KNOWLEDGE MANAGEMENT PRACTICES AND COMPETITIVE ADVANTAGE IN CONSULTING ENGINEERING FIRMS IN UGANDA

By
Beatrice K. Kabaza
(07/MMSPPM/13/013)

A dissertation submitted in partial fulfillment of the requirements for the award of Masters Degree in Management Studies (Project Planning and Management) of Uganda Management Institute

March, 2010

DECLARATION

I, **Kabaza Kakiiza Beatrice,** hereby declare that to the best of my knowledge, this is my original work and has not been submitted for the award of a degree in any other university/ institution of higher learning.

Signed: …….

Date: ……..

APPROVAL

This is to certify that this dissertation has been presented for examination in partial fulfillment of the requirements for the award of Degree of Masters in Management Studies (Project Planning and Management) with my endorsement as a research/work based supervisor:

Signed: ……

Dr. Muhenda Basaasa Mary

Uganda Management Institute Research Supervisor

Date: …….

Signed: ……

Mr. Mugamba Winyi Emmanuel

Work-Based Supervisor

Date: …….

DEDICATION

To Timothy, Natasha, Vanessa and Rachel, "**my tower of strength**", who are always close to my heart, thank you for tirelessly encouraging me to go on especially in times of near despair.

and

To my father Akiiki, who would have been so proud of me. To my dearest mother Akiiki, who ceaselessly prays for my endeavours and my father-in-law Mr. Zabuloni Kabaza for his love.

ACKNOWLEDGEMENT

I would like to thank my supervisors, Dr. Muhenda Mary Basaasa for her encouragement and for believing in me, Mr. Mugamba Winyi Emmanuel without whose relentless support I would not have come this far. Many thanks to Dr. Albert Rugumayo who made me take the first step. I cannot forget my colleagues at Gauff Consultants (U) Ltd who were eager to help and always willing to go an extra mile for me. To my brothers and sisters, especially Sarah, for their endless encouragement and support in more than one way.

I thank all the respondents who encouraged me to get to the end of this invigorating journey. May God Bless you all always.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

APQC	-	American Productivity and Quality Centre
FIDIC	-	Fédération Internationale des Ingenieurs-Conseils (International Federation of Consulting Engineers)
ICT	-	Information Communication Technology
SECI	-	Socialisation, Externalization, Combination and Internalisation
SMEs	-	Small to Medium Enterprises
SPSS	-	Statistical Package for Social Sciences
UACE	-	Uganda Association of Consulting Engineers

APPENDICES

ABSTRACT

This study examined the effect of knowledge management practices on competitive advantage in consulting engineering firms in Uganda and the moderating role of ICT Usage. Knowledge management practices formed the independent variable and competitive advantage was the dependent variable. Consulting engineering firms are not delivering value for money service due to the stiff competition they are facing and failure of the individual workers to manage and leverage their knowledge well in order to gain competitive advantage. The study was a cross-sectional survey using a self-administered questionnaire conducted on a sample of 131 out of which 102 returned the questionnaire representing a response rate of 78%. The respondents were selected using simple random sampling technique and data was analysed using reliability analysis, descriptive statistics, correlation analysis, multiple and hierarchical regressions using the SPSS programme. The multiple regression results indicated that improved knowledge filtering and knowledge application do significantly increase competitive advantage. The hierarchical results indicated that ICT usage significantly influenced the relationship between acquisition, filtering, configuration, sharing and competitive advantage but did not affect the relationship between knowledge application and competitive advantage. The implications of the study are that consulting engineering firms are not consciously and systematically practicing knowledge management in order to gain competitive advantage. This study strongly recommends that consulting engineering firms should implement a knowledge management strategy aimed at filtering and applying knowledge in order to gain competitive advantage. Future research could study the barriers and success factors of knowledge management implementation in the consulting engineering firms in Uganda and other industrial sectors since this study only covered engineering firms.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter discusses the concept of knowledge management practices and competitive advantage in consulting engineering firms in Uganda. The background to the study, the general objective and specific objectives of the study, the research questions, the hypotheses, the significance, assumptions and limitations of the study and the definitions of terms used are herein highlighted.

1.1 Background to the Study

In today's fast changing business environment the only way to gain competitive advantage is by managing the knowledge of the individuals working in the firm (Arora, 2002; Drucker, 1998). Nonaka (1991) stated that "In a world where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge". A number of construction firms in United Kingdom are already managing knowledge of their employees, referred to as "human capital", to gain competitive advantage (Carrillo, 2004). KPMG (2000), in their empirical research on the implementation of knowledge management in firms in the United Kingdom, confirmed that "knowledge management was not just a fad, but here to stay". In the same research, it was established that out of two hundred and eighty three firms that took part in the study, eighty five percent agreed they had or were considering knowledge management to gain competitive advantage. Chong (2005) confirmed that top executives of both Canadian Financial Post 300 firms and US Fortune 500 firms view knowledge management as critical for competitive advantage.

Previously, managerial trends like Total Quality Management and Business Process Re-

engineering failed and managers came to realise that the only untapped resource was the knowledge of the individual employees. Nonaka and Takeuchi (1995) argue that organisations cannot create knowledge without individuals. Therefore, the strategy to manage knowledge for competitive advantage has gained increasing attention since the mid-1990s for all types of firms due to the dynamic nature of the business environment brought about by the shift from production-based to knowledge-based economy (Chong, 2005; Ahmed, Lim & Loh, 2002) whereby many jobs require people to think, plan or make decisions, rather than to lift, assemble or build. In addition, globalization with its rapid proliferation of Information Communication Technology (ICT) and web-based business processes require that knowledge within the firm is effectively, efficiently and exhaustively managed to achieve the firm's goals and objectives and gain competitive advantage (Shankar, Singh, Gupta & Narain, 2003; Egbu, 2004; Anantatmula, 2007).

