Tenure in Organization

		Frequency	Percent	Valid percent	Cumulative percent
Valid	4 – 5 years	78	45.9	45.9	45.9
	Over 5 years	92	54.1	54.1	100.0
	Total	170	100.0	100.0	

Table 10 below presents descriptive statistics on the distribution, by core mission, of the nonprofit organizations the research participants were employed with. The data obtained represents responses from participants spread across 10 different sectors within which the nonprofit organizations operated. Organizations whose core missions focused on agriculture and education were most represented with frequencies of 37 and 33 and accounting for 21.8% and 19.4% of the total respondents respectively.

Table 10

Categories of Nonprofit Organizations Where Participants Were Employed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Advocacy	24	14.1	14.1	14.1
	Agriculture	37	21.8	21.8	35.9
	Education	33	19.4	19.4	55.3
	Foundation	16	9.4	9.4	64.7
	Healthcare	18	10.6	10.6	75.3
	humanitarian and development	1	.6	.6	75.9
	Media	1	.6	.6	76.5
	Other	1	.6	.6	77.1
	Religious	23	13.5	13.5	90.6
	Research	16	9.4	9.4	100.0
	Total	170	100.0	100.0	

The survey attracted responses from managers within ICT departments more than any other with 31.8% of participants being in ICT departments (n = 54, 31.8%, see Table 11). This was as would be expected as the results of the study could have direct impact on the ICT practitioners. Finance and Executive Management were the next two departments with high responses at 30 and 27, with a combined representation of 33.5% of total valid responses (see Table 11). The three departments of ICT, finance and executive management contributed 65.3% of the total responses. Coincidentally, staff in the three departments (ICT, finance and executive management) would ideally be expected to be most knowledgeable on the information requested for in the survey hence explaining the high response rate. The departments of strategy and analytics, grants management, human

resources, research & development, and resource mobilization had the lowest response rates at 1%, 4%, 6%, 6%, and 6% respectively (see Table 11).

Table 11

Distribution of Participants by Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Executive Management	27	15.9	15.9	15.9
	Finance	30	17.6	17.6	33.5
	Grants Management	4	2.4	2.4	35.9
	Human Resources	6	3.5	3.5	39.4
	ICT	54	31.8	31.8	71.2
	Monitoring & Evaluation	10	5.9	5.9	77.1
	Policy	11	6.5	6.5	83.5
	Programs	15	8.8	8.8	92.4
	Research & Development	6	3.5	3.5	95.9
	Resource Mobilization	6	3.5	3.5	99.4
	Strategy & Analytics	1	.6	.6	100.0
	Total	170	100.0	100.0	

Interestingly, there was absolute gender parity in the research participation with 50% of respondents being male and 50% being female (see Table 12 below).

Table 12

Participants' Gender Distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	85	50.0	50.0	50.0
	Male	85	50.0	50.0	100.0
	Total	170	100.0	100.0	

Even though descriptive statistics were analyzed for all demographic data gathered, only demographic responses that were either a prerequisite for inclusion in the study or significant to note are presented above; these include years of use of ICT by the organization, number of full-time employees in the organization, annual budget for the organization, the number of years the participant had worked for the organization, nonprofit sector distribution, participants department-wise view, and gender analysis of participants.

Study Results

The study results presented in this chapter were obtained following analysis of collected data, at a significance level, i.e. alpha, of 0.05, using the procedures outlined in Chapter 3. The results are organized into two sections. The first section provides a description of the statistics that characterize the sample used in the study. The second section contains statistical analysis findings organized around the six research questions and hypotheses that guided this study.

As indicated earlier, the study was undertaken using a published measurement instrument developed by Prof. C. K. Hou (Hou, 2013). However additional questions were added to the scale to collect demographic type data as well as to measure the effect of investments in other ICT systems different from the enterprise systems that Prof. C. K. Hou included in his scale. Sullivan and Artino Jr. (2013) recognize the fact that "researchers frequently create Likert-type items and group them into a "survey scale" and then calculate a total or mean score for the scale items"; such is common when the object

of a study is to measure concepts that are not concrete and where a single survey may not be able to fully capture the concept being measured (Sullivan & Artino Jr., 2013). Sullivan and Artino Jr. (2013) further stated that in such scenarios, experts recommend the use of Cronbach's alpha, among other tests, to provide evidence that all the components of the expanded scale adequately inter-correlate and that the grouped items measure the underlying variable (Sullivan & Artino Jr., 2013). It provides a measure of the variability in the survey responses purely resulting from differences in the respondents, i.e. it gives the assurance that answers to a survey only differ because respondents have differing opinions about a survey item and not because the survey items lack clarity.

Table 13 below shows the reliability measure for the scale used. The obtained Cronbach's alpha value of 0.933 indicates a very strong level of internal consistency for the scale used in the study. In addition, a review of the Item-Totals Statistics for the scale reveals that for all items, the Cronbach's alpa remains the same or reduces except if the item on "business intelligence system usage" is deleted. Since the "Corrected Item-Total Correlation" for the "business intelligence system usage" item is small (0.074), deleting the item would only result in a minimal increase (0.001) in the Cronbach's alpa value (see Appendix C, Table C1), there is therefore no sufficient reason to delete the item from the scale.

Table 13

Reliability Statistics for the Scale Used

Cronbach's Alpha	Cronbach's Alpha based on Standardized Items	No of items
.933	.932	72

Descriptive statistics were used to provide measures of central tendency and variation of the data collected. The statistics used to offer a view of the sample data included mean, median, mode, range, and standard deviation to measure central tendency and range to demonstrate the variability of the data, that is, the difference between lowest and highest scores for each of the items measured.

Descriptive statistics for the study were generated and reported for constructs that related to subscales that measure the effect of ICT investments on decision making performance, namely, system quality, data quality, decision-making process and decision-making communication. In addition, descriptive statistics were degenerated and reported on the effect of ICT investments on OP through the subscales of internal processes perspectives, customer perspective, learning and growth perspective as well as the financial perspective (see Table D1 to Table D19 in Appendix D).

Table 14 below shows the numbers of questions that were used to measure each of the constructs in the study. The responses obtained depicted a reasonable distribution across the 7-point Likert-type scales.

Table 14

Study responses by Construct and Subscale

Construct	Dimension	Number of items	Scale Mean	Variance	Std. Deviation	Cronbach's Alpha
Decision making performance	Decision-making process	14	75.859	41.329	6.4288	.748
	System Quality	12	60.900	48.197	6.9424	.777
	Data quality	10	56.388	24.156	4.9149	.705
	Decision making communication	6	35.588	7.451	2.7296	.551
OP	Internal processes perspective	9	36.029	40.431	6.3585	.833
	Financial perspective	5	13.159	26.229	5.1214	.815
	Customer perspective	4	15.888	12.325	3.5107	.747
	Learning & growth perspective	8	41.306	18.959	4.3542	.718

Decision Making Performance. The decision making performance construct was measured by seeking perspectives of managers from organizations within the study population, the nonprofit sector in Kenya, using four dimensions, namely decision-making process, system quality, data quality, and decision making communication. The

decision making process was measured using 14 Likert-type items on a 7-point scale to understand the levels of agreement or otherwise with the statements presented on the impact of ICT investments towards facilitating identification of appropriate criteria for effective decision making.

The system quality dimension, which sought to understand the performance of ICT systems in the organizations studied presented 12 survey items to gauge the level of respondents' rating of flexibility, reliability, ease of use, and timeliness of response of systems relative to ICT investments. In order to gain an understanding of the perception of leadership on the role ICT plays in facilitating data quality, 10 survey questions were presented to gauge the levels of perceived relationships between ICT investments and availability of data that met user expectations.

The fourth dimension used to measure this construct was the decision making communication which presented six Likert-type survey items that sought to assess the attribution of ICT investments to the efficiency and effectiveness of communicating decisions. In order to create an index for each of the dimensions of the decision making construct, a mean of the survey item responses making up the dimension were computed. The mean was chosen as opposed to summation because it is easier to relate to the original scores since, like the original scale, it has a minimum score of 1 and maximum score of 7. A mean value above 3.5 implies more agreement with the survey item and a lower than 3.5 value implies disagreement with the statement. Table 15 provides descriptive statistics for the decision making construct which indicate a lean towards more agreement with the survey items.

Table 15

Descriptive Statistics for the Decision Making Performance Dimension

	N	Survey Items	Range	Min	Max	Mean	Std. Deviation
Decision-making communication	170	6	3.5	3.5	7.0	5.931	.4560
Data Quality	170	10	2.6	4.4	7.0	5.639	.4915
Decision-making process	170	14	2.7	4.1	6.8	5.415	.4618
System quality	170	12	3.3	3.7	7.0	5.085	.5756
Valid N	170						

OP. The OP construct used in this study was modeled along the Balanced Score Card (BSC) concept that was developed by Kaplan and Norton (1992) and originally published in 1992 (Hou, 2013). Respondents provided their assessments on their level of agreement or disagreement with statements that associated investments in ICT with OP measures of financial, customer, internal business processes, and learning and growth perspectives. Responses were captured on a seven-point Likert type scale with a score of 1 representing *strongly disagree* and a score of 7 representing *strongly agree* with the survey item presented.

The financial perspective dimension sought to gather assessments of managers on the impact of ICT investments on productivity improvement, revenue growth, and cost control. The financial perspective was measured using five seven-point Likert type items. The customer perspective was measured using four survey items on a seven-point Likert type scale. The contribution of ICT investments on internal business processes perspective was measured using 8 survey items while the relationship between ICT

investments and OP through learning and growth perspectives was measured using eight Likert-type survey items.

Table 16 provides descriptive statistics for the OP construct. The data gathered revealed an interesting phenomenon that the mean for the impact of ICT investments on OP, from the financial perspective, is below 3.5 implying a general trend towards disagreement with the statements in the survey. At a mean of 5.181 and standard deviation of .5457, respondents were in more agreement on the effect of ICT investments on learning and growth perspective factors than any of the other factors within the OP construct.

Table 16

Descriptive Statistics for the OP Dimension

	N	Survey Items	Range	Min	Max	Mean	Std. Deviation
Internal process perspective	170	9	4.3	2.7	7.0	4.006	.7053
Financial perspective	170	5	5.6	1.0	6.6	2.632	1.0243
Customer perspective	170	4	4.7	2.3	7.0	3.995	.8788
Learning and growth perspective	170	8	2.8	4.0	6.8	5.181	.5457
Valid N	170						

Evaluation of Statistical Assumptions

Prior to commencing statistical tests of the hypotheses under this study, the tests below were undertaken to ensure that assumptions of the statistical tests used were not violated.

1. That there were no outliers. The research study collected data using a 7-

point Likert-type scale. There was therefore no room for any respondent to provide inaccurate or incomplete data. This assumption was therefore met.

2. The assumption of adequacy of cases to predictors was met. The study sample of 170 was far much higher than 116 (= 104 + M), i.e. 104 + 12 where M is the number of independent variables used in the multiple regression model.
3. The assumption of multicollinearity was met since all the predictors were within acceptable levels of correlation, i.e. Tolerance is > 0.1 or VIF < 10 for all variables (see Appendix D Tables D20 to D30).
4. The assumption of independence of errors was met because the computed Durblin-Watson statistic of the model was within the acceptable range of 1 to 3 (Field, 2014), implying that there was no first order linear autocorrelation in the linear regression data.
5. The assumption of homoscedasticity of data was also met. This is depicted in Appendix D Tables D31 - D33 where the descriptive statistics values for Kurtosis and Skewness are less than the standard error, indicating that there was no significant degree of skewness or kurtosis in the data hence no evidence of significant deviation from normality for the residuals. The same is confirmed by the normality plots (see Appendix F Figures F7 - F9) in which the observed residual values lie closely to the true normal distribution line hence the data in question satisfies the conditions for performing a ANOVA analysis.

6. The assumption of normality of residuals of the regression line was met as demonstrated by the normal P-P plots (see Appendix F Figures F1 to F6).

Subsequent to ensuring that the variables being tested met the appropriate statistical assumptions, the analysis that follow were undertaken to determine if any relationships existed between the predictor and outcome variables studied.

Statistical Analysis Findings

As aptly stated by Pollard (2014), hypothesis testing assumes the null hypothesis to be true and involves testing it for possible rejection while the alternative hypothesis is assumed to be false but tested for acceptance. As it is standard, the null hypothesis is denoted by H_0 while the alternative hypothesis is denoted by H_1. The *p*-value, representing the probability value of the null hypothesis, was obtained from the statistical tests undertaken, and used to draw inferences on whether to reject or accept the null hypothesis. In interpreting the implication of the *p*-value, I followed the widely accepted view that a *p*-value that is lower than a set alpha (α-) value indicates that the null hypothesis is unlikely to be true hence should be rejected and the alternative hypothesis be accepted while to the contrary, if the *p*-value is higher than the α-value, which is 0.05 in this study, the null hypothesis is accepted and the alternative hypothesis is rejected (Wetzels & Wagenmakers, 2012).

Since the purpose of this study was to identify correlations, Pearson correlation coefficients were used to test the hypotheses. Multiple regression analysis was also used to estimate the model characteristics as well as to estimate the strength and direction of the relationships between the predictor and outcome variables. The above statistical

analysis techniques have been used in similar studies hence the credibility of their selection (Qian, Cao, & Takeuchi, 2013). Two-tailed statistical tests were conducted since the researcher did not have prior knowledge of the nature of the relationships between the study variables.

Research Question 1

How is decision making performance in an organization related to investments in ICT? This question sought to understand the collective effect of making investments in ICT on an organization's performance outcomes (Yuthas & Eining, 1995, p.72 as in Hou, 2013). The approach to answering this question was grounded on seminal work by Hamilton and Chervany (1981) (as in Hou, 2013) which suggested that "information systems (IS or ICT) effectiveness may be evaluated in terms of the extent to which IS contributes to effectiveness of improving IS usage with the aim of improving the decision making performance and seeking to achieve corporate objectives" (Hou, 2013). In order to understand the correlation between decision making performance and investments in ICT, the following hypothesis was tested: -

H_{01}: There is no strong correlation between investments in ICT / ICT usage and decision-making performance.

H_{a1}: There is a strong correlation between investments in ICT / ICT usage and decision-making performance.

The Pearson correlation statistics indicated that there was a positive correlation between investments in the four types of ICT systems and decision making performance, as depicted in Table 17 below.

Table 17

Correlation Coefficients Between Decision Making Performance and Investment in ICT.

			1	2	3	4	5
1	Decision Making Performance	Pearson Correlation	1	.386**	.413**	.181*	.340**
		Sig. (2-tailed)		.000	.000	.018	.000
		N	170	170	170	170	170
2	Management Information system usage	Pearson Correlation	.386**	1	.392**	.076	.066
		Sig. (2-tailed)	.000		.000	.323	.390
		N	170	170	170	170	170
3	Monitoring and Evaluation system usage	Pearson Correlation	.413**	.392**	1	.105	.183*
		Sig. (2-tailed)	.000	.000		.172	.017
		N	170	170	170	170	170
4	Business Intelligence system usage	Pearson Correlation	.181*	.076	.105	1	.320**
		Sig. (2-tailed)	.018	.323	.172		.000
		N	170	170	170	170	170
5	Integrated information system usage	Pearson Correlation	.340**	.066	.183*	.320**	1
		Sig. (2-tailed)	.000	.390	.017	.000	
		N	170	170	170	170	170

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

The null hypothesis was further tested using multiple regression analysis. As it is standard, the data was tested for violation of relevant statistical assumptions. The value of Durbin-Watson of 2.347 meets the independence of residuals requirement. In addition none of the tolerance values was higher than 0.9 hence no high correlation among the predictor variables implying no multicollinearity.

The results of the tests returned a significant regression equation ($F(4,165)= 18.117$, $p < .001$) and an $R^2 = .305$ implying that 30.5% of variance in the decision making performance overall model was accounted for by the combination of

relationships between investments in management information system, monitoring and evaluation system, business intelligence system, and an integrated information management system with a standard error of the estimate at .3312 (see Tables 18 and 19).

Table 18

Regression Model Summary for ICT Investments and Decision Making Performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.552[a]	.305	.288	.3312

a. Predictors: (Constant), Integrated information system usage, Management Information system usage, Business Intelligence system usage, Monitoring and Evaluation system usage.

Table 19

Analysis of Variance between Decision-Making Performance and ICT Investments

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.947	4	1.987	18.117	.000[b]
	Residual	18.094	165	.110		
	Total	26.041	169			

a. Dependent Variable: Decision Making Performance
b. Predictors: (Constant), Integrated information system usage, Management Information system usage, Business Intelligence system usage, Monitoring and Evaluation system usage

The regression model coefficients in Table 19 inform that investments in MIS, MES and IIS were individually statistically significant in predicting decision making performance at $p < 0.05$ (two-tailed) while investments in BIS were not statistically correlated with DMP. The bias corrected and accelerated bootstrap 95% CI supported the regression coefficients findings that decision-making performance was indeed

significantly correlated with MIS investments, r = .121 [.059, .181]; MES investments, r = .117 [.065, .173]; IIS investments, r=.094 [.045, .059] (all ps < .001) and that investments in BIS were not significantly related with the DMP construct, r = .022 [-.053, .100] (p > .05) (see Appendix E Table E1a). However collectively, investments in all the four ICT systems strongly predicted decision making performance. The multiple regression equation (equation model) generated is represented as:

ODMP = 3.495 + .121MIS + .117MES + .022BIS + .094IIS (see Table 20): -

Table 20

Regression Model Coefficients for ICT Investments and Decision Making Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.495	.260		13.454	.000
	Management Information system usage (MIS)	.121	.032	.264	3.739	.000
	Monitoring and Evaluation system usage (MES)	.117	.033	.257	3.586	.000
	Business Intelligence system usage (BIS)	.022	.030	.050	.735	.463
	Integrated information system usage (IIS)	.094	.025	.259	3.738	.000

Note. Dependent Variable: Decision Making Performance

The above results indicate that there was a statistically significant positive correlation between investments in ICT and decision making performance. The positive correlation implying that the two variables change in the same direction. The null hypothesis was therefore rejected and the alternative hypothesis that there is a

strong correlation between investments in, hence usage of, ICT and decision making performance was accepted.

Additional Statistical Tests of Hypotheses

During the analysis of the main hypothesis H_{01}, four additional hypotheses that were found useful in the study emerged, as listed below: -

H_{01a}: There is no strong correlation between investments in MIS and DMP. Results of analysis indicated that a strong positive correlation existed between DMP and MIS investments, r =.121 [.059, .181] $p < .001$) (see Appendix E Table E1a). This hypothesis was therefore rejected and the alternative hypothesis accepted.

H_{01b}: There is no strong correlation between investments in MES and DMP. Results of analysis indicated that a strong positive correlation existed between the effectiveness of decision making and investing in monitoring and evaluation systems, r = .117 [.065, .173] ($p < .001$) (see Appendix E Table E1a). The null hypothesis was rejected and the alternative hypothesis accepted.

H_{01c}: There is no strong correlation between investments in BIS and DMP. Results of analysis established that investments in BIS were not significantly related with the DMP construct, r = .022 [-.053, .100] ($p > .05$) (see Appendix E Table E1a). The null hypothesis was therefore accepted, and the alternative hypothesis rejected.

H_{01d}: There is no strong correlation between investments in IIS and DMP. Results of analysis established that investments in IIS investments correlated positively with DMP, r = .094 [.045, .059] ($p < .001$) (see Appendix E Table E1a). The null hypothesis was rejected and the alternative hypothesis accepted.

Research Question 2

What is the correlation between investments in ICT and OP? This question sought to understand the relationship between making investments in ICT and the overall OP. The key objective is to examine whether organizations improve their OP following investments in MIS, MES, BIS, and IIS. To achieve the above objective, the following hypothesis was put forth for testing:

H_{02}: There is no strong correlation between investments in ICT / ICT usage and OP.

H_{a2}: There is a strong correlation between investments in ICT / ICT usage and OP.

The first task undertaken was to run a correlation test to determine if there were any relationships between MIS, MES, BIS and IIS, individually and collectively, and OP. Tables 21 and 23 below depict that there is a relationship between each of the ICT investments factors measured and OP. In fact there is a positive correlation between investments in MIS, MES and IIS and OP while there is a weak negative relationship between investments in BIS and OP with r = - 0.096 (see Table 22). However the bias corrected and accelerated bootstrap 95% CI revealed further that OP was indeed significantly correlated with MIS investments, r =.213 [.082, .351] and IIS investments, r = .128 [.054, .207] (all ps < .05) while investments in MES and BIS were not significantly correlated with the OP construct, r = .052 [-.038, .142] (p > .05) and, r = -.318 [-.291, .015] respectively (see Appendix E Table E1b).

Table 21

Analysis of Variance between OP and ICT Investments Factors

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.258	4	2.815	7.981	.000[b]
	Residual	58.190	165	.353		
	Total	69.448	169			

a. Dependent Variable: OP

b. Predictors: (Constant), Integrated information system usage, Management Information system usage, Business Intelligence system usage, Monitoring and Evaluation system usage

The ANOVA results returned a significant regression equation ($F(4,165)= 7.981$, $p < .001$) and an $R^2 = .162$ implying that 16.2% of variance in the OP overall model was accounted for by the combination of relationships between investments in management information system, monitoring and evaluation system, business intelligence system, and an integrated information management system with a standard error of the estimate at .5939 (see Tables 21 and 22).

Table 22

Regression Model of OP and ICT Investments Factors

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.403[a]	.162	.142	.5939	.162	7.981	4	165	.000	1.333

a. Predictors: (Constant), Integrated information system usage, Management Information system usage, Business Intelligence system usage, Monitoring and Evaluation system usage
b. Dependent Variable: OP

Table 23

Regression Model Coefficients for ICT Investments and OP

			1	2	3	4	5
1	Management Information system usage	Pearson Correlation	1	.392**	.076	.066	.313**
		Sig. (2-tailed)		.000	.323	.390	.000
		N	170	170	170	170	170
2	Monitoring and Evaluation system usage	Pearson Correlation	.392**	1	.105	.183*	.201**
		Sig. (2-tailed)	.000		.172	.017	.009
		N	170	170	170	170	170
3	Business Intelligence system usage	Pearson Correlation	.076	.105	1	.320**	-.096
		Sig. (2-tailed)	.323	.172		.000	.212
		N	170	170	170	170	170
4	Integrated information system usage	Pearson Correlation	.066	.183*	.320**	1	.186*
		Sig. (2-tailed)	.390	.017	.000		.015
		N	170	170	170	170	170
5	OP	Pearson Correlation	.313**	.201**	-.096	.186*	1
		Sig. (2-tailed)	.000	.009	.212	.015	
		N	170	170	170	170	170

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

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

Multiple linear regression analysis was undertaken to further explain the extent of the relationship between the predictor and outcome variables.

The regression model coefficients in Tables 22 and 23 inform that investments in MIS, MES and IIS were individually statistically significant in predicting decision making performance but not investments in BIS. It was noted that investments in BIS seemed to have an insignificant negative correlation with OP. However collectively, investments in all the four ICT systems strongly predicted OP. The multiple regression equation (model equation) generated is represented as:

OP = 2.546 + .213MIS + .052MES - .138BIS + .128IIS

The results in Table 24 indicate that, overall, there was a statistically significant positive correlation between investments in ICT and OP. The positive correlation implying that the two variables change in the same direction. The null hypothesis was therefore rejected and the alternative hypothesis that there is a strong correlation between investments in, hence usage of, ICT and OP was accepted.

Table 24

ANOVA Statistics between Decision Making Performance and OP

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32.751	4	8.188	36.814	.000[b]
	Residual	36.697	165	.222		
	Total	69.448	169			

a. Dependent Variable: OP
b. Predictors: (Constant), Decision-making communication, Decision-making process, Data Quality, System quality

Additional Statistical Tests of Hypotheses that Emerged

During the analysis of the main hypothesis H_{02}, four additional hypotheses that were found useful in the study emerged, as listed below:

H_{02a}: There is no strong correlation between investments in MIS and OP. Results of analysis indicated that a strong positive correlation existed between OP and MIS investments, $r = .213$ [.082, .351] ($p < .05$) (see Appendix E, Table E1b). The null hypothesis was therefore rejected and the alternate hypothesis rejected.

H_{02b}: There is no strong correlation between investments in MES and OP. Results of analysis indicated that no correlation existed between OP and investments in MES, $r = .052$ [-.038, .142] ($p > .05$) (see Appendix E Table E1b). The null hypothesis was therefore accepted and the alternate hypothesis rejected.

H_{02c}: There is no strong correlation between investments in BIS and OP. Results of analysis indicated that no correlation existed between OP and investments in $r = -.318$ [-.291, .015] ($p > .05$) (see Appendix E Table E1b). The null hypothesis was therefore accepted and the alternate hypothesis rejected.

H_{02d}: There is no strong correlation between investments in IIS and OP. Results of analysis indicated that a strong positive correlation existed between OP and IIS investments, $r = .128$ [.054, .207] ($p < .05$) (see Appendix E Table E1b). The null hypothesis was therefore rejected and the alternate hypothesis rejected.

Research Question 3

What is the correlation between decision making performance and OP? This question sought to understand whether decision making performance had an effect on OP. The hypothesis below was tested to establish existence of correlation between the two variables:

H_{03}: There is no strong correlation between decision-making performance and OP.

H_{a3}: There is a strong correlation between decision-making performance and OP.

A Pearson product-moment correlation was computed to assess the relationship between decision making performance and OP. Table 24 shows that there was a positive correlation between all the decision making performance dimensions (decision-making process, system quality, data quality, and decision-making communication) and OP [r = .625, n = 170, p = 0.01] (see Table 25).

The regression model summary depicts a positive strong correlation with R = 0.687 and that nearly half of variation (47.2%) in OP is explained by the combination of relationships between decision making performance factors (see Table 24).

The regression model coefficients in Table 25 inform that when all decision making performance factors are considered, DMP did predict OP. It was noted though that the model had a negative intercept. Individually, the system quality and decision making communication dimensions of decision making performance had a significant positive correlation with OP while the correlation between decision making process and data quality did not predict OP in any significant manner. This was affirmed by the bias corrected and accelerated bootstrap 95% CI results which indicated that OP was not significantly correlated with decision-making process, r = -.039 [-.254, .182] (p > .05) and data quality r = -.014 [-.209, .199] (p > .05) but was significantly correlated with system quality, r =.655 [.421, .852] (p < .001); decision-making communication r = .304 [.071, .554] (p < .05) (see Appendix E Table E1c). In the overall model though,

decision making performance seemed to significantly predict OP ($F(4,165)= 36.814$, $p < .001$) and an $R^2 = .472$ implying that close to half (47.2%) of the variance in the OP overall model was accounted for by the combination of relationships between the decision-making performance factors with a standard error of the estimate at .4716 (see Tables 22b & 24).

The multiple regression equation (equation model) generated is represented as:

OP = -0.774 - .039DMP + .635SQ - .014DQ + .304DMC

The results in Table 22b indicate that decision making performance was a statistically significant factor in the OP model. This is affirmed by the ANOVA statistics which indicate a significant relationship between combined effect of the predictors and the dependent variable. The correlation implies that while system quality and decision making performance change in the same direction as OP, the contrary is true for decision making process and data quality. In fact the introduction of data quality into the model results in an insignificant F Change statistic though that does not affect the overall model. The null hypothesis is therefore rejected and the alternative hypothesis accepted.

Table 25

ANOVA for Investments in DMP Factors and OP

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32.751	4	8.188	36.814	.000[b]
	Residual	36.697	165	.222		
	Total	69.448	169			

a. Dependent Variable: OP

b. Predictors: (Constant), Data Quality, Decision-making communication, Decision-making process, System quality

Table 26

Model Summary for Investments in BIS, MIS, IIS and MES and OP

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.403[a]	.162	.142	.5939	.162	7.981	4	165	.000	1.333

a. Predictors: (Constant), Business Intelligence system usage, Management Information system usage, Integrated information system usage, Monitoring and Evaluation system usage

b. Dependent Variable: OP

Table 27

Model Summary for Decision Making Performance and OP

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.687[a]	.472	.459	.4716	.472	36.814	4	165	.000	1.182

a. Predictors: (Constant), Decision-making communication, Decision-making process, Data Quality, System quality

b. Dependent Variable: OP

Table 28

Correlations of Decision Making Performance and Management Information System Usage

			1	2	3	4	5
1	Management Information system usage	Pearson Correlation	1	.392**	.076	.066	.313**
		Sig. (2-tailed)		.000	.323	.390	.000
		N	170	170	170	170	170
2	Monitoring and Evaluation system usage	Pearson Correlation	.392**	1	.105	.183*	.201**
		Sig. (2-tailed)	.000		.172	.017	.009
		N	170	170	170	170	170
3	Business Intelligence system usage	Pearson Correlation	.076	.105	1	.320**	-.096
		Sig. (2-tailed)	.323	.172		.000	.212
		N	170	170	170	170	170
4	Integrated information system usage	Pearson Correlation	.066	.183*	.320**	1	.186*
		Sig. (2-tailed)	.390	.017	.000		.015
		N	170	170	170	170	170
5	OP	Pearson Correlation	.313**	.201**	-.096	.186*	1
		Sig. (2-tailed)	.000	.009	.212	.015	
		N	170	170	170	170	170

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

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

Research Question 4

How does a firm's investment in ICT affect OP and decision making performance? This question sought to provide an understanding of the effect of investments in ICT on OP as well as its effect on decision making performance. In addition to understanding the existence of a correlation, there was need to understand which, among the two dependent variables, had a higher impact on OP. A test of the hypothesis below was carried to provide the explanation sought:

H_{04}: There is a no stronger correlation between investments in ICT / ICT usage and decision-making performance than between investments in ICT / ICT usage and OP.

H_{a4}: There is a stronger correlation between investments in ICT / ICT usage and decision-making performance than between investments in ICT / ICT usage and OP.

In order to establish the difference in the contribution of investments in ICT to decision making performance and OP, two multiple correlation tests were carried out.

The first test was a forced entry regression in which both investments in ICT and decision making performance were treated as independent variables, with OP being the dependent variable. The result of this test indicated a significant correlation between the two predictor variables and OP with Pearson correlation coefficients of .403 and .671 with and without decision making process being included in the model respectively (r = 0.403, $p < .001$ and $r = .671$, $p < 0.001$ respectively). The overall model revealed that the combined effect of the two independent variable factors accounted for 45.1%. It was also noted that if the effect of decision making process was removed from the model, the contribution of investments in ICT in the variability of the model was 16.2% implying that decision making process alone accounted for 28.9% (see Tables 26, 27 & 29).

Table 29

Correlations: ICT Investments, Decision Making Performance and OP

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin - Watson
					R Square Change	F Change	df 1	df2	Sig. F Change	
1	.403[a]	.162	.142	.5939	.162	7.981	4	165	.000	
2	.671[b]	.451	.434	.4823	.289	86.140	1	164	.000	1.218

a. Predictors: (Constant), Integrated information system usage, Management Information system usage, Business Intelligence system usage, Monitoring and Evaluation system usage

b. Predictors: (Constant), Integrated information system usage, Management Information system usage, Business Intelligence system usage, Monitoring and Evaluation system usage, Decision Making Performance

The second test was a forced entry regression analysis with investments in ICT factors being the only independent variables and, again, OP being the dependent variable. The result depicted a significant correlation with $r = .552$, $p < .001$ and R^2 of .305 implying that investments in ICT accounting for 30.5% in variance in OP. Therefore, from the respective contributions in the variance in decision making performance of 16.2% resulting from investments in ICT and 30.5% of variance in OP resulting from investments in ICT, it may be concluded that indeed the correlation between investments in ICT (or ICT usage) and decision-making performance is not stronger than the correlation between investments in ICT (or ICT usage) and OP. The null hypothesis was therefore accepted and the alternate hypothesis rejected.

Table 30

ANOVA: ICT Investments, Decision Making Performance and OP

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.258	4	2.815	7.981	.000[b]
	Residual	58.190	165	.353		
	Total	69.448	169			
2	Regression	31.297	5	6.259	26.907	.000[c]
	Residual	38.151	164	.233		
	Total	69.448	169			

a. Dependent Variable: OP

b. Predictors: (Constant), Integrated information system usage, Management Information system usage, Business Intelligence system usage, Monitoring and Evaluation system usage

c. Predictors: (Constant), Integrated information system usage, Management Information system usage, Business Intelligence system usage, Monitoring and Evaluation system usage, Decision Making Performance

Additional Statistical Tests of Hypotheses that Emerged

During the analysis of the main hypothesis H_{04}, four additional hypotheses that were found useful in the study emerged, as listed below: -

H_{04a}: There is no stronger correlation between investing in MIS and DMP than between MIS and OP. Results of analysis, using standardized coefficients (beta values), indicated that a stronger positive correlation did not exist between investing in MIS and DMP ($\beta = .264$, $p < .001$) than that which existed between OP and MIS investments ($\beta = .286$, $p < .001$), (see Appendix E1a, E1b Table). The null hypothesis was therefore accepted and the alternate hypothesis rejected.

H_{04b}: There is no stronger correlation between investing in MES and DMP than between MES and OP. Results of analysis indicated that a stronger correlation existed between MES and DMP ($\beta = .257$, $p < .001$) than between OP and investments in MES

(β = .070, $p < .001$) (see Appendix E Tables E1a, E1b). The null hypothesis was therefore rejected and the alternate hypothesis accepted.

H_{04c}: There is no stronger correlation between investing in BIS and DMP than between BIS and OP. Results of analysis indicated that no stronger correlation existed between BIS and DMP (β = .050, ns $p = .463$) than between OP and investments in BIS (β = -.194, $p < .05$) (see Appendix E Tables E1a, E1b). The null hypothesis was therefore accepted and the alternate hypothesis rejected.

H_{04d}: There is no stronger correlation between investing in IIS and DMP than between IIS and OP. Results of analysis indicated that a stronger positive correlation existed between investing in IIS and DMP (β = .259, $p < .001$) than between OP and IIS investments (β = .216, $p < .05$) (see Appendix E Tables E1a, E1b). The null hypothesis was therefore rejected and the alternate hypothesis rejected.

Research Question 5

How is decision making performance affected by information quality compared with system quality? This question sought to understand which between the two factors of information quality and system quality has a higher effect on decision-making performance. The following hypothesis was tested to gain the required understanding:

H_{05}: There is no stronger correlation between information quality and decision making performance than between system quality and decision making performance.

H_{a5}: There is a stronger correlation between information quality and decision making performance than between system quality and decision making performance.

A multiple correlation analysis was conducted in two steps. The first as a forced entry regression analysis in which are the factors for measuring decision making performance were entered into the model at once. The analysis revealed a highly significant positive correlation (at 0.05 level) between all the four factors and the outcome variable. The computed values indicate that if system quality increased by one unit (β = 0.253), decision making performance would increase by 0.253 units while a unit increase in data quality (which for purposes of this research was assumed to be equivalent to information quality) would result in a 0.249 increase in decision making performance (see Table 31). The above would be true only if the effects of decision-making communication and decision-making process were held constant.