Consulting engineering firms operate in project based environments with independent multidisciplinary teams that are regarded as temporary or virtual organizations with specific objectives, detailed tasks, restricted time and budgets to deliver a one-of-a-kind-product or service (Carrillo, 2004; Teerajetgul & Charoenngam, 2006; Pathirage, Amaratunga & Haigh, 2007). Consulting engineering firms are continuously creating and applying knowledge in pursuit of finding novel solutions to client immediate problems. As consulting engineering firms handle whole project life cycle issues that involve handing over projects to clients at completion and those involved in operation and maintenance, the need to quickly and effectively communicate the right information to the client, local people, the stakeholders and beneficiaries of the different interventions is paramount. Clients know what they want and their expectations are high and will not hesitate to switch consultants if unsatisfied. In order to effectively differentiate themselves, consulting engineering firms need to develop capacity

to deliver superior service in order to retain their customers and gain competitive advantage. Many firms are now starting to exploit their intellectual assets, the knowledge carried around by the employees, as a basis for competitive advantage (Stewart, 1994). According to Hoon (2003) companies such as Cisco Systems, Ford Motor and Rolls-Royce are being advised to efficiently and effectively create, locate, capture and share their knowledge and expertise to remain competitive.

Competitive advantage in this study refers to the attributes and resources of a firm that allow its employees to outperform others in the same industry or service market (Christensen & Fahey, 1984; Passemard & Kleiner, 2000; Porter, 1980). In consulting engineering terms these attributes include innovativeness, whereby innovative technologies are used in new product development or service. Technological innovation is a critical driver of the improvement in consumers' living standards, survival, growth, the success of firms and the wealth of nations (Tellis, 2007). To keep ahead of competition, employees must be able to gainfully utilise alliances to bring in new skills and creativity. Firms need to develop their competencies in order to be competitive and create environments whereby employees are allowed to experiment with new technologies even if they cause existing investments to lose value. It is paramount for consulting engineering firms to provide quality service support in order to guarantee client satisfaction.

Consulting engineering firms provide services through people with expertise and these people's contribution determines the firm's success (Sharkie, 2003). He further argues that employees' skills and knowledge need to be cultivated and leveraged to create competitive advantage. Quinn, Anderson & Finkelstein (1996) argue that highly motivated and creative groups often outperform groups with greater physical or financial resources. As the culture of construction work is project-based, short-term and task oriented with high turnover rates in

highly skilled staff, this means that specialists with their technical knowledge could be lost from one project to the next. The need to devise ways of tapping the "brains" of the highly specialised professionals to develop knowledge, retain it, and then generate new ideas faster than the competitor is an option that the consulting engineering firms have to utilize in order to gain competitive advantage (Anantatmula, 2007).

A firm needs to nurture knowledge creating environments to enable employees to exploit and develop resources better than the rivals' and create sufficient knowledge to address the industry's future success factors. A firm will be more successful and have competitive advantage over others if its employees learn quickly and implement and commercialize knowledge faster than the workers of the competition in the same industry (Rampersad, 2002). Firms that deliberately devise knowledge management strategies have a competitive advantage that they use to identify risks, look for opportunities to create value and reduce costs while delivering value-for-money service. It is our thinking that if consulting engineering firms in Uganda leverage their employees' knowledge, they are likely to gain a competitive advantage.

There is also growing concern on the maintenance of appropriate quality of the professional services provided, with due attention to suitability for purpose, economy and value, including life-cycle costs, sustainability, efficiency, integrity, management of risks, public welfare, fair opportunity for all consultancy firms and transparency of the process (Fédération Internationale des Ingenieurs-Conseils, 2001). Consulting engineering firms have to satisfy their clients consistent with professional standards and ethics while ensuring continuous improvement of efficiency in providing their services. The firm's success will ultimately depend on the speed at which relevant knowledge is acquired, filtered, configured, shared and then applied by its employees in order to develop capabilities and core competencies that

cannot easily be imitated by rivals (Sharkie, 2003).

The recently reinstated East African Community and the deregulation and liberalisation policies have led to increased mobility of specialised human resource, information and more intense competition as more foreign firms break into the liberised market. The market has become more saturated with both local and foreign firms endeavouring toward like core competencies. The liberalization of the economy of Uganda since 1990 has spurred development in a variety of sectors bringing with it an upswing growth of the building and construction industry (Construction Review, 2006). This has led to increased pressure on the Ugandan consulting engineers who are now forced to devise new methods in their struggle to contain or increase their competitive advantage.

Competition has also intensified due to a number of challenges of the 21st Century which include among others, globalization of competition, rapid technological development and clients who have become increasingly more professional, using outsourcing strategies and often globalizing their approaches as the number of global firms increase and technology changes (Anantatmula, 2007). Kaplan & Norton (2001) contend that the 21st Century requires strategies designed for knowledge-based competition. Under these conditions, provision of value-for-money service has become a more crucial factor in the process of creating superior value for customers at the same time remaining ethical. Nearly all firms are confronted with the need to respond faster to client problem solving, price pressure and time-based competition by being more creative and innovative.

1.2 Statement of the Problem

There have been many complaints in the Newspapers in Uganda in the recent past regarding bad workmanship in road works and collapsing buildings during construction causing loss of

lives and property (Sembatya, 2008; Monitor Team, 2008; Mugisha, 2008; Osike & Karugaba, 2008; Musoke, Muwanga & Sempogo, 2008). Such inefficiencies have left clients dissatisfied with the poor workmanship offered by some consulting firms as they are not offering the clients value-for-money services. The firms themselves do not seem to learn from their past experiences as they keep reinventing the wheel and repeating the same mistakes. Yet the survival of consulting engineering firms depends on guaranteeing client satisfaction at all times through innovativeness, developing core competencies, offering quality service support and continuous learning and growth. There is, therefore, need for consulting engineering firms to differentiate themselves from their competitors by offering a superior service which can only be assured if the service cannot be easily imitated by competitors. Firms have in addition to quickly adapt to continuous change in an increasingly knowledge-based economy in order to provide value-for-money service to the client and remain competitive. It is against this background that this study set to examine whether knowledge management practices have an effect on the firm's competitive advantage since it is not possible to just "cut and paste" best practices from the past due to unique and complex nature of projects (Pathirage, Amaratunga, & Haigh, 2007; Kamara, Anumba, Carrillo & Bouchlaghem, 2003; Carrillo, 2004) and in light of anticipation that lack of competitive advantage may be due to the firms' inability to systematically manage their knowledge. Unless engineering firms learn to innovate in order to offer products and services that give them a competitive edge in the market, they are likely to continue offering shoddy work that leaves clients dissatisfied and pose threats to people's lives and property and deplete government revenue base.