Table 31

Correlation Coefficients for Decision Making Performance Factors

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.055	.035		1.587	.114
	System quality	.253	.006	.370	45.570	.000
	Data Quality	.249	.006	.312	42.595	.000
	Decision-making communication	.240	.006	.279	41.480	.000
	Decision-making process	.252	.006	.296	43.741	.000

a. Dependent Variable: Decision Making Performance

In order to ascertain the findings above, a further multiple correlation was undertaken, this time eliminating decision-making process and decision-making communication. The results were as above but with a minor improvement in the effect of

the two predictor variables with unstandardized coefficients of .422 and .324 for system quality and data quality respectively as depicted in Tables 32 & 33 below.

Table 32

Correlation Coefficients for Decision Making Performance Factors

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.559	.132		11.841	.000
	System quality	.422	.025	.619	16.793	.000
	Data Quality	.324	.029	.405	11.002	.000

a. Dependent Variable: Decision Making Performance

Table 33

Model Summary: System Quality, Data Quality and Decision-Making Performance

Model	R	R Sq.	Adj.R Square	Std. Error of the estimate	Change Statistics					Durbin-Watson
					R Square change	F change	df1	df2	Sig. F change	
1	.874[a]	.764	.762	.1915	.764	542.461	1	168	.000	
2	.929[b]	.863	.861	.1462	.099	121.037	1	167	.000	1.959

a. Predictors: (Constant), System quality

b. Predictors: (Constant), System quality, Data Quality

c. Dependent Variable: Decision Making Performance

The null hypothesis is therefore accepted, and the alternative hypothesis rejected.

Research Question 6

What is the correlation between investments in MES, MIS, BI or an integrated system and OP? The question sought to understand whether there existed any significant differences in the effects of investing in the different ICT systems on OP. In order to address this question, the hypothesis below was tested:

H_{06}: There is no stronger correlation between investing in an integrated system and OP than between individual ICT systems and OP.

H_{a6}: There is a stronger correlation between investing in an integrated system and OP than between individual ICT systems and OP.

The data obtained in the study reveals that indeed there is a variance in effects on OP of investing in MIS, MES, BIS and IIS. The computed statistics indicated that there was a significant correlation between OP and usage of MIS (r = .213, p < .001), BIS (r = -.138, p = .05), and IIS (r = .128, p < .05) but not with MES system usage (r = .052, ns, p = .376) (see Table 34). The results indicate a positive significant relationship between MIS and IIS, and OP while the relationship between OP and investments in BIS is negative meaning that a unit increase in expenditure on BIS would result in a decrease in OP by .138 units. If one considered only investments in MES and BIS, then the null hypothesis would be accepted and alternate hypothesis rejected. However, investments in MIS were the strongest contributor to OP (r = .213, p < .001) (see Table 34). The latter would result in the rejection of the null hypothesis hence acceptance of the alternative hypothesis.

Additional Statistical Tests of Hypotheses that Emerged

During the analysis of the main hypothesis H_{06}, three additional hypotheses that were found useful in the study emerged, as listed below: -

H*06a*: There is no stronger correlation between investing in IIS and OP than between MIS and OP. Results of analysis revealed that correlation between IIS & OP as significant (β = .216, p < .001) while correlation between MIS and OP was slightly

stronger (β = .286, $p < .001$) (see Table 34). The null hypothesis is therefore accepted, and the alternative hypothesis rejected.

H*06b*: There is no stronger correlation between investing in IIS and OP than between MES and OP. Results of analysis revealed that correlation between IIS & OP as significant (β = .216, $p < .001$) while correlation between MES and OP was neither any stronger nor significant (β = .070, ns, $p = .376$) (see Table 34). The null hypothesis is therefore rejected, and the alternative hypothesis accepted.

H*06c*: There is no stronger correlation between investing in IIS and OP than between BIS and OP. Results of analysis revealed that correlation between IIS & OP as significant (β = .216, $p < .001$) while correlation between BIS and OP, even though negative, was still not any stronger (β = -.194, $p = .011$) (see Table 34). The null hypothesis is therefore rejected, and the alternative hypothesis accepted.

Table 34

Correlation Coefficients between ICT Investment Options and OP

Coefficients[a]												
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.546	.466		5.465	.000	1.626	3.466					
	Management Information system usage	.213	.058	.286	3.686	.000	.099	.327	.313	.276	.263	.845	1.183
	Monitoring and Evaluation system usage	.052	.059	.070	.887	.376	-.064	.167	.201	.069	.063	.821	1.218
	Business Intelligence system usage	-.138	.054	-.194	-2.579	.011	-.244	-.032	-.096	-.197	-.184	.894	1.119
	Integrated information system usage	.128	.045	.216	2.834	.005	.039	.218	.186	.215	.202	.875	1.143

a. Dependent Variable: OP

Summary

Data were collected from the nonprofit sector in Kenya, an exercise that lasted 28 days. A total of 211 responses were received out of which 41 did not meet the set study criteria. The objective of the study being to explore and get to understand the contribution of investments in ICT towards OP, six questions were addressed through statistical tests of hypothesis. The study made use of a tested and validated measurement instrument but the researcher added demographic questions in order to filter out responses from participants that did not qualify for the study and made minor cosmetic changes to the questions for ease of understandability. The researcher retested the questionnaire based on the data received and the Cronbach's alpha statistic obtained affirmed scale reliability.

In order to respond to the 6 study questions, multiple correlation and multiple regression analysis techniques were employed. Making use of Pearson correlation, it was established that indeed the effectiveness of the decision-making process, hence the decision making performance correlated positively well with investments in ICT. Similarly, investments in two of the four elements of ICT correlated positively with OP. Overall, it was established that investments in ICT positively correlated with both decision-making performance and OP but its contribution towards OP was more elaborate.

An interesting finding from the respondents' data was that investments in business intelligence systems correlated negatively with OP and that investments in monitoring and evaluation systems did not significantly contribute towards an improvement in OP. The negative correlation between investments in BIS and OP may

be attributable to the fact that business intelligence systems are primarily used to complement other systems and may not contribute to positive OP in isolation of other information systems. Respondents may therefore have perceived sole investments in BIS as non-value adding to their organizations. The lack of a significant association between investments in MES and OP may be explained by the fact that MES have primarily been used to measure external impact of organizational interventions and not necessarily to track improvements in internal business processes and performance. Respondents may therefore have been at odds in correlating investments in MES and OP. Table 35 below provides a summary of hypotheses testing results.

Table 35

Summary of Tests of Hypotheses

Research Question	Null Hypothesis	Pearson's Correlation Coefficient	*p*-value	Accept/ Reject
How is decision making performance in an organization related to investments in ICT?	H_{01}: There is no strong correlation between investments in ICT / ICT usage and decision-making performance.	.552	<0.001	Reject
	H_{01a}: There is no strong correlation between investments in MIS and DMP	.264	<.001	Reject
	H_{01b}: There is no strong correlation between investments in MES and DMP	.257	<.001	Reject
	H_{01c}: There is no strong correlation between investments in BIS and DMP	.050	ns, p = .463	Accept
	H_{01d}: There is no strong correlation between investments in IIS and DMP	.259	<.001	Reject
What is the correlation between investments in ICT and OP?	H_{02}: There is no strong correlation between investments in ICT / ICT usage and OP.	.403	<.01	Reject
	H_{02a}: There is no strong correlation between investments in MIS and OP	.286	<.001	Reject
	H_{02b}: There is no strong correlation between investments in MES and OP	.070	ns, p = .376	Accept

	H_{02c}: There is no strong correlation between investments in BIS and OP	-.194	<.05	Accept
	H_{02d}: There is no strong correlation between investments in IIS and OP	.216	<.05	Reject
What is the correlation between decision making performance and OP?	There is no strong correlation between decision-making performance and OP.	.687	<.01	Reject
		Standardized Regression Coefficient Beta (β)	*p*-value	Accept/ Reject
How does a firm's investment in ICT affect OP and decision making performance?	H_{04}: There is a no stronger correlation between investments in ICT / ICT usage and decision-making performance than between investments in ICT / ICT usage and OP.	ICT/DMP R^2=.305 ICT/OP R^2=.162	<.001	Reject
	H_{04a}: There is no stronger correlation between investing in MIS and DMP than between MIS and OP.	.264 / .286	<.001 <.001	Accept
	H_{04b}: There is no stronger correlation between investing in MES and DMP than between MES and OP.	.257 / .070	<.001 ns, *p*= .376	Reject
	H_{04c}: There is no stronger correlation between investing in BIS and DMP than between BIS and OP.	.050 / -.194	ns, *p*=.463 <.05	Accept
	H_{04d}: There is no stronger correlation between investing	.259 / .216	<.001 <.05	Reject

	in IIS and DMP than between IIS and OP.			
How is decision making performance affected by information quality compared with system quality?	There is no stronger correlation between information quality and decision making performance than between system quality and decision making performance.	.405 /.619	<.001	Accept
What is the correlation between investments in ERP, MIS, BI or an integrated system and OP?	H_{06}: There is no stronger correlation between investing in an integrated system and OP than between individual ICT systems and OP.	.034 / .128	.015 / <.001	Accept
	H_{06a}: There is no stronger correlation between investing in IIS and OP than between MIS and OP.	.216 /.286	$p < .001$	Accept
	H_{06b}: There is no stronger correlation between investing in IIS and OP than between MES and OP.	.216 /.070	ns, $p = .376$	Reject
	H_{06c}: There is no stronger correlation between investing in IIS and OP than between BIS and OP.	.216 /-.194	$p = .011$	Reject

Note. All tests at *p*-values <.05.

In the chapter that follows, a discussion of the results and interpretation of study findings are presented. In addition, conclusions, recommendations for further research, and implications for social change form part of Chapter 5.

Chapter 5: Summary, Conclusions, and Recommendations

Introduction

Leadership in nonprofit organizations is under a lot of pressure from their funders to carefully manage efficiency ratios (Parsons, Pryor & Roberts, 2014). Efficiency ratios are proportions of total expenses that an organization spends on its core mission, such as administrative or program ratios. Since donors are consistently using these ratios as metrics for measuring nonprofit organizations' efficient use of the funds entrusted to them, and possibly determine continued donor support, the drive to manage overhead costs is at the top of every nonprofit's management agenda. The use of ICT has been proven to contribute, to a reasonable extent, to efficiency in nonprofit operations. ICT costs have therefore tended to constitute a significant proportion of nonprogram costs in nonprofits, hence drawing the attention of management on the need to efficiently manage such costs in order to keep the efficiency ratios to acceptable levels (Kitching, Roberts, & Smith, 2012).

The purpose of this quantitative study was to explore the relationships between investments in ICT and OP. As nonprofits endeavor to achieve their organizational objectives, the need to carefully allocate resources among competing alternatives (for example, for the attainment of organizational efficiency and effectiveness) becomes more apparent. This study was posited on the fact that prioritizing resources has an impact on OP and that ICT was considered a key factor in influencing OP. Informed decision making is necessary for such prioritization (Lewis & Smith, 2014; Smith, 2014) yet despite the consensus that the effective use of ICT improves OP, the real impact of ICT on OP remains unclear. An understanding of the effect investments in ICT would have on

OP is expected to offer a sound basis upon which decisions are made for the achievement of the desired optimal allocation of scarce resources.

The study findings revealed that, indeed, the consolidated effects of investments in MIS, MES, BIS and IIS were significantly related to decision making effectiveness. However, whereas there was positive correlation with MIS, MES, and IIS, no significant correlation was noted between investments in BIS and DMP. Even though the consolidated effect of investing in ICT on DMP was strong, investing in individual systems resulted in a weak to medium effect on decision making performance.

The study further revealed that, similar to DMP, the consolidated effects of investments in MIS, MES, BIS and IIS were significantly related to OP. Whereas there was positive correlation with MIS, BIS, and IIS, no significant correlation was noted between investments in MES and OP. It was noted that there was a negative association between investing in BIS and OP. This suggests that spending additional resources on BI systems without spending on complementary systems may decrease OP.

Interpretation of the Findings

The literature review and analysis, detailed in Chapter 2, highlighted past findings that reiterated the contribution of ICT to OP, such as the works of Piget and Kossaï (2013) and Salge et al. (2015). The review also noted the diverse literature that spanned fields beyond information systems in which contradictory findings on the value of ICT to OP were voiced (Kohli & Devaraj, 2003; Carr, 2003). This study found associations that were consistent with this perspective, but only at a granular level, for example, when investment in a particular ICT area is considered in isolation from investments in other ICT areas—a situation that seldom happens.

It was noted that even though significant amount of work had been done in the past in this study's research domain (Hussain & Oshikoya, 1998; Oshikoya & Hussain, 1998; Piget & Kossaï, 2013; Salge, Kohli & Barrett, 2015), little literature existed that investigated associations among the constructs this study delved on from a nonprofit perspective. The findings in this study therefore extend the understanding of the relationships between investments in ICT and OP with a specific focus on the nonprofit sector from a developing economy perspective; this is deemed a valuable addition to the common body of knowledge.

The study findings are generally consistent with the findings of the study undertaken by Prof. C.K. Hou on the effect of using enterprise resource planning systems on decision making performance and OP, a study conducted among the semiconductor industry companies in Taiwan (Hou, 2013); this finding may suggest that, after all, there might not be a significant difference in the trend between the effects of ICT investments on OP in for-profit and nonprofit organizations. Such a suggestion though would be a subject of confirmation by a separate study.

In this study, the researcher made use of a cross-sectional survey, where all data was collected at one point in time (over a period of 28 days) from managers in nonprofit organizations in Kenya. After appropriate data management was undertaken, the survey data was analyzed using IBM SPSS version 21 software. Pearson correlation and multiple regression analysis were employed to assist in identifying whether the study constructs were significantly associated or not, and to estimate the strength and direction of any relationships as guided by Field (2016). An analysis and interpretation of the study

findings are outlined in the section that follows, organized by research question and hypothesis.

Research Question 1

This question inquired whether organizations benefited from making investments in ICT by way of achieving improvements in the performance of their decision making roles. One hypothesis was used to examine whether "there is no strong correlation between investments in ICT / ICT usage and decision-making performance". Test results suggested that investments in ICT were statistically significantly associated with a nonprofit organization's improved decision-making performance (r = .552, p < .001). In fact the combined effect of investing in MIS, MES, BIS, and IIS explained 30.5% of the effectiveness of organizational decision making with an adjusted R^2 = .288. This finding is consistent with that in Prof. C-K. Hou's study in which integrated information systems usage (ERPBI) was found to be positively related to decision-making performance with standardized estimate = .311, t = 3.367, p < 0.001 (Hou, 2013).

A further investigation revealed that investments in MIS, IIS, and MES systems all contributed strongly to decision making effectiveness with standardized Beta (β) values of .264, .259 ,and .257 respectively. The results did not reveal any significant association between investments in BIS and decision-making performance. This result, which is consistent with practice, confirms that there would be no need of investing in a BIS alone if the other ICT systems did not exist. It is an important result as it reasserts the value of investing in the four ICT components for effective organizational decision making. In addition, the finding further stresses the importance of the need for

organizations to make investments in areas that empower managers to make effective decisions, and one such area has empirically been confirmed to be in ICT.

Research Question 2

The second question in this study inquired whether there existed any relationship between investments in ICT and OP. In order to explore this relationship, one hypothesis which advanced that "there is no strong correlation between investments in ICT / ICT usage and OP" was tested. The study results suggested that there was indeed a statistically significant positive association between investing in ICT and overall OP (r = .403, $p < .001$). The results revealed that the total effect of investing in MIS, MES, BIS and IIS accounted for 16.2% of any variance in OP. The result of the total effect of investing in the four ICT elements were consistent with past findings by Prof. C-K Hou (Hou, 2013).

In addition to the above tested hypothesis, at the time of analysis, it was found necessary to investigate whether investing in the individual ICT systems of MIS, MES, BIS and IIS had an impact of resultant OP or not, and if so establish the comparative extent. The findings revealed that the use of MIS, BIS and IIS had a statistically significant association with OP as demonstrated by the standardized beta (β) values of .286, -.194, and .216 (and $p < .001$, $p < 05$, $p < .05$ respectively) for MIS, BIS, and IIS respectively. The results showed that nonprofit organizations that invested in MIS and IIS had higher degrees of OP than those that invested in BIS only. Further, investments in BIS may result in a decrease in OP.

The findings indicated that investing in MES alone did not significantly affect decision making. The results also indicated that investing in ICT had a higher effect on

DMP (r = .552, p < .001) than OP (r = .403, p < .001). However since there is a higher correlation coefficient between DMP and OP (r = .625, p < .001), it is implied that organizations which invested in ICT as instruments for decision making achieved better OP results than those that invested in ICT without DMP in mind. The results in this study are consistent with those obtained by Prof. C-K Hou, despite the difference in the population sampled, where it was established that organizations that used ERPBI (similar to IIS in this study) attained better DMP and OP than those that made use of only a single ICT system such as in an ERP system (Hou, 2013).

Research Question 3

This question inquired whether there was a relationship that could be explained statistically between decision making performance and OP. To explore this inquiry, the hypothesis that "there was no strong correlation between decision-making performance and OP" was formulated. Results obtained suggested that there was indeed a strong association between decision-making performance and OP (r = .625, p < .001) with decision-making performance accounting for 39.1% of the effects of OP. The finding of a strong positive relationship between decision-making performance and OP is consistent with past findings in past research by Hou (2013). The finding further reinforces the view advanced by Hamilton and Chervany (1981) and Hou (2013) who emphasized that decision-making performance by employees influenced OP. It is therefore in the best interest of any organization to empower its decision makers as decision making capabilities have direct effects on the performance of the organization.

Research Question 4

This question inquired whether investing in ICT affected OP and decision making performance the same or differently and if so attempt to assess the strength of such effects. One hypothesis had initially been formulated to address this question, however upon further examination, four other hypotheses were formulated in order to address the question more exhaustively. The original null hypothesis was "there is no stronger correlation between investments in ICT / ICT usage and decision-making performance than between investments in ICT / ICT usage and OP.". The four additional hypotheses that were formulated to support the original hypothesis were:

H_{04a}: There is no stronger correlation between investing in MIS and DMP than between MIS and OP.

H_{04b}: There is no stronger correlation between investing in MES and DMP than between MES and OP.

H_{04c}: There is no stronger correlation between investing in BIS and DMP than between BIS and OP.

H_{04d}: There is no stronger correlation between investing in IIS and DMP than between IIS and OP.

The study findings revealed that when all ICT investments elements of MIS, MES, BIS and IIS are taken together, they explain 16.2% of the OP model ($r = .403$, $p < .001$) and 30.5% of the decision making performance model ($r = .552$, $p < .001$). The results confirmed that investments in ICT had a stronger influence on decision-making performance than they had on OP. Hypothesis H_{04a} sought to understand whether MIS contributed more significantly to DMP than OP. The findings, interpreted using

standardized regression coefficients (beta) value, revealed a stronger association between investments in MIS and OP (B = .286) than MIS and DMP (B = .264). The results for H_{04b} revealed a stronger influence of MES on DMP (B = .257, p < .001) but there was no significant correlation noted between MES on OP. Results for H_{04c} revealed that investing in BIS did not have a direct influence on DMP but it was negatively correlated with OP (B = -.194, p < .05). The results for test of H_{04d} supported the null hypothesis that there was a stronger relationship between IIS and DMP (B = .259, p < .001) than between IIS and OP (B = .216, p < .05). These findings may assist managers in investment decision-making to understand the 'mix and match' necessary for the attainment of optimal OP.

Research Question 5

The fifth research question inquired whether information quality or system quality was a better predictor of decision-making performance. And to address this question, a hypothesis was advanced that there was no stronger correlation between information quality and decision-making performance than between system quality and decision-making performance. Results of analysis provided Pearson correlation coefficients of r = .405, p < .001 for the relationship between information quality (DQ) and DMP and r = .619, p < .001 for system quality (SQ) and DMP. This result indicated that a stronger positive association existed between SQ and DMP than DQ and DMP hence decision makers would need to spend more resources on improving system quality rather than in improving data quality even though both are important contributors towards more decision making effectiveness.

Research Question 6

This, being the last research question in this study, inquired whether any association existed between MES, IIS, MIS, or BI and OP and the extent of such an association if any. In order to respond to this question, an initial hypothesis was formulated. However, during analysis, the need to break the initial hypothesis into three hypotheses was identified in order to enable testing for correlations between individual ICT investment areas and OP. The three hypotheses formulated therefore were: -

H_{06a}: There is no stronger correlation between investing in IIS and OP than between MIS and OP.

H_{06b}: There is no stronger correlation between investing in IIS and OP than between MES and OP.

H_{06c}: There is no stronger correlation between investing in IIS and OP than between BIS and OP.

The findings inform that indeed IIS is a stronger predictor of OP (B = .286, p < .001) than MIS (B = .216, p < .05). The test of hypothesis H_{06b} revealed that IIS predicted OP (B = .216, p < .05) positively but MES was not a significant predictor of OP (B =. 070, ns, p = .376). The final test, of hypothesis H_{06c} indicated that IIS was a better predictor of OP (B = .216, p < .05) than BIS (B = -.194, p < .05). The results inform that OP is not directly predicted by the investments in the individual ICT systems. This appears to be consistent with findings by Hou (2013) in which no direct link was found to exist between OP and usage of integrated systems but rather the effect of use of ERPBI systems on OP was found to be “indirect and heavily mediated by decision-making performance” (Hou, 2013). While evaluating the mediating effects of DMP on use of

individual ICT systems is out of the scope of this study, the above results drive the researcher towards agreeing with past conclusions that the use of ICT may have intermediary effects on improving decision making among other business processes, which consequently influence OP (Soh and Markus, 1995b; Mooney et al., as in Hou, 2013). Therefore, as aptly stated by Hou (2013), managers would be better placed at investing, not to get direct benefit from investments in MIS, MES, BIS and/or IIS, but the effects of intangible benefits accruing from ICT enabled enhancements of decision-making performance.

Limitations of the Study

The results of this study were based on responses from a sample of 170 respondents. Even though the sample met the minimum sample requirement of 113, the responses received may not necessarily reflect the actual situation within the organizations surveyed. The fact that the data collection exercise was wholly anonymous may introduce questions about the level of knowledge of research participants on the organizations they represented.

The study sample was drawn from the population of nonprofit organizations that were based in Kenya, had annual budgets of at least $10million, and had used ICT for at least 5 years. A higher organizational annual budget may not necessarily imply more investments or use of ICT than organizations with lesser annual budgets. In addition, while ICT is such an expansive field, due to limitation of resources, only 4 categories of ICT systems were considered in this study, and the interpretation of the names may vary between organizations and individuals. The results may therefore not be generalizable across industry, geography, and time. Further research may be needed to validate the

findings of this study at a different point in time, in another industry or another geographical location.

The study assumed that any person in a management position was knowledgeable enough to respond to the research questionnaire, and for anonymity purposes, no direct contact was made with respondents. This arrangement may limit the accuracy of responses as there may be chances of misinterpreting the research questions from the perspectives of the different participants and organizations. Therefore, despite best effort, the researcher may not claim absolute accuracy and reliability of the data used in the study. This study also assumed that investments in ICT lead to eventual effective usage of the system; such may not be the case all the time.

Finally, the correlation approach employed in the data analysis in this study has inherent limitations that make more profound findings unattainable. Hence the researcher does not claim causal relationships in his interpretation of the research findings.

Recommendations

The subject of this study is of significant importance to all organizations, nonprofits included, to researchers as well as practitioners. ICT costs will continue to grow, possibly at a rate higher than the growth in financial capabilities of organizations. There is a dire need for informed decision making, hence a reliable model that spans the real world complexities of the ICT field needs to be developed. To ensure thoroughness, accuracy, and completeness of coverage, developing such a model would require a substantial period of time and sound financial backing in order to cover a much larger population, engage the most appropriate persons, and gather data over a couple of years. There is need for an exhaustive model for predicting relationships between all elements

of ICT to assist in managerial decision making that leads to optimal allocation of scarce resources.

This study explored relationships between four factors that measured decision-making performance and four factors that measured OP and explored relationships between these two dimensions and investments in ICT. The study relied purely on the perceptions of respondents rather than objective measures. Future study may focus on verifying the adequacy of the four measures of decision-making performance and OP. Similarly, future research may concentrate on developing a measurement instrument that accommodates a diverse set of ICT investment areas.

For researchers, this study should stimulate interest in further research in areas that improve OP through information and communications technology, especially in the nonprofit sector about which little literature exists. Managers in nonprofit organizations could assess the reliability of predictive power alluded to in the study findings by making ICT investments in the ratios suggested and gauge the resultant levels of decision-making performance and OP.

This study used a cross-sectional research approach due to resource constraints hence did not account for the time-lag required for the effects of ICT investments to yield a payoff. There is therefore a need for further research to explore the impact of investments in ICT on both decision-making performance and OP over a long period of time (Hou, 2013).

Implications

The findings of this study have direct implications for individuals, families, organizations, the society at large, as well as policy makers. At the individual level, this

study empowers people with the tools that may make them important contributors to organizational turnaround. Individuals with the ability to make quick correct decisions that are capable of turning around an ailing organization tend to become sought after thought leaders.

The results of this study empower organizational leaders to know the segments of ICT in which to invest most in order to achieve the highest potential for success. Management in an organization that is caught in between investing the only dollar at their disposal in either MIS, MES, BIS or IIS have a basis for making informed prioritization. The study provides quantitative evidence of the association, direction of association and strength of association between investments in ICT, decision making performance and OP hence availing a basis for justification of expenditure in a particular ICT system over another.

As stated earlier, investments in ICT make up a significant component of an organization's operating budget. The study enlightens leadership on the benefits of investing in ICT that enhances decision making effectiveness as opposed to attempting to use such ICT investments to influence OP directly.

From a social change perspective, this study reveals relationships existing between investments in ICT and other factors that influence nonprofit OP in a manner that could significantly reduce wasteful investments in ICT. Reduced expenditure in ICT elements that do not add business value increases the much sought after program efficiency ratios necessary for continued nonprofit donor support; donor reinvestment and continued support could possibly result in better livelihoods of disadvantaged

communities served by such a nonprofit organization. Enhancement of managerial decision making capabilities is a positive social gain that needs no overemphasis.

This study's findings cast light on past mixed findings on the effect of expenditure in ICT and performance of firms, such as the study on the business value of IT by Camisón and Villar-López (2014). The results of the study clearly explain the relationships, strength and direction, between the various factors contributing to OP and investments in ICT. The study makes significant contributions to the scholarly literature on the relationships between investments in ICT, decision-making performance, and OP in the nonprofit sector, a domain in which such literature was limited. Policy makers, especially those in the donor world, could use this study's findings in the evaluation of efficiency of and stewardship in the use of resources bestowed upon nonprofit organizations.

Conclusions

The world we live in today has become very competitive and complex. There is increased demand for nonprofit organizations to demonstrate unprecedented levels of transparency and accountability as well as on-time reporting to their stakeholders as proof of suitability as worthy stewards of the funds entrusted unto them by donors. The achievement of the required levels of efficient and effective use of resources would be a tall order without the use of ICT systems. The demand by donors to have organizational systems of awardees linked to their ICT systems will continue to evolve. Organizations therefore need to invest in ICT systems and resources that are appropriate to the nature of their business requirements, not only to meet the increasingly complex demands of the day but also to prepare to fit in the total-technology-enabled world of the future.

The business of identifying ICT systems that are appropriate for investing in is broad and complex, and so is OP. Informed ICT investment decision making process is therefore pivotal to the attainment of high levels of OP. This study offers essential guidelines to decision makers as they endeavor to make rational ICT investment decisions for the attainment of OP objectives. This was achieved through a detailed examination of the correlations between investments in four types of ICT systems, decision-making performance, and OP. The existence of significant correlations between all but two of the measured factors were confirmed.

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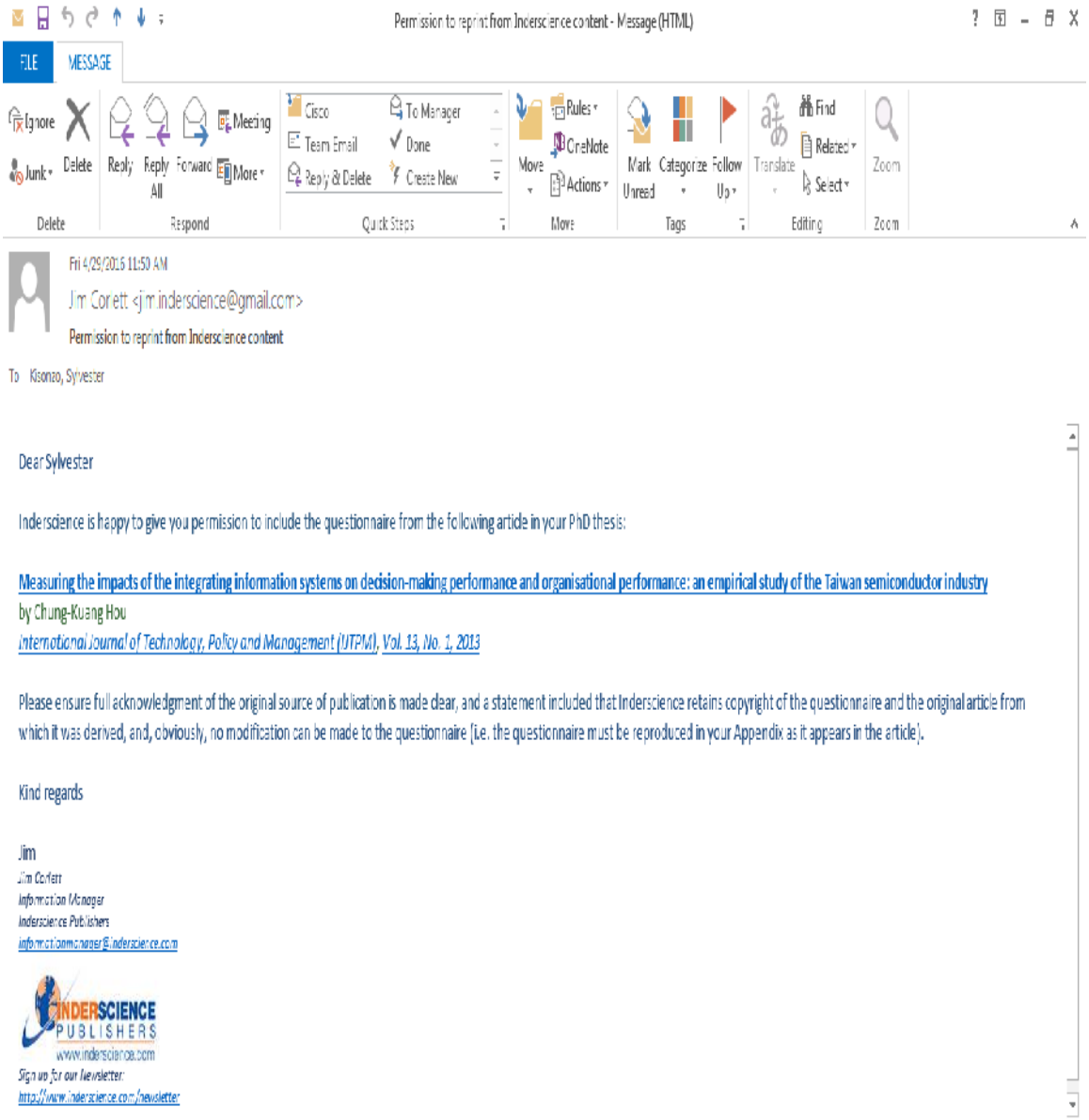
Appendix A: Permission to Use Measurement Instrument



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To Kisonzo, Sylvester

Dear Sylvester

Inderscience is happy to give you permission to include the questionnaire from the following article in your PhD thesis:

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by Chung-Kuang Hou
International Journal of Technology, Policy and Management (IJTPM), Vol. 13, No. 1, 2013

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Appendix B: Research Questionnaire

I thank you most sincerely for taking your time to respond to this questionnaire. The data collected will only be used for academic purposes and will be handled with utmost confidentiality. The completed questionnaire will not be revealed or shared with any third parties other than solely for academic purposes. At any point, you have the right to terminate responding to this questionnaire, or decline from responding to a question should you find it necessary.

The questionnaire is divided into two sections, section A is made up of general questions about the participant and the organization the participants represents while section B is made up of specific interview questionnaire items regarding decision making and organizational performance. Responses to all the questionnaire items in section B shall be measured on a seven-point Likert-type scale that ranges from 'extremely poor' represented by a score of 1 to 'excellent' represented by a score of 7. Please be as objective as you can in responding to the questionnaire items that follow.

A. General Questions

1. How long have you worked in this organization? (select one)
    a. Below 2 years
    b. 2 – 3 years
    c. 4 – 5 years
    d. Over 5 years
2. What is your highest level of education (tick one)
    a. Secondary education
    b. High school

c. Diploma

d. 4-year Bachelor's degree

e. Master's degree

f. Doctorate degree

3. What is the category of management that your position represents (select one)

a. General Management

b. ICT Management

c. General management with strong ICT expertise

d. Other management category

e. Non-management

4. Your nonprofit organization's core mission (tick one):

a. Healthcare

b. Education

c. Religious

d. Advocacy

e. Agriculture

f. Research

g. Foundation

h. Other (specify)

5. What is your organization's current number of full-time employees? (select one)

a. 1 – 10

b. 11 – 20

c. 21 – 50

d. 51 – 100

e. Above 100

6. For how many years has your organization been using ICT? (select one)

a. Below 5 years

b. 5 or more years

7. What is the size of the ICT department, i.e. total staff size? (select one)

a. 1 – 4

b. 5 – 10

c. 11 – 20

d. 21 – 40

e. Above 40

8. What is your organization's annual budget in US$ (average of the last 3 years):

a. Below US$10,000,000

b. $10,000,000 – 50,000,000

c. 50,000,000 – 100,000,000

d. Above 100,000,000

9. What is your organization's annual operating (non-program) budget in US$ (average of the last 3 years):

a. Below US$1,000,000

b. $1,000,000 – 5,000,000

c. 5,000,001 – 10,000,000

d. Above 10,000,000

10. What is your organization's average annual ICT budget (average over the last 3 years)?
    a. Below US$100,000
    b. $100,000 – 500,000
    c. 500,001 – 1,000,000
    d. Above 1,000,000
11. Which department, from below, best describes your work section in your organization?
    a. ICT
    b. Finance
    c. Executive Management
    d. Programs
    e. Policy
    f. Monitoring & Evaluation
    g. Research & Development
    h. Strategy & Analytics
    i. Resource Mobilization
    j. Human Resources
    k. Grants Management
12. What is your gender? (select one)
    a. Male
    b. Female

13. What is your age group, in years? (select one please)

    a. 18 – 29

    b. 10 – 39

    c. 40 – 54

    d. 55 – 64

    e. Above 64

B. Questions relating to decision making performance and organizational performance

To what extent do investments in ICT facilitate the following processes in your organization: Tick the box that best explains the situation in your organization; Only one (1) box may be ticked for each questionnaire item.