1.3 General Objective

The study set out to establish the effect of knowledge management practices on competitive

advantage in consulting engineering firms in Uganda.

1.3.1 Specific Objectives

The study was guided by the following specific objectives:

1. To establish the effect of knowledge acquisition on competitive advantage in consulting engineering firms in Uganda.
2. To investigate the effect of knowledge filtering on competitive advantage in consulting engineering firms in Uganda.
3. To examine the effect of knowledge configuration on competitive advantage in consulting engineering firms in Uganda.
4. To investigate the effect of knowledge sharing on competitive advantage in consulting engineering firms in Uganda.
5. To determine the effect of knowledge application on competitive advantage in consulting engineering firms in Uganda.
6. To examine the influence of ICT usage on the relationship between knowledge management practices and competitive advantage in consulting engineering firms in Uganda.

1.4 Research Questions

The study was guided by the following research questions.

1. What is the effect of knowledge acquisition on competitive advantage in consulting engineering firms in Uganda?
2. How does knowledge filtering affect competitive advantage in consulting engineering firms in Uganda?

3. Does knowledge configuration have any effect on competitive advantage in consulting engineering firms in Uganda?
4. How does knowledge sharing affect competitive advantage in consulting engineering firms in Uganda?
5. How does knowledge application affect competitive advantage in consulting engineering firms in Uganda?
6. Does ICT usage influence the relationship between knowledge management practices and competitive advantage in consulting engineering firms in Uganda?

1.5 Hypotheses

The following hypotheses were postulated:

H_1. Knowledge acquisition affects competitive advantage in consulting engineering firms in Uganda.

H_2. Knowledge filtering affects competitive advantage consulting engineering firms in Uganda.

H_3. Knowledge configuration affects competitive advantage consulting engineering firms in Uganda.

H_4. Knowledge sharing affects competitive advantage consulting engineering firms in Uganda.

H_5. Knowledge application affects competitive advantage consulting engineering firms in Uganda.

H_6. ICT usage significantly influences the relationship between knowledge management practices and competitive advantage in consulting engineering firms in Uganda.

1.6 Scope of the Study

The study was carried out on the individuals working in 12 consulting engineering firms of repute with most experience in Uganda that are members of the Uganda Association of Consulting Engineers (UACE). UACE is a professional association for consulting engineers that is a member of the International Federation of Consulting Engineers (FIDIC). Eleven of these firms operate in Kampala while one operates in Entebbe. The period covered is from 1999 to 2007. The period is selected because UACE started its operations in 1999. Knowledge management practices that include acquisition, filtering, configuration, sharing and application were examined to establish the effect they have on competitive advantage. The researcher also evaluated whether ICT usage influences the relationship between knowledge management practices and competitive advantage in consulting engineering firms in Uganda.

1.7 Significance of the Study

There is limited empirical evidence on the effect of knowledge management practices on competitive advantage in consulting engineering firms in Uganda. The findings of this study will be an eye-opener for consulting engineers who have not yet understood knowledge management practices as a management strategy in gaining competitive advantage. The benefits knowledge management practices offer and how they are implemented in order to gain competitive advantage will be highlighted in the study. Individuals working in large or small firms that are already informally practicing or considering adopting knowledge management practices will have a guide to further study the practices and probably put them into practice.

Barriers and enablers of knowledge management practices will also be brought out by the

study to benefit consulting engineering firms in improving their business performance in times of greater competition, through improved management of the their knowledge resources required for input into key performance indicators (Carrillo, 2004). The improved performance of these firms will have a positive impact on the industry's clients and stakeholders in terms of a better service, cost savings and increased satisfaction.

The findings and results of this study will be useful to the industry and will probably stimulate future research that will help to understand the critical issues of knowledge management practices and competitive advantage. Initiatives with the aim to leverage knowledge in the firm context might be developed to provide solutions to integrate knowledge management practices in their business strategy.

1.8 Operational Definitions

For purposes of this study, in order to avoid ambiguity as well as create a common understanding of the terms, the operational definitions of terms are as follows:

1.8.1 Knowledge

There are two types of knowledge: Tacit knowledge which resides in people's heads and includes insights, intuition, and hunches – which are often built by experience and training and cannot be easily formalized and shared (Polanyi, 1964; Nonaka, 1998; Carrillo & Chinowsky, 2006) and, Explicit knowledge that is codified and documented and is stored in physical or electronic form. Explicit knowledge is normally captured in manuals, knowledge bases, technical notes, databases, best practice guides, standards and procedures, filing cabinets and the firm's documented processes and policies (Carrillo, Anumba, & Kamara, 2000; Nonaka, 1998; Andreasson & Svartling, 1999).

1.8.2 Knowledge Management

Knowledge management refers to emerging set of strategies and approaches to create, safeguard, and use knowledge assets - including people and information - which allows knowledge to flow to the right people at the right time so that these assets create more value for the firm and help the firm meet its objectives (APQC, 2001; Payne & Sheehan, 2004; Tiwana, 2004).

1.8.3 Knowledge Management Practices

Knowledge management practices wherever they appear will mean, knowledge acquisition, knowledge filtering, knowledge configuration, knowledge sharing and knowledge application.

1.8.4 Knowledge Acquisition

Knowledge acquisition involves knowledge creation and content development through the distillation of experiences and lessons learned from client engagement projects, by collecting, synthesizing and interpreting a variety of information (Holsapple & Joshi, 2002).

1.8.5 Knowledge Filtering

After information has been acquired or created, it is interpreted and evaluated from a contextual mental model in order to filter and retain only knowledge that is important and useful for meeting the firm's objectives.

1.8.6 Knowledge Configuration

When acquired knowledge has been filtered for its strategic and practical usefulness, it is organized and stored for present and future use (Gupta & McDaniel, 2002). Knowledge can

be documented or it can be electronically stored.