A score of 1 implies "*disagree very much*" while a score of 7 implies "*agree very much*".

DMP1	Decision-making process factors: decision making process	1	2	3	4	5	6	7
1.	Identify potential problems and notice before they become serious crises							
2.	Identify potential problems faster							
3.	Identify potential opportunity faster							
4.	Provide alternative solutions							
5.	Examine more alternative solutions							
6.	Spend significantly more time analyzing data before making a decision							
7.	Use more sources of information in decision making							
8.	Engage in more in-depth analysis							
9.	Identify past similar solutions and recommends an appropriate solution							
10.	Forecast the future consequences of using various alternatives							
11.	Make decisions quicker							
12.	Spend less time in meetings							
13.	Shorten the time frame for making decisions							

14.	Improve the reliability of decision processes or outcomes							
DMP2	Decision-making process factors: System quality factors							
		1	2	3	4	5	6	7
15.	Easy to change for supporting your business strategies							
16.	Easy to change for users' new requirements							
17.	Reliable system							
18.	Display information in time whenever a search is performed							
19.	Respond fast when information or reports are requested							
20.	Easy to use							
21.	Convenient to access for users							
22.	Easy to learn for users							
23.	Complete user training							
24.	Sufficient user training							
25.	Superior user training							
26.	Sufficient supports from system vendor							
DMP3	Decision-making process factors: Decision-making communication factors							
		1	2	3	4	5	6	7
27.	Easier to communicate with my workgroup in decision making							
28.	Easier to communicate with others outside my workgroup in decision making							
29.	Easier to communicate with my subordinates in decision making							
30.	Easier to communicate with my superiors in decision making							
31.	Enhance communications among participants involved in jointly making a decision							
32.	Enhances communication among decision-making participants across organizational boundaries							
DMP4	Decision-making process factors: Data quality factors							
		1	2	3	4	5	6	7
33.	Accurate contents							
34.	High reliable information							
35.	Consistent information in all cases							
36.	Applicable to your work							
37.	Up-to-date information							
38.	Complete data							

39.	Easy to comprehend for users							
40.	Easily retrievable							
41.	Quickly retrievable when you need							
42.	Protected against unauthorized access							
OP1	Organizational performance factors: Internal process perspective							
		1	2	3	4	5	6	7
43.	Improve efficiency in operational process							
44.	Facilitate target customer selection							
45.	Facilitate customer acquisition							
46.	Facilitate customer retention							
47.	Identify the opportunities to develop new products or services							
48.	Develop new products or services effectively							
49.	Reduce the cycle time of new product development							
50.	Extend product portfolio through collaboration							
51.	Increase effective production of new products							
OP2	Organizational performance factors: Learning and growth perspective							
		1	2	3	4	5	6	7
52.	Improve employee skills, such as project management							
53.	Improve know-how capabilities of your firm’s employee to perform their jobs							
54.	Improve accessibility of the information							
55.	Improve availability of the information							
56.	Improve capabilities in data analysis and interpretation							
57.	Improve system flexibility and integration in technology infrastructure							
58.	Increase communication across the organization by sharing of knowledge							
59.	Improve the firm’s awareness of shared vision, objectives and values							
OP3	Organizational performance factors: Financial perspective							
		1	2	3	4	5	6	7
60.	Increase return on investment							
61.	Increase return on asset							
62.	Increase profit margin							
63.	Increase market share							
64.	Increase asset utilization							

OP4	Organizational performance factors: Customer perspective (think of customers as organizations or people requiring your organization's services)							
		1	2	3	4	5	6	7
65.	Improve product or service quality							
66.	Reduce customer complaints							
67.	Shorten customer response time							
68.	Promote image and reputation							
SI	Systems Investment/Usage factors: Integrated Systems Usage (7 implies Strongly Agree, 1 implies Strongly Disagree)							
		1	2	3	4	5	6	7
69.	My organization has invested in and makes extensive use of a Management Information System							
70.	My organization has invested in and makes extensive use of a Monitoring and Evaluation System							
71.	My organization has invested in and makes extensive use of a Business Intelligence System							
72.	My organization has invested in and makes extensive use of an integrated IT system (all systems packaged in one enterprise system (ERP))							

Appendix C: Scale Reliability

Table C1

Item-Total Statistics for Scale Used in Study

Item-Total Statistics				
	Scale mean if item deleted	Scale variance if item deleted	Corrected Item-Total correlation	Cronbach's alpha if Item deleted
Speed of identification of potential problems and notification before they become serious crises	352.924	914.828	.307	.932
Speed of identification of potential problems	352.588	922.255	.261	.933
Speed of identification of potential opportunity	353.176	914.075	.323	.932
Ability to provide alternative solutions	353.035	921.348	.260	.933
Ability to examine more alternative solutions	352.829	913.764	.339	.932
The extent of data analysis before making a decision	353.494	922.725	.157	.933
Use of more sources of information in decision making	352.976	912.532	.399	.932
Engagement in more in-depth analysis	352.347	921.021	.269	.933
Identification of past similar solutions and recommendation of an appropriate solution	352.553	917.858	.277	.933
Forecasting the future consequences of using various alternatives	352.653	918.772	.258	.933

Speed of decision making	352.447	919.550	.289	.932
Reduced time spent in meetings	352.935	911.386	.374	.932
Shortened time-frame for making decisions	352.841	911.850	.398	.932
Improved reliability of decision processes or outcomes	352.471	920.866	.265	.933
Ease of change to support business strategies	353.441	906.615	.456	.932
Ease of change to accommodate users' new requirements	353.018	908.645	.394	.932
System reliability	352.771	907.562	.396	.932
Information display time whenever a search is performed	352.335	917.810	.336	.932
Fast response when information or reports are requested	352.288	920.135	.292	.932
Ease of use	352.718	902.689	.496	.931
Convenience of access for users	353.006	907.888	.384	.932
Ease of learning by users	353.559	891.183	.552	.931
Completeness of user training	353.718	902.204	.482	.931
Sufficiency of user training	353.671	900.222	.521	.931
Superiority of user training	353.700	902.034	.490	.931
Sufficiency of support from system vendor	353.559	900.260	.451	.932
Ease of communication with my workgroup in decision making	352.512	916.216	.382	.932

Ease of communication with others outside my workgroup in decision making	352.329	916.802	.375	.932
Ease of communication with my subordinates in decision making	352.188	919.018	.313	.932
Ease of communication with my superiors in decision making	352.224	917.382	.336	.932
Enhanced communications among participants involved in jointly making a decision	352.212	917.470	.341	.932
Enhanced communication among decision-making participants across organisational boundaries	352.288	919.922	.286	.932
Accuracy of contents	353.347	903.601	.504	.931
High reliability of information	352.971	906.100	.460	.932
Consistency of information in all cases	352.324	921.640	.274	.933
Relevancy to your work	352.141	919.921	.296	.932
Timeliness of information	352.171	920.876	.282	.932
Completeness of data	352.341	916.912	.280	.933
Understandability to users	352.776	909.962	.378	.932
Ease of retrieval	352.718	911.257	.374	.932
Speed of retrieval when needed	352.729	913.051	.354	.932
Protection against unauthorised access	352.329	925.666	.178	.933

Improvement of efficiency in operational process	352.506	917.506	.371	.932
Facilitation of targeted customer selection	352.435	916.259	.306	.932
Facilitation of customer acquisition	354.406	897.757	.511	.931
Facilitation of customer retention	354.506	898.630	.506	.931
Identification of opportunities to develop new products or services	354.624	901.112	.469	.931
Development of new products or services more effectively	354.612	899.351	.498	.931
Reduction of cycle time of new product development	354.947	902.346	.480	.931
Extended product portfolio through collaboration	355.024	900.982	.519	.931
Increased effective production of new products	354.924	903.053	.475	.931
Improved employee skills, such as project management	354.194	900.288	.537	.931
Improved know-how capabilities of a firm’s employees to perform their jobs	353.771	904.367	.464	.932
Improved accessibility of information	352.718	905.979	.721	.931
Improved availability of information	352.482	917.872	.359	.932

Improved capabilities for data analysis and interpretation	352.282	922.985	.235	.933
Improved system flexibility and integration in technology infrastructure	352.235	922.927	.223	.933
Increased communication across the organisation by sharing of knowledge	352.906	900.819	.495	.931
Improved firm's awareness of shared vision, objectives and value	353.894	904.841	.457	.932
Increased return on investment	355.524	886.843	.477	.932
Increased return on asset	355.618	895.042	.500	.931
Increased profit margin	355.594	901.118	.468	.931
Increased market share	355.553	890.154	.560	.931
Increased asset utilisation	355.671	892.790	.504	.931
Improved product or service quality	355.488	895.529	.484	.931
Reduced customer complaints	354.982	899.733	.491	.931
Shortened customer response time	353.476	911.849	.346	.932
Improved firm's image	353.059	912.565	.322	.932
Management Information system usage	352.624	914.402	.387	.932
Monitoring and Evaluation system usage	352.282	915.328	.368	.932

Business Intelligence system usage	352.341	930.380	.074	.934
Integrated information system usage	352.541	913.836	.310	.932

Appendix D: Descriptive Statistics

Table D1

Descriptive Statistics for decision-Making Process Factors

	N	Range	Min	Max	Mean	Std. Deviation
Engagement in more in-depth analysis	170	3.0	4.0	7.0	5.876	.8299
Speed of decision making	170	3.0	4.0	7.0	5.776	.8549
Improved reliability of decision processes or outcomes	170	3.0	4.0	7.0	5.753	.8483
Identification of past similar solutions and recommendation of an appropriate solution	170	3.0	4.0	7.0	5.671	.9777
Speed of identification of potential problems	170	4.0	3.0	7.0	5.635	.7822
Forecasting the future consequences of using various alternatives	170	5.0	2.0	7.0	5.571	.9900
Ability to examine more alternative solutions	170	3.0	4.0	7.0	5.394	.9988
Shortened time-frame for making decisions	170	3.0	4.0	7.0	5.382	.9363
Speed of identification of potential problems and notification before they become serious crises	170	4.0	3.0	7.0	5.300	1.0426
Reduced time spent in meetings	170	4.0	3.0	7.0	5.288	1.0114
Use of more sources of information in decision making	170	4.0	3.0	7.0	5.247	.9089

Ability to provide alternative solutions	170	4.0	3.0	7.0	5.188	.8355
Speed of identification of potential opportunity	170	4.0	3.0	7.0	5.047	1.0310
The extent of data analysis before making a decision	170	5.0	2.0	7.0	4.729	1.1705
Valid N (listwise)	170					

Table D2

Descriptive Statistics for Decision-Making Process Scale

	N	Range	Min	Max	Mean	Std. Deviation
Decision-making process	170	2.7	4.1	6.8	5.415	.4618
Valid N (listwise)	170					

Table D3

Descriptive Statistics for Decision-Making Communication Factors

	N	Range	Min	Max	Mean	Std. Deviation
Ease of communication with my subordinates in decision making	170	4.0	3.0	7.0	6.035	.8206
Enhanced communications among participants involved in jointly making a decision	170	4.0	3.0	7.0	6.012	.8284
Ease of communication with my superiors in decision making	170	4.0	3.0	7.0	6.000	.8427
Enhanced communication among decision-making participants across organisational boundaries	170	3.0	4.0	7.0	5.935	.8437
Ease of communication with others outside my workgroup in decision making	170	3.0	4.0	7.0	5.894	.7848
Ease of communication with my workgroup in decision making	170	4.0	3.0	7.0	5.712	.7952
Valid N (listwise)	170					

Table D4

Descriptive Statistics for Decision-Making Communication Scale

	N	Range	Min	Max	Mean	Std. Deviation
Decision-making communication	170	3.5	3.5	7.0	5.931	.4560
Valid N (listwise)	170					

Table D5

Descriptive Statistics for System Quality Factors

	N	Range	Min	Max	Mean	Std. Deviation
Fast response when information or reports are requested	170	3.0	4.0	7.0	5.935	.8151
Information display time whenever a search is performed	170	3.0	4.0	7.0	5.888	.8245
Ease of use	170	4.0	3.0	7.0	5.506	1.0561
System reliability	170	5.0	2.0	7.0	5.453	1.1097
Convenience of access for users	170	4.0	3.0	7.0	5.218	1.1278
Ease of change to accommodate users' new requirements	170	4.0	3.0	7.0	5.206	1.0708
Ease of change to support business strategies	170	4.0	3.0	7.0	4.782	1.0057
Sufficiency of support from system vendor	170	4.0	3.0	7.0	4.665	1.2353
Ease of learning by users	170	4.0	3.0	7.0	4.665	1.2869
Sufficiency of user training	170	4.0	3.0	7.0	4.553	1.0825
Superiority of user training	170	4.0	3.0	7.0	4.524	1.0890
Completeness of user training	170	4.0	3.0	7.0	4.506	1.1000
Valid N (listwise)	170					

Table D6

Descriptive Statistics for System Quality Scale

	N	Range	Min	Max	Mean	Std. Deviation
System quality	170	3.3	3.7	7.0	5.085	.5756
Valid N (listwise)	170					

Table D7

Descriptive Statistics for Data Quality Factors

	N	Range	Min	Max	Mean	Std. Deviation
Relevancy to your work	170	3.0	4.0	7.0	6.082	.8171
Timeliness of information	170	3.0	4.0	7.0	6.053	.8013
Consistency of information in all cases	170	3.0	4.0	7.0	5.900	.7818
Protection against unauthorised access	170	3.0	4.0	7.0	5.894	.8217
Completeness of data	170	3.0	4.0	7.0	5.882	1.0195
Ease of retrieval	170	3.0	4.0	7.0	5.506	1.0161
Speed of retrieval when needed	170	3.0	4.0	7.0	5.494	.9926
Understandability to users	170	3.0	4.0	7.0	5.447	1.0604
High reliability of information	170	4.0	3.0	7.0	5.253	1.0150
Accuracy of contents	170	4.0	3.0	7.0	4.876	1.0100
Valid N (listwise)	170					

Table D8

Descriptive Statistics for Data Quality Scale

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Data Quality	170	2.6	4.4	7.0	5.639	.4915
Valid N (listwise)	170					

Table D9

Descriptive Statistics for Decision Making Performance Scale

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Decision Making Performance	170	2.9	4.0	6.9	5.531	.3925
Valid N (listwise)	170					

Table D10

Descriptive Statistics for Internal Processes Perspective Factors

	N	Range	Min	Max	Mean	Std. Deviation
Facilitation of targeted customer selection	170	4.0	3.0	7.0	5.788	.9742
Improvement of efficiency in operational process	170	3.0	4.0	7.0	5.718	.7632
Facilitation of customer acquisition	170	5.0	2.0	7.0	3.818	1.1801
Facilitation of customer retention	170	5.0	2.0	7.0	3.718	1.1627
Development of new products or services more effectively	170	5.0	2.0	7.0	3.612	1.1574
Identification of opportunities to develop new products or services	170	5.0	2.0	7.0	3.600	1.1635
Increased effective production of new products	170	5.0	2.0	7.0	3.300	1.0870
Reduction of cycle time of new product development	170	5.0	2.0	7.0	3.276	1.0987
Extended product portfolio through collaboration	170	5.0	2.0	7.0	3.200	1.0637
Valid N (listwise)	170					

Table D11

Descriptive Statistics for Internal Process Perspective Scale

	N	Range	Min	Max	Mean	Std. Deviation
Internal process perspective	170	4.3	2.7	7.0	4.006	.7053
Valid N (listwise)	170					

Table D12

Descriptive Statistics for Learning and Growth Perspective Factors

	N	Range	Min	Max	Mean	Std. Deviation
Improved system flexibility and integration in technology infrastructure	170	3.0	4.0	7.0	5.988	.8565
Improved capabilities for data analysis and interpretation	170	4.0	3.0	7.0	5.941	.8119
Improved availability of information	170	3.0	4.0	7.0	5.741	.7716
Improved accessibility of information	170	3.0	4.0	7.0	5.506	.6639
Increased communication across the organisation by sharing of knowledge	170	4.0	3.0	7.0	5.318	1.1170
Improved know-how capabilities of a firm's employees to perform their jobs	170	4.0	3.0	7.0	4.453	1.0662
Improved firm's awareness of shared vision, objectives and value	170	6.0	1.0	7.0	4.329	1.0646
Improved employee skills, such as project management	170	4.0	3.0	7.0	4.029	1.0515
Valid N (listwise)	170					

Table D12

Descriptive Statistics for Learning and Growth Perspective Scale

	N	Range	Min	Max	Mean	Std. Deviation
Learning and growth perspective	170	2.8	4.0	6.8	5.181	.5457
Valid N (listwise)	170					

Table D13

Descriptive Statistics for Learning and Growth Perspective Factors

	N	Range	Min	Max	Mean	Std. Deviation
Increased return on investment	170	6.0	1.0	7.0	2.700	1.6130
Increased market share	170	6.0	1.0	7.0	2.671	1.2999
Increased profit margin	170	5.0	1.0	6.0	2.629	1.1657
Increased return on asset	170	6.0	1.0	7.0	2.606	1.2885
Increased asset utilisation	170	6.0	1.0	7.0	2.553	1.3500
Valid N (listwise)	170					

Table D14

Descriptive Statistics for Financial Perspective Scale

	N	Range	Min	Max	Mean	Std. Deviation
Financial perspective	170	5.6	1.0	6.6	2.632	1.0243
Valid N (listwise)	170					

Table D15

Descriptive Statistics for Customer Perspective Factors

	N	Range	Min	Max	Mean	Std. Deviation
Improved firm's image	170	4.0	3.0	7.0	5.165	1.1024
Shortened customer response time	170	5.0	2.0	7.0	4.747	1.0662
Reduced customer complaints	170	5.0	2.0	7.0	3.241	1.1592
Improved product or service quality	170	6.0	1.0	7.0	2.735	1.3124
Valid N (listwise)	170					

Table D16

Descriptive Statistics for Customer Perspective Scale

	N	Range	Min	Max	Mean	Std. Deviation
Customer perspective	170	4.7	2.3	7.0	3.995	.8788
Valid N (listwise)	170					

Table D16

Descriptive Statistics for Organizational Performance Scale

	N	Range	Min	Max	Mean	Std. Deviation
Organizational Performance	170	4.2	2.6	6.8	3.965	.6410
Valid N (listwise)	170					

Table D17

Descriptive Statistics for ICT Usage Factors

	N	Range	Min	Max	Mean	Std. Deviation
Monitoring and Evaluation system usage	170	6.0	1.0	7.0	5.941	.8614
Business Intelligence system usage	170	5.0	2.0	7.0	5.882	.9025
Integrated information system usage	170	3.0	4.0	7.0	5.682	1.0792
Management Information system usage	170	6.0	1.0	7.0	5.600	.8593
Valid N (listwise)	170					

Table D18

Descriptive Statistics for Decision Making Performance Factors

	N	Range	Min	Max	Mean	Std. Deviation
Decision-making communication	170	3.5	3.5	7.0	5.931	.4560
Data Quality	170	2.6	4.4	7.0	5.639	.4915
Decision-making process	170	2.7	4.1	6.8	5.415	.4618
System quality	170	3.3	3.7	7.0	5.085	.5756
Valid N (listwise)	170					

Table D19

Descriptive Statistics for Organizational Performance Factors

	N	Range	Min	Max	Mean	Std. Deviation
Learning and growth perspective	170	2.8	4.0	6.8	5.181	.5457
Internal process perspective	170	4.3	2.7	7.0	4.006	.7053
Customer perspective	170	4.7	2.3	7.0	3.995	.8788
Financial perspective	170	5.6	1.0	6.6	2.632	1.0243
Valid N (listwise)	170					

Table D20

Correlation Coefficients between Decision-Making Performance and its Measurement Factors

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.055	.035		1.587	.114					
	Decision-making process	.252	.006	.296	43.741	.000	.746	.959	.244	.678	1.474
	System quality	.253	.006	.370	45.570	.000	.874	.962	.254	.471	2.122
	Decision-making communication	.240	.006	.279	41.480	.000	.727	.955	.231	.690	1.449
	Data Quality	.249	.006	.312	42.595	.000	.795	.957	.238	.581	1.721

Note. Dependent Variable: Decision making performance

Table D21

Collinearity Diagnostics between Decision Making Performance and its Measurement Factors

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	Decision-making process	System quality	Decision-making communication	Data Quality
1	1	4.983	1.000	.00	.00	.00	.00	.00
	2	.007	27.288	.19	.01	.52	.03	.01
	3	.004	34.989	.02	.86	.00	.11	.16
	4	.004	36.882	.01	.01	.10	.45	.61
	5	.002	46.582	.78	.11	.37	.42	.21

Note. Dependent Variable: Decision making performance

Table D22

Correlation Coefficients between Decision-Making Performance Factors and Organizational Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-.774	.574		-1.347	.180					
	Decision-making process	-.039	.095	-.028	-.413	.680	.360	-.032	-.023	.678	1.474
	System quality	.635	.092	.570	6.912	.000	.663	.474	.391	.471	2.122
	Decision-making communication	.304	.096	.216	3.176	.002	.503	.240	.180	.690	1.449
	Data Quality	-.014	.097	-.011	-.145	.885	.427	-.011	-.008	.581	1.721

Note. Dependent Variable: Organizational performance

Table D23

Collinearity Diagnostics between Decision-Making Performance Factors and Organizational Performance

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.412	5.460	3.965	.4402	170
Std. Predicted Value	-3.528	3.398	.000	1.000	170
Standard Error of Predicted Value	.039	.201	.076	.028	170
Adjusted Predicted Value	2.127	5.303	3.960	.4406	170
Residual	-1.1489	1.6777	.0000	.4660	170
Std. Residual	-2.436	3.557	.000	.988	170
Stud. Residual	-2.489	3.646	.004	1.012	170
Deleted Residual	-1.1988	1.7619	.0043	.4893	170
Stud. Deleted Residual	-2.529	3.790	.007	1.023	170
Mahal. Distance	.160	29.619	3.976	4.227	170
Cook's Distance	.000	.403	.010	.039	170
Centered Leverage Value	.001	.175	.024	.025	170

Note. Dependent Variable: Organizational performance.

Table D24

Collinearity Diagnostics between Decision-Making Performance Factors and Organizational Performance

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	Decision-making process	System quality	Decision-making communication	Data Quality
1	1	4.983	1.000	.00	.00	.00	.00	.00
	2	.007	27.288	.19	.01	.52	.03	.01
	3	.004	34.989	.02	.86	.00	.11	.16
	4	.004	36.882	.01	.01	.10	.45	.61
	5	.002	46.582	.78	.11	.37	.42	.21

Note. Dependent Variable: Organizational performance.

Table D25

Correlation Coefficients between Organizational Performance and its Measurement Factors

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-.006	.022		-.268	.789					
	Internal process perspective	.251	.004	.276	62.175	.000	.775	.979	.208	.571	1.752
	Learning and growth perspective	.249	.005	.212	49.881	.000	.730	.968	.167	.622	1.608
	Financial perspective	.254	.003	.406	85.347	.000	.879	.989	.286	.497	2.013
	Customer perspective	.252	.003	.345	82.103	.000	.789	.988	.275	.635	1.574

Note. Dependent Variable: Organizational performance

Table D26

Collinearity Diagnostics between Organizational Performance and its Performance Measures

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	Internal process perspective	Learning and growth perspective	Financial perspective	Customer perspective
1	1	4.878	1.000	.00	.00	.00	.00	.00
	2	.081	7.774	.02	.00	.01	.58	.00
	3	.025	14.087	.01	.12	.01	.07	.90
	4	.012	20.044	.16	.86	.05	.28	.09
	5	.004	33.230	.81	.02	.94	.07	.01

Note. Dependent Variable: Organizational performance

Tables D27

Residual Statistics for OP and its Factors

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.627	6.834	3.965	.6404	170
Std. Predicted Value	-2.088	4.480	.000	1.000	170
Standard Error of Predicted Value	.002	.010	.005	.002	170
Adjusted Predicted Value	2.628	6.839	3.965	.6406	170
Residual	-.0436	.0457	.0000	.0276	170
Std. Residual	-1.560	1.637	.000	.988	170

Stud. Residual	-1.580	1.681	-.002	1.003	170
Deleted Residual	-.0447	.0482	-.0001	.0284	170
Stud. Deleted Residual	-1.587	1.690	-.001	1.005	170
Mahal. Distance	.188	21.687	3.976	3.858	170
Cook's Distance	.000	.053	.006	.009	170
Centered Leverage Value	.001	.128	.024	.023	170

Note. Dependent Variable: Organizational performance

Table D28

Correlation Coefficients between Organizational Performance and ICT Investments Factors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.546	.466		5.465	.000					
	Management Information system usage	.213	.058	.286	3.686	.000	.313	.276	.263	.845	1.183
	Monitoring and Evaluation system usage	.052	.059	.070	.887	.376	.201	.069	.063	.821	1.218
	Business Intelligence system usage	-.138	.054	-.194	-2.579	.011	-.096	-.197	-.184	.894	1.119
	Integrated information system usage	.128	.045	.216	2.834	.005	.186	.215	.202	.875	1.143

Note. Dependent Variable: Organizational performance

Table 29

Collinearity Diagnostics between Organizational Performance and its Performance Measures

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	Management Information system usage	Monitoring and Evaluation system usage	Business Intelligence system usage	Integrated information system usage
1	1	4.931	1.000	.00	.00	.00	.00	.00
	2	.030	12.776	.00	.19	.06	.05	.52
	3	.019	16.110	.01	.02	.06	.68	.41
	4	.013	19.605	.00	.65	.71	.00	.05
	5	.007	25.693	.99	.14	.16	.27	.02

Note. Dependent Variable: Organizational performance

Table D30

Residual Statistics for OP and ICT Factors

Residuals Statistics[a]

	Min	Max	Mean	Std. Deviation	N
Predicted Value	2.634	4.663	3.965	.2581	170
Std. Predicted Value	-5.157	2.705	.000	1.000	170
Standard Error of Predicted Value	.052	.308	.097	.031	170
Adjusted Predicted Value	2.646	4.633	3.963	.2586	170
Residual	-1.1058	2.4672	.0000	.5868	170
Std. Residual	-1.862	4.155	.000	.988	170
Stud. Residual	-1.878	4.245	.001	1.006	170
Deleted Residual	-1.1246	2.6157	.0014	.6083	170
Stud. Deleted Residual	-1.892	4.484	.005	1.024	170
Mahal. Distance	.316	44.594	3.976	4.313	170
Cook's Distance	.000	.276	.007	.026	170
Centered Leverage Value	.002	.264	.024	.026	170

Note. Dependent Variable: Organizational performance

Table D31

Standardized Residual Descriptive Statistics for DMP and its Factors

			Statistic	Std. Error
Standardized Residual	Mean		.0000000	.07578341
	95% Confidence Interval for Mean	Lower Bound	-.1496041	
		Upper Bound	.1496041	
	5% Trimmed Mean		.0024216	
	Median		.2899618	
	Variance		.976	
	Std. Deviation		.98809481	
	Minimum		-1.52729	
	Maximum		1.56628	
	Range		3.09357	
	Interquartile Range		2.08820	
	Skewness		-.070	.186
	Kurtosis		-1.344	.370

Table D32

Standardized Residual Descriptive Statistics between OP and its Factors

			Statistic	Std. Error
Standardized Residual	Mean		.0000000	.07578341
	95% Confidence Interval for Mean	Lower Bound	-.1496041	
		Upper Bound	.1496041	
	5% Trimmed Mean		-.0036755	
	Median		-.2119743	
	Variance		.976	
	Std. Deviation		.98809481	
	Minimum		-1.56028	
	Maximum		1.63704	
	Range		3.19732	
	Interquartile Range		1.77069	
	Skewness		.135	.186
	Kurtosis		-1.254	.370

Table D33

Standardized Residual Descriptive Statistics between ICT Investments and OP

			Statistic	Std. Error
Standardized Residual	Mean		.0000000	.07578341
	95% Confidence Interval for Mean	Lower Bound	-.1496041	
		Upper Bound	.1496041	
	5% Trimmed Mean		-.0552238	
	Median		-.0872725	
	Variance		.976	
	Std. Deviation		.98809481	
	Minimum		-1.86206	
	Maximum		4.15454	
	Range		6.01660	
	Interquartile Range		1.11074	
	Skewness		1.206	.186
	Kurtosis		3.396	.370

Appendix E: Hypotheses test results

Table E1a

Bootstrap Coefficients for DMP and ICT Investments.

Bootstrap for Coefficients

Model		B	Bootstrap[a]				
			Bias	Std. Error	Sig. (2-tailed)	BCa 95% Confidence Interval	
						Lower	Upper
1	(Constant)	3.495	-.012	.442	.001	2.638	4.409
	Management Information system usage	.121	.000	.031	.001	.059	.181
	Monitoring and Evaluation system usage	.117	.000	.027	.001	.065	.173
	Business Intelligence system usage	.022	.001	.039	.564	-.053	.100
	Integrated information system usage	.094	.001	.024	.001	.045	.143

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

Table E1b

Bootstrap Coefficients for OP and ICT Investments.

Model		B	Bootstrap[a]				
			Bias	Std. Error	Sig. (2-tailed)	BCa 95% Confidence Interval	
						Lower	Upper
1	(Constant)	2.546	-.014	.710	.001	1.143	3.902
	Management Information system usage	.213	6.574E-005	.064	.002	.082	.351
	Monitoring and Evaluation system usage	.052	.000	.048	.254	-.038	.142
	Business Intelligence system usage	-.138	.003	.073	.064	-.291	.015
	Integrated information system usage	.128	.000	.040	.003	.054	.207

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

Table E1c

Bootstrap Coefficients for DMP and OP.

Bootstrap for Coefficients							
	Model	B	Bootstrap[a]				
			Bias	Std. Error	Sig. (2-tailed)	BCa 95% Confidence Interval	
						Lower	Upper
1	(Constant)	-.774	-.028	.843	.363	-2.298	.770
	Decision-making process	-.039	.005	.105	.709	-.254	.182
	System quality	.635	-.008	.115	.001	.421	.852
	Decision-making communication	.304	.003	.123	.013	.071	.554
	Data Quality	-.014	.004	.104	.902	-.209	.199

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

Table E1

Correlations of Decision Making Performance and Monitoring and Evaluation System Usage

			1	2	3	4	5
1	Decision-making process	Pearson Correlation	1				
		Sig. (2-tailed)					
		N	170				
2	System quality	Pearson Correlation	.538**	1			
		Sig. (2-tailed)	.000				
		N	170	170			
3	Decision-making communication	Pearson Correlation	.401**	.531**	1		
		Sig. (2-tailed)	.000	.000			
		N	170	170	170		
4	Data Quality	Pearson Correlation	.443**	.629**	.425**	1	
		Sig. (2-tailed)	.000	.000	.000		
		N	170	170	170	170	
5	Monitoring and Evaluation system usage	Pearson Correlation	.353**	.319**	.315**	.352**	1
		Sig. (2-tailed)	.000	.000	.000	.000	
		N	170	170	170	170	170

Table E2

Correlations of Decision Making Performance and Monitoring and Evaluation System Usage

			1	2	3	4	5
1	Decision-making process	Pearson Correlation	1				
		Sig. (2-tailed)					
		N	170				
2	System quality	Pearson Correlation	.538**	1			
		Sig. (2-tailed)	.000				
		N	170	170			
3	Decision-making communication	Pearson Correlation	.401**	.531**	1		
		Sig. (2-tailed)	.000	.000			
		N	170	170	170		
4	Data Quality	Pearson Correlation	.443**	.629**	.425**	1	
		Sig. (2-tailed)	.000	.000	.000		
		N	170	170	170	170	
5	Business Intelligence system usage	Pearson Correlation	.143	.092	.099	.228**	1
		Sig. (2-tailed)	.062	.231	.197	.003	
		N	170	170	170	170	170

Table E3

Correlations of Decision Making Performance and Integrated Information System Usage

			1	2	3	4	5
1	Decision-making process	Pearson Correlation	1				
		Sig. (2-tailed)					
		N	170				
2	System quality	Pearson Correlation	.538**	1			
		Sig. (2-tailed)	.000				
		N	170	170			
3	Decision-making communication	Pearson Correlation	.401**	.531**	1		
		Sig. (2-tailed)	.000	.000			
		N	170	170	170		
4	Data Quality	Pearson Correlation	.443**	.629**	.425**	1	
		Sig. (2-tailed)	.000	.000	.000		
		N	170	170	170	170	
5	Integrated information system usage	Pearson Correlation	.245**	.304**	.263**	.265**	1
		Sig. (2-tailed)	.001	.000	.001	.000	
		N	170	170	170	170	170

Table E4

Correlations of Organizational Performance and Management Information System Usage

			1	2	3	4	5
1	Internal process perspective	Pearson Correlation	1				
		Sig. (2-tailed)					
		N	170				
2	Learning and growth perspective	Pearson Correlation	.538**	1			
		Sig. (2-tailed)	.000				
		N	170	170			
3	Financial perspective	Pearson Correlation	.599**	.519**	1		
		Sig. (2-tailed)	.000	.000			
		N	170	170	170		
4	Customer perspective	Pearson Correlation	.413**	.459**	.573**	1	
		Sig. (2-tailed)	.000	.000	.000		
		N	170	170	170	170	
5	Management Information system usage	Pearson Correlation	.201**	.309**	.227**	.293**	1
		Sig. (2-tailed)	.009	.000	.003	.000	
		N	170	170	170	170	170

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

Table E5

Correlations of Organizational Performance and Monitoring and Evaluation System Usage

			1	2	3	4	5
1	Internal process perspective	Pearson Correlation	1				
		Sig. (2-tailed)					
		N	170				
2	Learning and growth perspective	Pearson Correlation	.538**	1			
		Sig. (2-tailed)	.000				
		N	170	170			
3	Financial perspective	Pearson Correlation	.599**	.519**	1		
		Sig. (2-tailed)	.000	.000			
		N	170	170	170		
4	Customer perspective	Pearson Correlation	.413**	.459**	.573**	1	
		Sig. (2-tailed)	.000	.000	.000		
		N	170	170	170	170	
5	Monitoring and Evaluation system usage	Pearson Correlation	.227**	.223**	.112	.131	1
		Sig. (2-tailed)	.003	.003	.146	.089	
		N	170	170	170	170	170

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

Table E6

Correlations of Decision-Making Performance and ICT System Usage

			1	2	3	4	5
1	Decision Making Performance	Pearson Correlation	1	.386**	.413**	.181*	.340**
		Sig. (2-tailed)		.000	.000	.018	.000
		N	170	170	170	170	170
2	Management Information system usage	Pearson Correlation	.386**	1	.392**	.076	.066
		Sig. (2-tailed)	.000		.000	.323	.390
		N	170	170	170	170	170
3	Monitoring and Evaluation system usage	Pearson Correlation	.413**	.392**	1	.105	.183*
		Sig. (2-tailed)	.000	.000		.172	.017
		N	170	170	170	170	170
4	Business Intelligence system usage	Pearson Correlation	.181*	.076	.105	1	.320**
		Sig. (2-tailed)	.018	.323	.172		.000
		N	170	170	170	170	170
5	Integrated information system usage	Pearson Correlation	.340**	.066	.183*	.320**	1
		Sig. (2-tailed)	.000	.390	.017	.000	
		N	170	170	170	170	170