1.8.7 Knowledge Sharing

Knowledge sharing is the flow of knowledge among and between individuals, groups and firms, whereby one unit is affected by the experience of another (Argote & Ingram, 2000; Egbu et al., 2005; Hoon, 2003).

1.8.8 Knowledge Application

Knowledge application is the use knowledge assets - including people and information – to get knowledge to the right people at the right time to create more value for the firm and solve client problems while meeting the firm's objectives (APQC, 2001; Payne & Sheehan, 2004; Tiwana, 2004).

1.8.9 Competitive Advantage

Competitive advantage in this study refers to the attributes and resources of a firm that allow it to outperform others in the same industry or service market (Christensen & Fahey, 1984; Passemard & Kleiner, 2000; Porter, 1980). In consulting engineering terms these attributes include innovativeness, competency development, quality service support, client satisfaction and learning and growth.

1.8.10 Information Communication Technology Usage

Information Communication Technology Usage will refer to the infrastructure set up in the firms and the know-how of Information Communication Technology (ICT) of the individuals working in the consulting engineering firms in Uganda.

1.8.11 Individuals

Individuals are all professional employees working in the consulting engineering firms who handle knowledge by the nature of their jobs.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews the literature relevant to knowledge management practices and competitive advantage in consulting engineering firms in Uganda in order to answer the research questions and test the hypotheses. Literature is presented objective by objective showing knowledge gaps that justified carrying out further research. The researcher reviewed textbooks, journals, articles, academic papers, project progress and final reports as well as different newspapers.

2.1 Theoretical Review

Management theory researchers view knowledge as individual and organizational competencies such as skills, know-how and know-what (Nonaka & Takeuchi, 1995; Davenport & Prusak, 1998), while Management Information System (MIS) researchers and practitioners regard knowledge as an object that can be controlled and recognized in computer based information systems (Hoon, 2003). In this study we examine the resource-based theory and knowledge-based theory and discuss how they underpin our conceptualisation. The Resource-Based Theory (RBT) of the firm has been considered as a replacement of the traditional product-based view of competitive advantage (Blacklet, 1996; Wernerfelt, 1995) as cited in Hoon (2003). In addition, Rollo (2002) argues that firms possess resources that enable them to achieve competitive advantage and generate economic profit. The theory discusses the nature of resources that organizations possess and details the qualities that such resources must maintain in order to be converted into sustainable competitive advantages over time (Barney, 1991; Wernerfelt, 1984). Advocates of this theory

propose that firms possess specific sets of human, physical, financial, or organizational resources, and thus a firm's competitive advantage is determined by its ability to obtain and defend these resources which must be valuable, rare, imperfectly tradable, and inimitable (Barney, 1991; Markides and Williamson, 1996). In addition, a firm must possess the ability to effectively and efficiently exploit the full potential of its resources, in order to develop and maintain any potential competitive advantage (Barney, 1997). Against this background we argue that knowledge that is rare, inimitable and valuable when well managed would lead to competitive advantage of the engineering firms in Uganda.

The knowledge-based view of the firm which is a recent extension of the resource-based view of the firm provides another strong theoretical dimension of how we conceptualise our relationship between knowledge management initiative and competitive advantage. The knowledge-based theory views firms as social communities specializing in the creation and internal transfer of knowledge (Grant, 1996; Kogut & Zander, 1993). Knowledge is considered a special strategic resource that does not depreciate in the way traditional economic productive factors do, but appreciates with use (Curado & Bontis, 2006). Knowledge-based view theorists also argue that firms exist because they have unique, often historically dependent abilities to accumulate specific resources that lead to differential levels of firm performance (Reed & DeFillippi, 1990), whereas Barney (1991) regarded knowledge as a separate resource on equal footing with other resources. He argued that firms gain a competitive advantage if they have the capability to transform other resources. Capabilities and resources have three distinct features which make them difficult to imitate: they are historically determined, socially embedded in the firm, and tacit (Barney, 1991). As the firm's capabilities are knowledge based, this makes knowledge a resource that forms the foundation of the firm's capabilities that transform into competencies which lead to

competitive advantage. Competencies transform into core competencies when they represent a domain in which the firm excels (Prahalad & Hamel, 1990) cited in Marr & Neely (2004). At an employee level, it includes personal knowledge, skills and talents, while at the firm level it includes infrastructure, networking relationships, technologies, routines, trade secrets, procedures and organizational culture (Marr & Neely, 2004). Individuals with their intellectual abilities, the knowledge they possess and their capacity to learn and acquire more knowledge at all hierarchical levels constantly contribute to the firm's competitiveness.