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

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

Table E7

Correlations of Organizational Performance and Integrated Information System Usage

			1	2	3	4	5
1	Internal process perspective	Pearson Correlation	1				
		Sig. (2-tailed)					
		N	170				
2	Learning and growth perspective	Pearson Correlation	.538**	1			
		Sig. (2-tailed)	.000				
		N	170	170			
3	Financial perspective	Pearson Correlation	.599**	.519**	1		
		Sig. (2-tailed)	.000	.000			
		N	170	170	170		
4	Customer perspective	Pearson Correlation	.413**	.459**	.573**	1	
		Sig. (2-tailed)	.000	.000	.000		
		N	170	170	170	170	
5	Integrated information system usage	Pearson Correlation	.140	.309**	.078	.125	1
		Sig. (2-tailed)	.068	.000	.314	.105	
		N	170	170	170	170	170

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

Table E8

Model Coefficients for Decision Making Performance Factors and Organizational Performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.360[a]	.130	.124	.5998	.130	25.019	1	168	.000	
2	.663[b]	.439	.432	.4830	.309	92.152	1	167	.000	
3	.687[c]	.472	.462	.4702	.032	10.178	1	166	.002	
4	.687[d]	.472	.459	.4716	.000	.021	1	165	.885	1.182

a. Predictors: (Constant), Decision-making process

b. Predictors: (Constant), Decision-making process, System quality

c. Predictors: (Constant), Decision-making process, System quality, Decision-making communication

d. Predictors: (Constant), Decision-making process, System quality, Decision-making communication, Data Quality

e. Dependent Variable: Organizational Performance

Table E9

ANOVA of Decision Making Performance and Organizational Performance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.002	1	9.002	25.019	.000[b]
	Residual	60.447	168	.360		
	Total	69.448	169			
2	Regression	30.496	2	15.248	65.372	.000[c]
	Residual	38.952	167	.233		
	Total	69.448	169			
3	Regression	32.746	3	10.915	49.370	.000[d]
	Residual	36.702	166	.221		
	Total	69.448	169			
4	Regression	32.751	4	8.188	36.814	.000[e]
	Residual	36.697	165	.222		
	Total	69.448	169			

a. Dependent Variable: Organizational Performance

b. Predictors: (Constant), Decision-making process

c. Predictors: (Constant), Decision-making process, System quality

d. Predictors: (Constant), Decision-making process, System quality, Decision-making communication

e. Predictors: (Constant), Decision-making process, System quality, Decision-making communication, Data Quality

Table E10

Correlations among Organizational Performance and Decision Making Performance Factors

			1	2	3	4	5
1	Organizational Performance	Pearson Correlation	1	.360**	.663**	.427**	.503**
		Sig. (2-tailed)		.000	.000	.000	.000
		N	170	170	170	170	170
2	Decision-making process	Pearson Correlation	.360**	1	.538**	.443**	.401**
		Sig. (2-tailed)	.000		.000	.000	.000
		N	170	170	170	170	170
3	System quality	Pearson Correlation	.663**	.538**	1	.629**	.531**
		Sig. (2-tailed)	.000	.000		.000	.000
		N	170	170	170	170	170
4	Data Quality	Pearson Correlation	.427**	.443**	.629**	1	.425**
		Sig. (2-tailed)	.000	.000	.000		.000
		N	170	170	170	170	170
5	Decision-making communication	Pearson Correlation	.503**	.401**	.531**	.425**	1
		Sig. (2-tailed)	.000	.000	.000	.000	
		N	170	170	170	170	170

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

Table E11

Correlations between Organizational Performance and Decision Making Performance

		Organizational Performance	Decision Making Performance
Organizational Performance	Pearson Correlation	1	.625**
	Sig. (2-tailed)		.000
	N	170	170
Decision Making Performance	Pearson Correlation	.625**	1
	Sig. (2-tailed)	.000	
	N	170	170

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

Table E12

Correlation between IIS and OP Compared with Correlation between MIS, BIS & MES and OP

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.186[a]	.034	.029	.6318	.034	5.990	1	168	.015
2	.403[b]	.162	.142	.5939	.128	8.381	3	165	.000

a. Predictors: (Constant), Integrated information system usage

b. Predictors: (Constant), Integrated information system usage, Management Information system usage, Business Intelligence system usage, Monitoring and Evaluation system usage

Appendix F: List of Figures

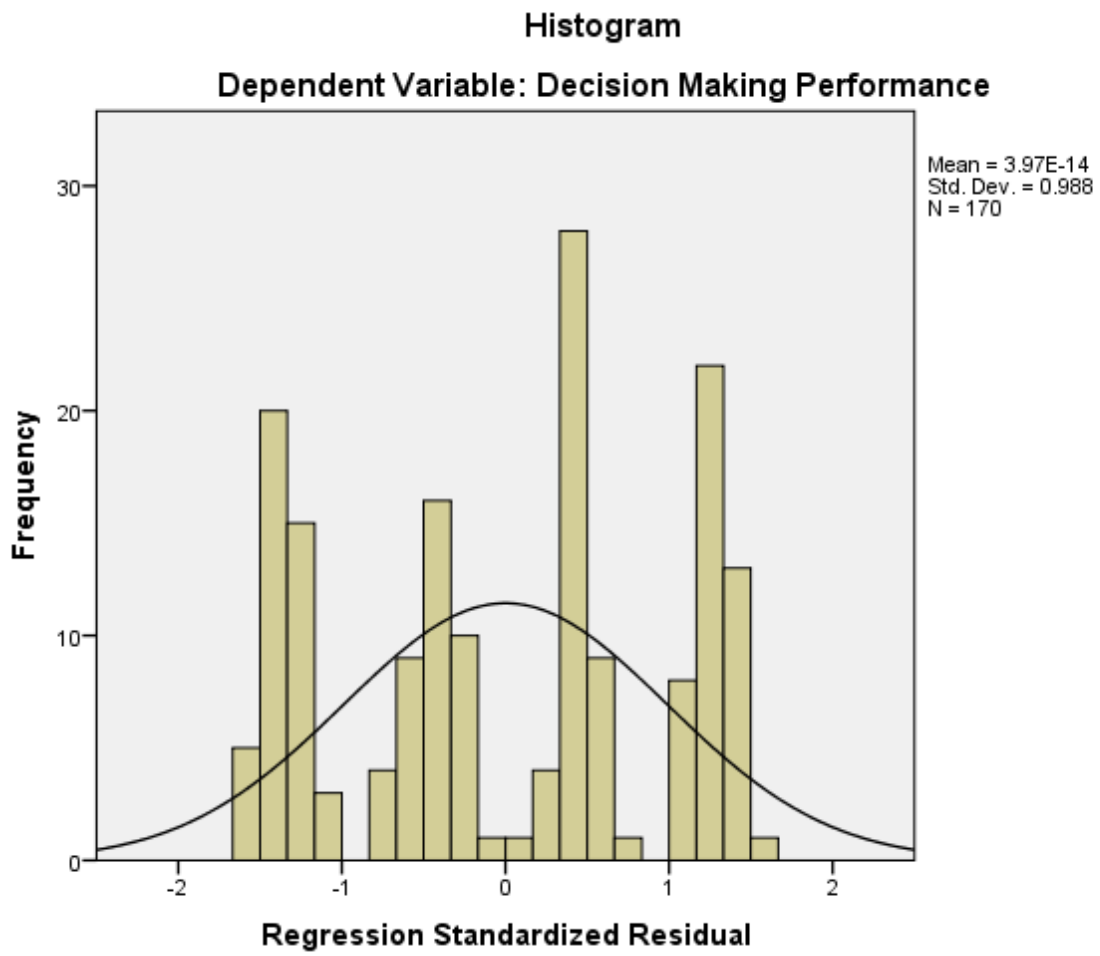

Figure F1: Histogram for regression standardized residual for DMP and its factors.

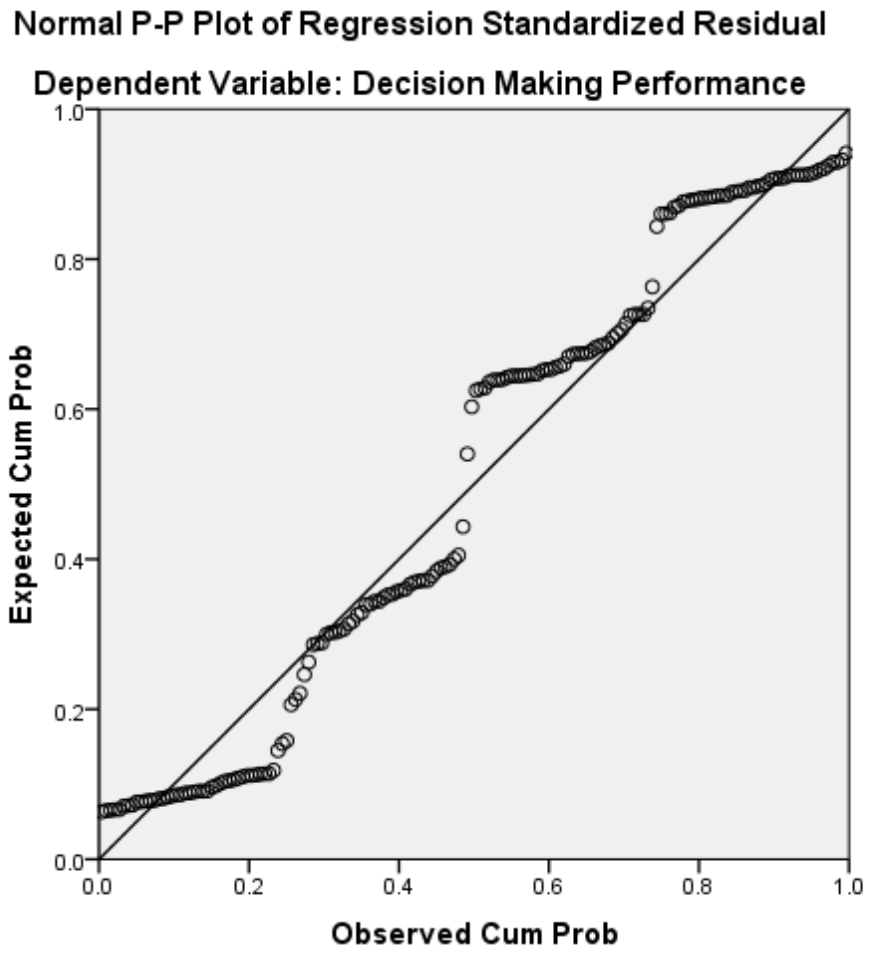

Figure F2: Normal P-P plot of regression standardized residual for DMP and its factors.

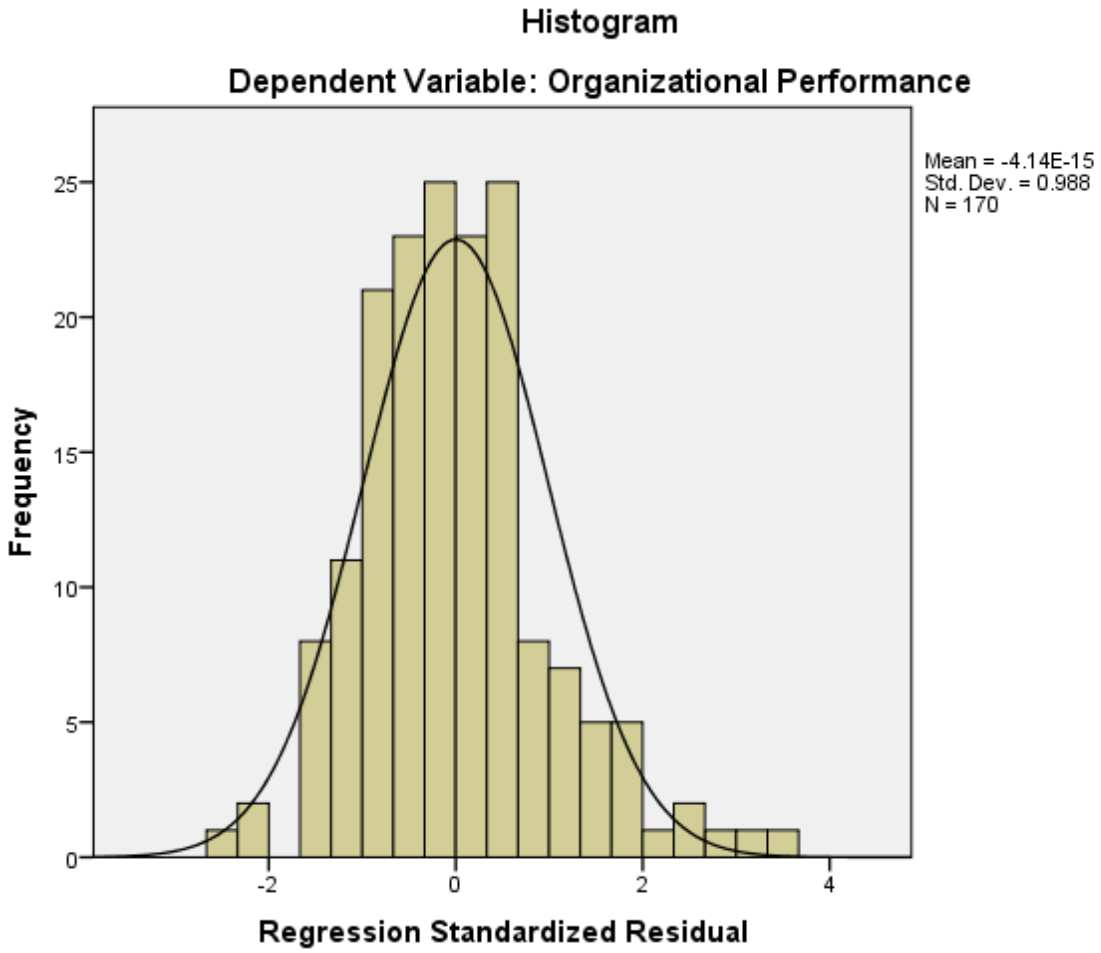

Figure F3: Histogram for regression standardized residual for OP and its factors.

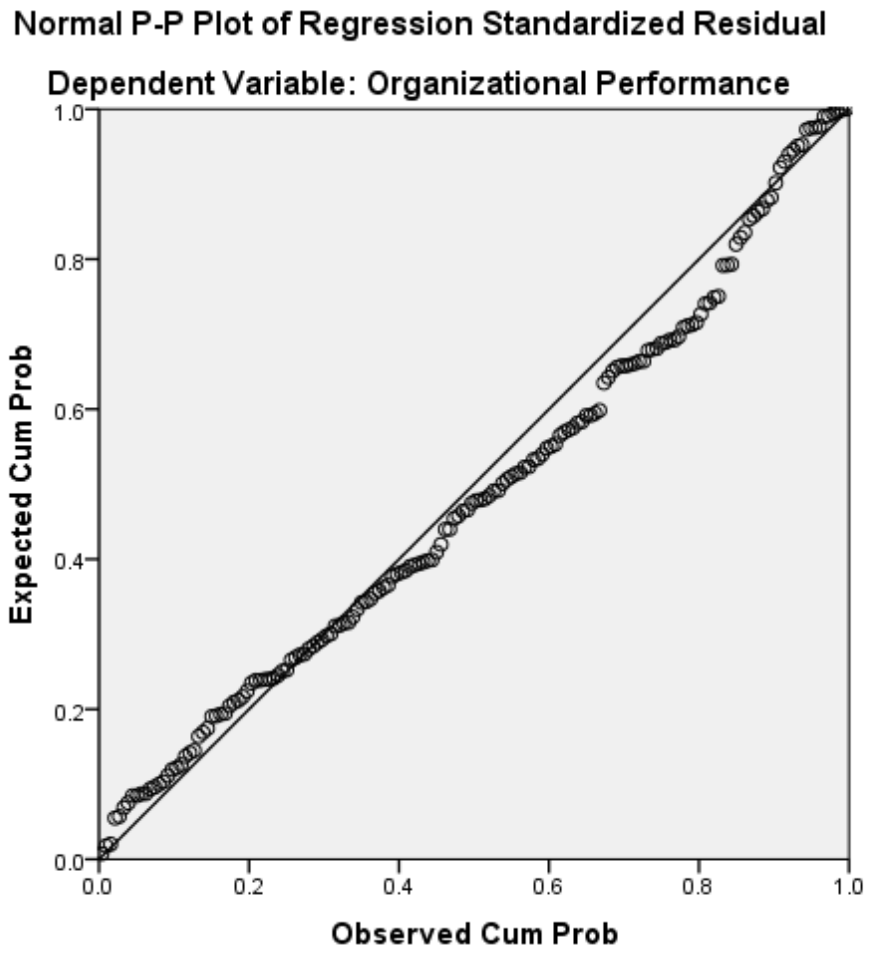

Figure F4: Normal P-P plot of regression standardized residual for OP and its factors.