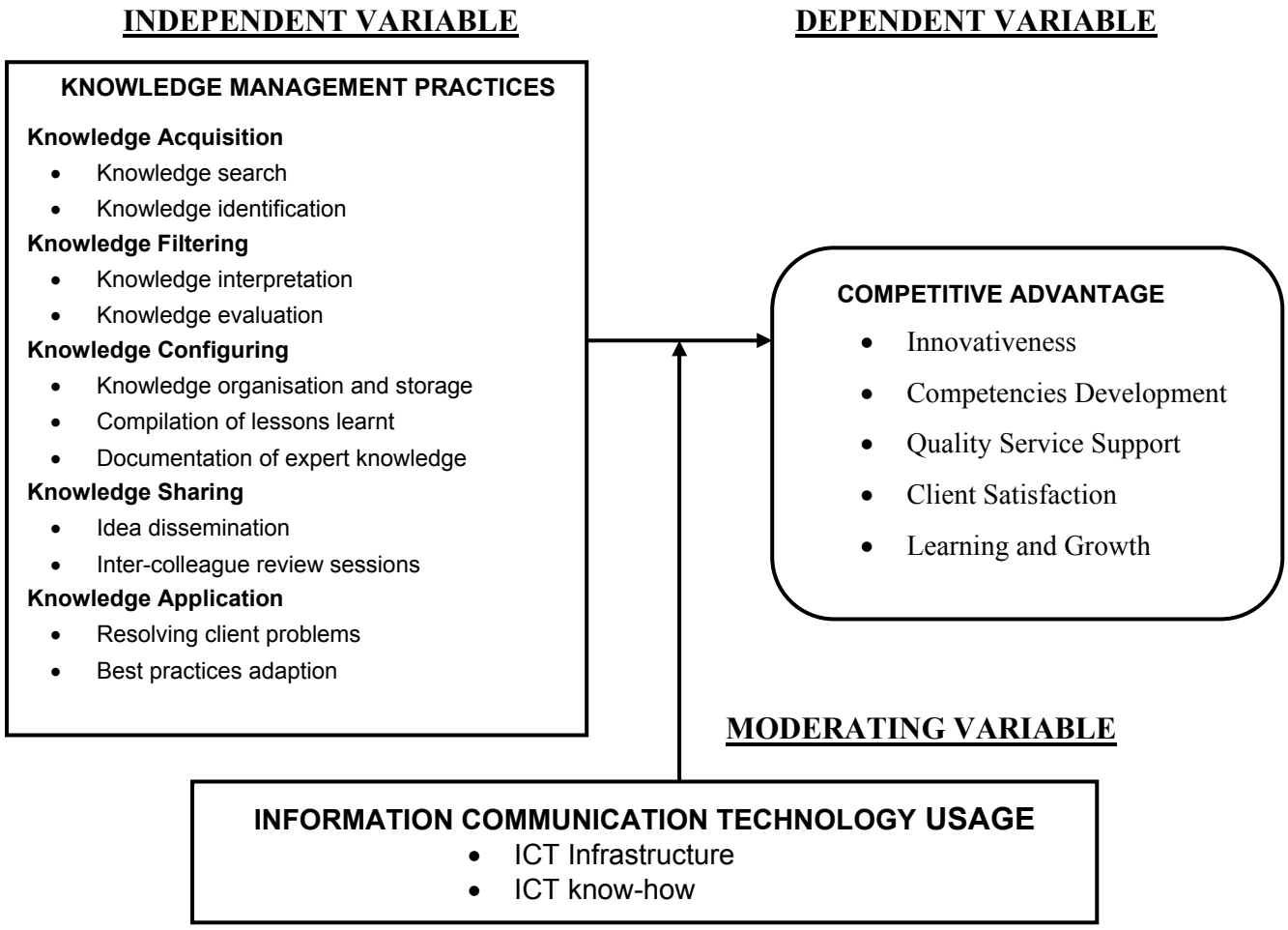
2.2 Conceptual Foundation

In line with current thinking, this study investigated non-price factors to underpin determinants of competitiveness. Although there are several non-price factors like human resource endowments, technical factors like Research and Development (R & D) capabilities, managerial and organizational factors (Clark & Guy, 1998), this study examined the effect of knowledge management practices of knowledge acquisition, knowledge filtering, knowledge configuration, knowledge sharing and knowledge application, on competitive advantage in consulting engineering firms in Uganda. The study also evaluated the role of ICT usage in moderating the relationship between knowledge management practices and competitive advantage. To underpin the conceptualization, the researcher drew from the two knowledge based theories namely the knowledge-based theory and the resource-based theory.

According to the resource-based and knowledge-based theories, individuals must possess the ability to effectively and efficiently exploit the full potential of the firm's resources, in order to develop and maintain any potential competitive advantages. It is such competences that are critical in acquiring, utilizing, developing and sharing knowledge, skills and experiences (Ericsson 1996) that translate into competitive advantage. Since engineering consultancy

firms are knowledge bearing entities and repositories of knowledge and capabilities (Rollo, 2002), the two theories support our conceptualization that views knowledge as a resource that forms the foundation of the company's capabilities that transform into competencies. Against this background the researcher argues that the more the knowledge management practices are carried out, the greater the competitive advantage for engineering firms that are basically knowledge intensive. The hypothesized relationship is presented in the conceptual framework in Figure 2.1.

Figure 2.1: Conceptual Framework



(Adapted from Alavi, 1997; Szulanshi, 2000)

Knowledge management practices formed the Independent Variable while competitive

advantage formed the Dependent Variable. The variance in competitive advantage is explained by knowledge management practices of acquisition, filtering, configuration, sharing and application and the relationship between knowledge management practices and competitive advantage is moderated by information communication technology usage. As affirmed by various researchers, a firm gains competitive advantage through strategic knowledge management practices (Davenport & Prusak, 1998; Zack, 1999; Alavi & Leidner, 2001). Competitive advantage which makes a firm more superior than another firm in the same industry was examined through five perspectives: innovativeness, competency development, quality service support, client satisfaction and learning and growth. We argue that with increased knowledge acquisition, filtering, configuring, sharing and application, consulting engineering firms are likely to gain competitive advantage over those firms that do not apply these practices.

2.3 Competitive Advantage

Strategic management practitioners and researchers have always wondered at the persistent superior performance demonstrated by highly successful firms. A great deal of attention has been geared towards the nature and causes of competitive advantage. Theoretical frameworks and perspectives have been advanced in an effort to explain competitive advantage. Traditionally, Porter (1980) suggested that there were five forces driving competitive advantage: the potential new entrants to the market, the bargaining power of the buyers, the bargaining power of the suppliers, the threat of substitutes, and the rivalry between the existing firms. In the mid 1990s, the resource-based view emerged and points to a firm's unique resources, core competencies, and dynamic capabilities in a rapidly changing global market as acknowledged by various scholars (Barney, 1991; Prahalad & Hamel, 1990; Teece,

Pisano & Shuen, 1997). The knowledge-based view that evolved from the resource-based view emphasizes creating a learning firm and fostering knowledge generation and exploitation as fundamental for competitive advantage in an increasingly information-based economy (Senge, 1990; Nonaka, 1991).

As noted by Nonaka & Takeuchi (1995), a company that manages knowledge effectively will have a better chance of long-term survival and a competitive advantage than those which lack in the same area. There is need to leverage the firm's intangible resources, of which human capital may be the most important and critical for competitive advantage as it is the most difficult to imitate (Carrillo et al., 2000). Porter (1985) argued that a firm must efficiently and effectively develop and apply its competency to achieve competitive advantage.