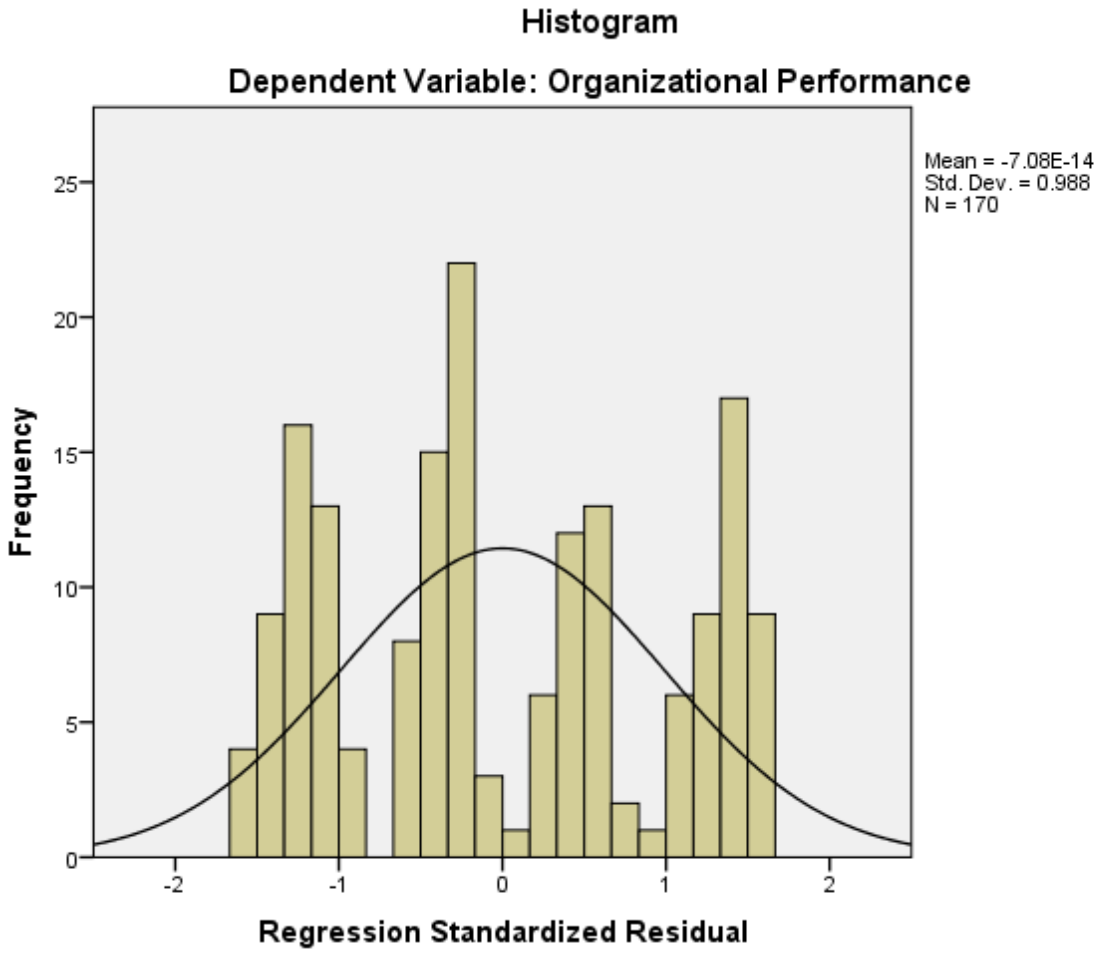

Figure F5: Histogram for regression standardized residual for OP & ICT factors.

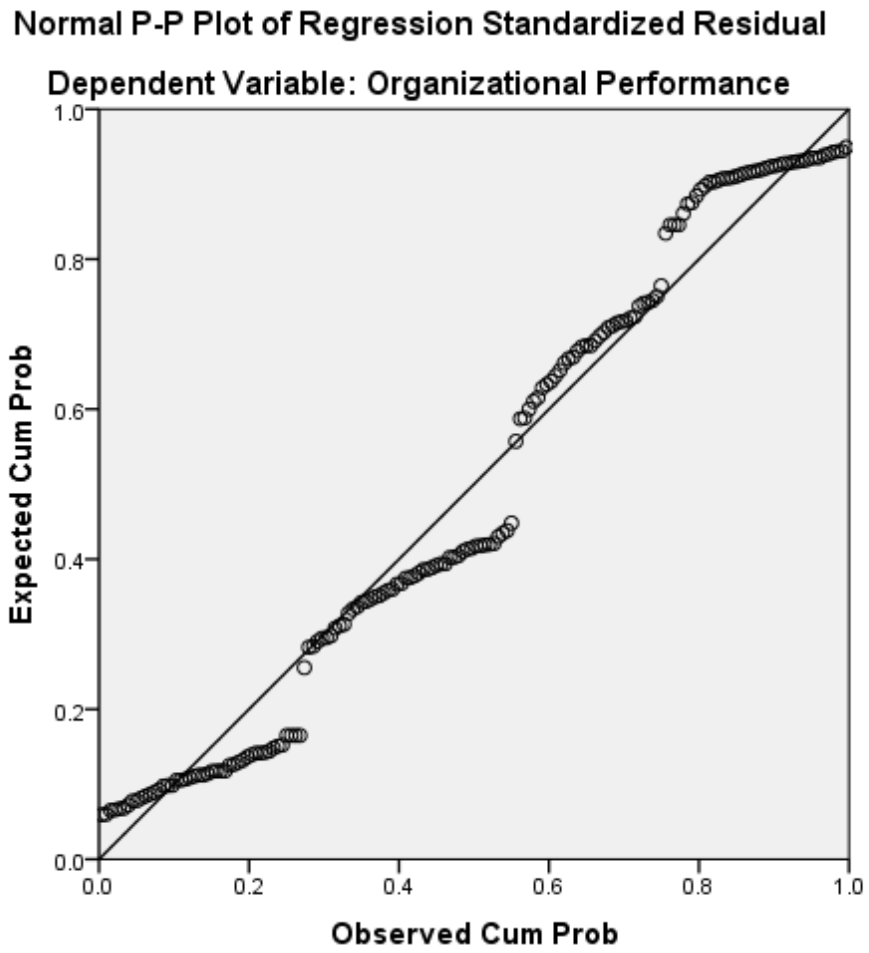

Figure F6: Normal P-P plot of regression standardized residual for OP & ICT factors.

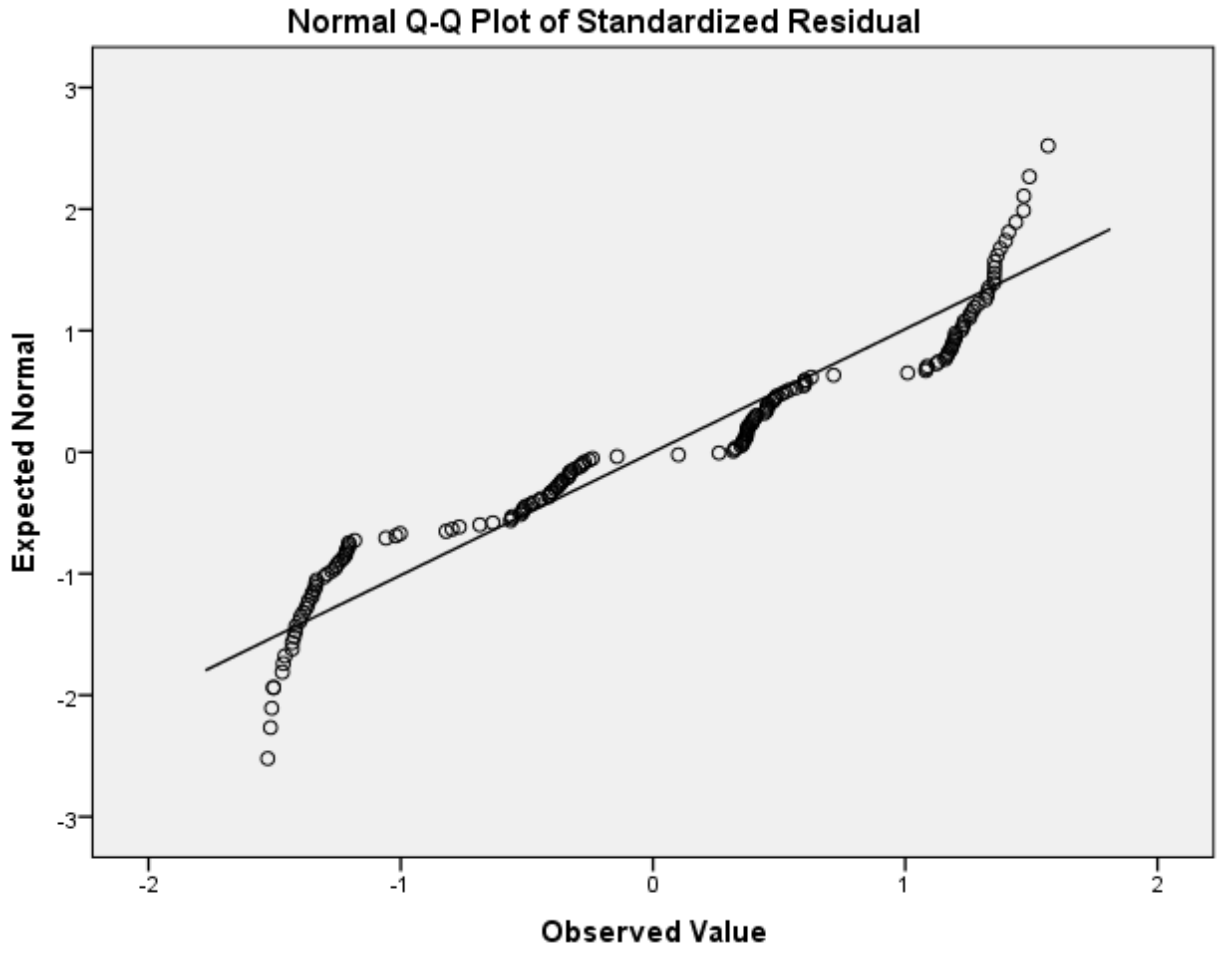

Figure F7: Scatter plot for regression standardized residuals between DMP and its DVs.

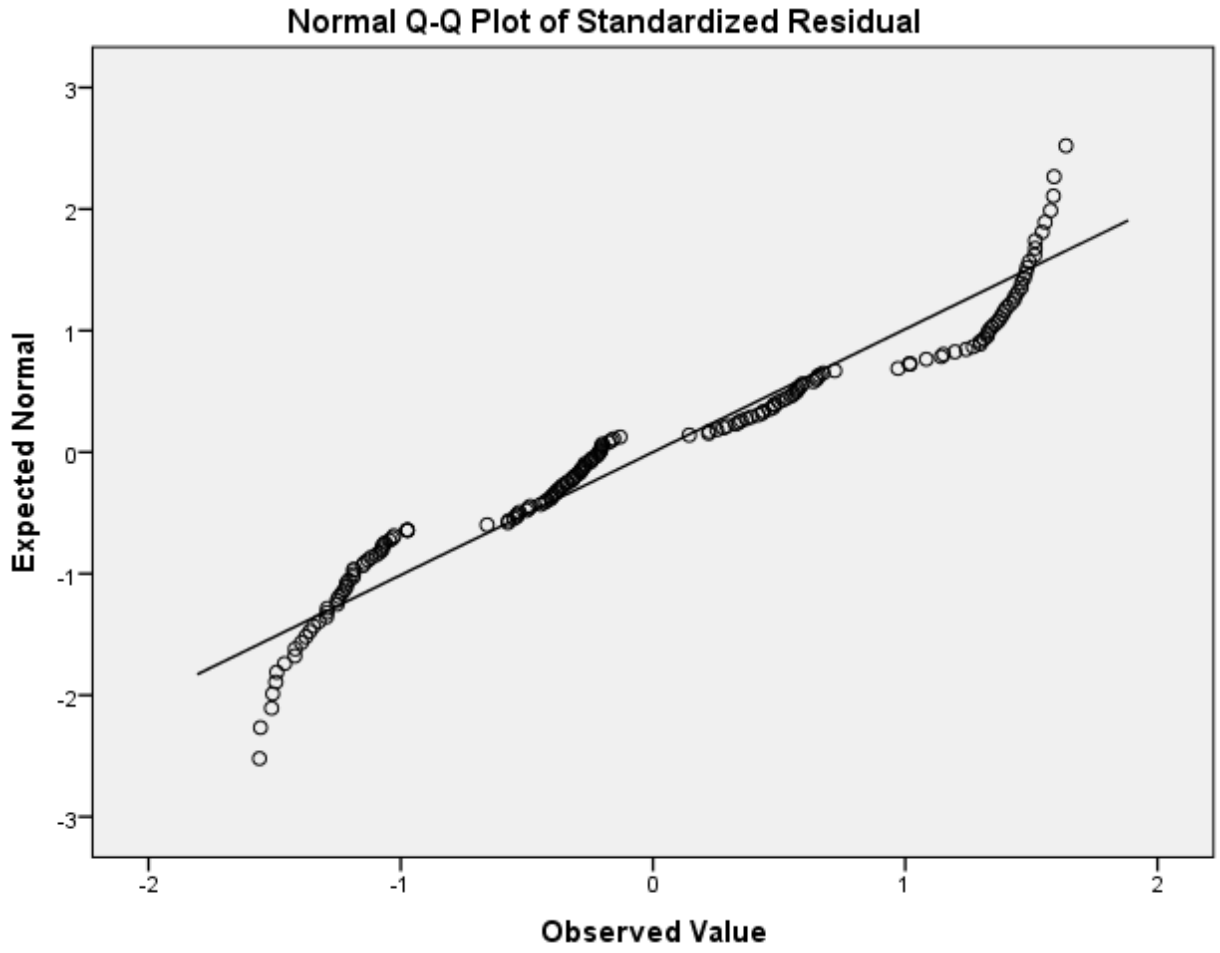

Figure F8: Scatter plot for regression standardized residuals for OP and its DVs.

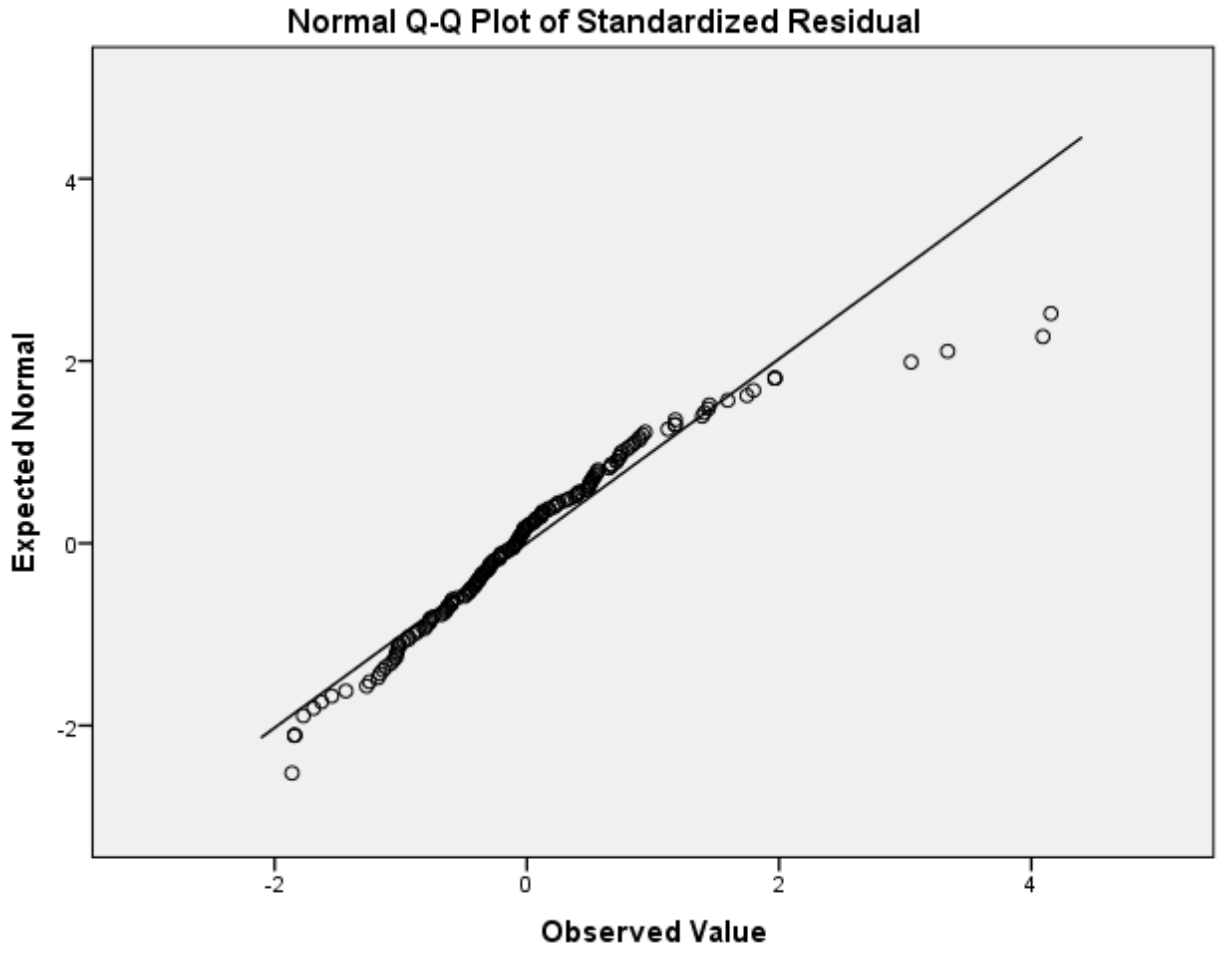

Figure F9: Scatter plot for regression standardized residuals for ICT investments and OP.