Drucker (1998) declared many years ago that every business is a knowledge business and almost every worker is a knowledge worker. This underpins the strategic importance of knowledge management practices in order for a firm to improve its competitiveness. This study considered innovativeness, competency development, quality service support, client satisfaction, and learning and growth as dimensions of competitive advantage.

2.4 Knowledge Management Practices and Competitive Advantage

According to Hoon (2003), previous researchers identified many key aspects of knowledge management practices which include: acquiring, collaborating, integrating, experimenting (Leonard, 1995); creating, transferring, assembling, integrating and exploiting (Teece, 1998), knowledge capturing, developing, sharing and utilizing (Lee & Hong, 2002). Rollo (2002) defines the knowledge-based firm as a "locus" of six critical capabilities: creating, destroying, integrating, absorbing, replicating and protecting. According to Gold, Malhotra,

& Segar, (2001), knowledge management practices are grouped into four dimensions which include; knowledge acquisition, knowledge conversion into useful form, application and protection. Furthermore, Singh et al. (2006) stated that knowledge management practices are strategies and processes to identify, capture, leverage knowledge to enhance competitiveness. Knowledge has long ago been recognized as an important non-price asset for sustaining competitive advantage and should therefore be well managed (Papoutsakis, 2006). Successful knowledge management strategies according to Ahmed et al. (2002) result in a variety of paybacks such as improved innovation that leads to improved products and services, improved decision making, quicker problem solving and fewer mistakes, reduction in product development time, enhanced customer care, service satisfaction and reduced costs on collaborative ventures. In addition, they contend that to remain competitive, firms must efficiently and effectively create, locate, capture, and share the knowledge and expertise of the individual working in the firm. This will increasingly require making the firm's knowledge explicit and recording it for easier distribution and reuse (Zack, 1999). The effect of knowledge management practices on competitive advantage in consulting engineering firms in Uganda is what the researcher examined. Firms remain competitive by acquiring, filtering, configuring, sharing and reusing the knowledge created by its employees.

As reflected by other scholars, effective knowledge management practices adapt individual knowledge into information that can be readily used to the benefit of the firm as a whole. Apart from extracting and clarifying knowledge from the individual, knowledge management strategies organize and provide structures to information so that it can be quickly located and used effectively and conveniently to improve the firm’s competitive advantage.

2.4.1 Knowledge Acquisition and Competitive Advantage

According to Jashapara (2004) knowledge acquisition is the beginning of the knowledge management cycle. Hoon (2003) asserted that different terms have been used to describe knowledge acquisition and these include creating, finding, capturing, innovating, seeking, generating and collaborating that enhance the firm's competitiveness. As confirmed by many studies, knowledge is acquired within the firm, from external sources and by creating new knowledge from the already existing information and that a firm that acquires knowledge faster than the competitor will have competitive edge over its competitors (Payne & Sheehan, 2004; Hoon, 2003). As noted by Nonaka & Takeuchi (1995), knowledge is also acquired through training or through colleagues who have the knowledge already through Socialization, Externalization, Combination and Internalization (SECI). They concluded that knowledge acquisition is an iterative and continuous process within the firm and between firms that improve their competitiveness.

As hypothesised by Rollett (2003), small engineering companies specializing in a niche market, successfully stay ahead of the competition through research and development because new knowledge facilitates creativity and innovation. Furthermore, Nonaka & Takeuchi (2004) argue that the success of firms depends on their unique approach to managing the creation of new knowledge that results in innovation which is a prerequisite to competitive advantage. This is supported by Egbu et al. (2005) who asserted that the knowledge creation practice adds value to previous knowledge through innovation. "When employees invent new knowledge, they are also reinventing themselves and the company and even the world" as stated by Nonaka (1998). He adds that the Japanese firms are competitive because of the fast way they create knowledge through SECI.

However, existing knowledge has a limit in its acquisition and application as it loses value unless the source of new knowledge keeps flowing in and as stated by Leonard-Barton (1995) knowledge acquisition is the core competency of any firm. This is further supported by Sveiby (2001) who noted that consulting engineering firms work in dynamic environments where technology keeps changing and for firms to keep ahead of competition they have to keep renewing their knowledge base with actionable knowledge. Moreover, Zack (1999) claimed that new knowledge acquisition affects competitive advantage through learning as it creates more abilities to create, suggests new ideas and improves innovativeness in the firm. It is ascertained by Zack (1999) that the ability to create knowledge and to continue to learn from it can become a competitive advantage because innovative knowledge developed today will become the core knowledge of tomorrow. Similarly, Carneiro (2000) confirmed that knowledge and information derived from data are required for competitive initiatives such as improving customer satisfaction, developing new products and markets and providing faster response, which are some of the dimensions of competitive advantage. Gupta & Daniels (2002) contend that Yli-Renko et al. (2001) produced research findings that indicate that knowledge acquisition is positively related to competitive advantage.

In order for consulting engineering firms to create value for the firm and increase the firm's competitiveness, newly acquired knowledge must be able to create new ideas, recognize new patterns and be embedded in new products and services. Additionally, individuals in the firm must learn and unlearn on a continuous basis as knowledge also ages and becomes obsolete as affirmed by Civi (2000). Further, knowledge unlike other assets possessed by the firm, appreciates with use and therefore requires to be updated from time to time. Due to the importance attached to knowledge acquisition in consulting engineering firms as indicated in the literature reviewed, the study set to examine its effect on competitive advantage in the

Uganda context.

2.4.2 Knowledge Filtering and Competitive Advantage

As acknowledged by Lubit (2001), all knowledge available is not useful, as all knowledge is not relevant to the business ventures at hand and it is not created equal. The knowledge filtering process requires that all acquired or created knowledge is sifted to retain knowledge that is necessary for the firm. According Payne & Sheehan (2004), one of the most important benefits of knowledge filtering is to avoid repeating mistakes already made by others and reducing duplication of work which makes a firm more competitive as it operates more efficiently and effectively. The aim of any consulting engineering firm is to execute projects with high quality and in less time, therefore the availability and easy access of actionable knowledge is paramount. When knowledge has been filtered and is ready to be used this does not only reduce waste but also helps in solving legal and insurance obligations in construction. Additionally, as opined by Senge (1994) individuals and companies have different mental models so when information is acquired it is interpreted and evaluated from a contextual mental model to create knowledge. The knowledge gleaned from the same set of information can differ greatly, not just in quality but also in applicability, thus emphasising the need to filter knowledge so that only knowledge that is useful and applicable to achieve reality-based results is retained for immediate or future use (Gupta & McDaniel, 2002).

In consulting engineering firms, during project reviews, people and their knowledge are brought together so that discussions are structured around specific project issues which can result in discovering valuable knowledge that could be used in subsequent projects (Gupta & McDaniel, 2002). Knowledge filtering helps reduce the time spent trying to locate the necessary knowledge, leading to faster service delivery that results in competitive advantage.

Knowledge is usually customized to meet the needs of a particular project and the combination of human and technological resources will help determine the required explicit knowledge. As affirmed by Chandra et al; (2001), to ensure competitiveness of the firm, knowledge must be well managed so that the right employees have easy access to it at the right time for quick decision making in problem-solving. The literature reviewed indicated that knowledge filtering is very important in ensuring that actionable knowledge is easily accessible, hence the need to investigate this phenomenon in consulting engineering firms in the Uganda environment.

2.4.3 Knowledge Configuration and Competitive Advantage

In consulting engineering firms, environments are always dynamic and knowledge is always needed to urgently solve client problems and codified knowledge increases the speed of knowledge exchange and also helps to quickly innovate (Gupta & McDaniel, 2002).

The amount of technical know-how, be it tacit or explicit need to be organized in such a way that others in the company know where to find it and from whom to get it, whenever needed, a procedure known as knowledge mapping in the literature (Egbu et al., 2005). Furthermore they argue that the faster useful knowledge is accessed, the faster client problems will be solved and this will lead to effective and efficient service delivery that will give a firm a competitive edge and the filtered knowledge lead its quick access. They concluded that recording valuable experience can prevent repetition of mistakes and reuse of the best practices while reducing costs and improving consistency and competitiveness.

Some researchers have argued that successfully configured knowledge will result in improved innovation and creativity that will lead to improved products and service, improved decision making, quicker problem solving and fewer mistakes, reduction in product

development time, enhanced customer care, service satisfaction and reduced costs on collaborative ventures that give a firm a competitive advantage (Ahmed et al., 2002).

In consulting engineering firms, configured knowledge is kept in report form, best practices guides and lessons learnt reports which when well protected and managed will make a firm more competitive (Tidd, 2000). In addition, documents containing explicit knowledge are very useful for firms, as they indicate past successes and failures, which help individuals working on projects not to reinvent the wheel when starting subsequent projects. Individuals can utilize these reports to improve on the successes and to avoid the mistakes already made in the past. As stated by Gupta & McDaniel (2002) knowledge configuration is important for innovativeness as well as learning and growth and client satisfaction. Furthermore, activities associated with retaining accumulated knowledge are essential, because often individual contributions as well as external gleanings may be strategically important, but not able to be acted on immediately. As opined by Senge (1994), in order to easily interpret stored knowledge, contextual and strategic thought processes that were used in the development of stored ideas must be included to show the perpetual filters through which given information sets were understood, this will quicken the interpretation of what was configured and stored to quicken the decision making process.

In consulting engineering firms knowledge is kept in form of documents such as progress reports, final completion reports, drawings, only to name a few. The information that is filtered and stored electronically has to be properly managed so that time spent trying to access this knowledge is minimized and the decision making processes is faster. The time factor in project execution is very important as projects are time bound therefore codification of knowledge can increase knowledge exchange, supporting independent and sometimes

systemic innovations in the future (Parikh, 2001). The importance attributed to knowledge configuration justified the study to investigate the effect of knowledge configuration on competitive advantage in consulting engineering firms in Uganda.

2.4.4 Knowledge Sharing and Competitive Advantage

Many researchers acknowledged that the knowledge sharing process enables the flow of knowledge among and between individuals, groups and firms, whereby one unit is affected by the experience of another (Argote & Ingram, 2000; Egbu et al., 2005; Hoon, 2003). This phenomenon can be assessed by the performance of the recipient unit. Kim & Nelson (2000), asserted that knowledge sharing occurs through a dynamic learning process where individuals working in these firms interact with customers and suppliers to innovate or creatively imitate to gain a competitive advantage. A number of studies have demonstrated that knowledge sharing leads to competitive advantage because it enables firms to enhance innovation performance and reduce redundant learning efforts (Scarbrough, 2003; Lin, 2007). This was also supported by many scholars who suggested that knowledge sharing enhances innovation capability, one of the dimensions of competitive advantage as contended by Liao & Chuang (2006).

Lin (2007), emphasises that knowledge sharing at individual level occurs when colleagues assist each other to do things in a better way, much faster, or more efficiently and at the firm level, knowledge sharing is capturing, organizing, reusing, and transferring experience-based knowledge that resides within the firm and making it available to others in the firm. Furthermore, Chinowksy & Carrillo (2007) affirm that failure to share tacit knowledge or create explicit knowledge from tacit knowledge can result in losses to the firm and accelerate the competitor's advantage. Additionally, knowledge sharing enables individual working in

consulting engineering firms to mutually exchange knowledge and synergise their efforts to jointly innovate or create new knowledge which leads to competitive advantage. In support of the above, Reid (2003) emphasised that knowledge sharing helps a firm to create opportunities to optimise its ability to meet its needs and generate solutions and efficiencies that provide the firm with a competitive advantage.

A firm's ability to transform and exploit knowledge may determine its level of innovation, leading to faster problem-solving capability and enhanced rapid reaction to new information. Moreover, knowledge sharing of past failures and past success is very important for better project implementation as mistakes already made are avoided and successes are improved in order for the firm to gain competitive advantage. The literature reviewed necessitated the researcher to investigate this occurrence in consulting engineering firms in Uganda.

2.4.5 Knowledge Application and Competitive Advantage

In order for knowledge to create value, it must be applied within a specific business context, and a knowledge management strategy consciously helps people to share and put knowledge into action by creating access, context, infrastructure, at the same time shortening learning cycles (Massey & Montoya-Weiss, 2003). Although Dawson (2000) states that each industry does it differently, the underlying processes are similar, in that people with diverse expertise and knowledge work together to enhance existing value chains or create new ones. Pfeffer & Sutton (2000) argued that competitive advantage goes to those firms that use knowledge best and not the ones that have the best knowledge. However, Jasphara (2004) contends that unless knowledge is applied in real world business activity, all the preceding phases of knowledge management are in vain. He adds that knowledge management is a multi-disciplined approach that helps to achieve organizational objectives by making the best use of

knowledge. It is hypothesized in the literature that the application of knowledge to firm's technologies and processes leads to competitive advantage. Davenport & Prusak (1998) contended that the application and use of knowledge has contributed to competitive advantage of firms while Rampersad (2002) posits that a firm will have a competitive advantage if it implements and commercialises new knowledge faster than the workers of the competitor in the same industry.

Many scholars and practitioners argue that consulting engineering firms operate in projects based environment with independent multidisciplinary teams that are regarded as temporary or virtual firms with specific objectives, detailed tasks, restricted time, and budgets to deliver a one-of-a-kind-product or service (Carrillo, 2004; Teerajetgul & Charoenngam, 2006; Pathirage et al., 2007). As confirmed by various researchers, the continuous sharing and applying of knowledge therefore facilitates its retention within the firm following the completion of the project, and thereafter, become available for use in subsequent projects as emphasised by many researchers (Kamara et al., 2003; Ebgu, 2004; Anumba et al., 2002).

In consulting engineering firms individual professionals need to generate new knowledge, facilitate its sharing internally and externally and apply it on a continuous basis in order to gain competitive advantage. Innovativeness and creativity are core competencies that engineering firms need in order to remain and become more competitive in the market place. The literature premises that knowledge application affects competitive advantage hence the justification to determine the effect of knowledge application on competitive advantage in consulting engineering firms in Uganda.

2.4.6 The Influence of Information Communications Technology Usage on the Relationship between Knowledge Management Practices and Competitive Advantage

The role of information communication technology triggers considerable controversy in the study of knowledge management and competitive advantage (Hendriks, 2001). However, Zack (1999) believes that information communication technology plays four different roles in the knowledge management strategy, namely, obtaining knowledge, linking knowledge related digital items, seeking and identifying related content, and lastly, flexibility to express the content based on the various utilisation backgrounds. Chong (2005) asserts that ICT can be effectively used to facilitate the codification, integration and dissemination of the firm's knowledge. Egbu et al. (2005) stated that some researchers argue that ICT can be used as a strategic weapon by small firms to maintain their competitiveness and attain a favourable position within the sector of activity. This had been affirmed by Tan (1996) who argued that ICT offered opportunities as a strategic weapon to gain competitive advantage, improve productivity and performance, enable new ways of managing and organising and developing new business in the construction industry. Laudon & Laudon (1998) identified four classes of IT used in the industry. The first class is for knowledge creation such as Computer Aided Design systems. The second class is under office automation systems such as word processors and databases. The third class is systems that facilitate knowledge sharing such as intranets, internet, groupware, document management systems, electronic mails and bulletin boards. The fourth class is for knowledge capture and codification with artificial intelligence technology. In agreement Tan (1996) stated that in architecture, engineering and construction industry, ICT is important in administration and accounting programmes, electronic interchange for both conventional and graphics-based data, project management applications,

two-dimensional or three-dimensional CAD systems, design and drafting system, numerical analysis, expert systems and decision support systems. The significance of ICT was also emphasised by Carrillo et al. (2000) who stated that in knowledge creation, ICTs are discipline specific and include CAD systems, analysis systems, estimating systems; in knowledge filtering these were termed as "office automation systems" which enable the manipulation of knowledge in the firm; in knowledge configuration, this involves systems that are able to encapsulate knowledge and expertise in coded or symbolic form using "artificial intelligence"; in knowledge sharing these include intranets, video conferencing, document management systems, bulletin boards, shared databases, electronic mail systems.

In consulting engineering firms, information communication technology plays an important role on how the firms operate, employees collect and share innovative ideas from and between every corner of the firm and finally come up with excellent products and new processes which can significantly outperform the competitors (Lin & Wei, 2005; Carrillo et al., 2000). As theorised by several researchers, ICT and knowledge sharing are closely linked as ICT enable rapid search, access and retrieval of information and supports communication and collaboration among employees at the same time overcomes geographical boundaries (Lin, 2007; Carrillo & Chinowsky, 2006; Carrillo et al., 2000; Khalifa & Liu, 2003). According to Zack (1999), ICT helps employees to obtain knowledge, define, store, categorize, index and link knowledge-related digital items and seek and identify related content. Dawson (2000) recognizes ICT as an important source of competitive advantage, but only in a short term perspective, as competitors will implement the same technology.

In consulting engineering firms, the use of ICT makes the internal and external collaboration faster and more efficient. As some of the benefits of knowledge management practices

include time and cost saving, the use of the computer as a tool to organize, store, and retrieve knowledge as soon as it is required is beneficial towards the firm's competitive advantage. As argued by Roberts (2000), ICT facilitates the rapid collection, storage and exchange of data on a scale not practicable in the past, thereby assisting the knowledge creation and sharing practice that are important in gaining competitive advantage. Gold et al. (2001) theorised that a well-developed technology integrates fragmented flows of information and knowledge, and the same argument is supported by Hoon (2003) who affirmed that the firm's scattered data can be integrated through ICT via the network making its access faster. As illustrated by Porter (1985), ICT can enhance operational efficiency and change the way a business will compete and when ICT is integrated into the activities of the value chain it will create competitive advantage.

However, some researchers contended that information communication technology, which plays an important role in knowledge management practices, cannot make firms or individuals more "knowledgeable" (Davenport & Prusak, 1998). This is supported by Egbu (2004) who believes information communication technology is just an important enabler as "it enables the process, people and the knowledge content". This is supported by Civi (2000) who emphasises that knowledge originates from the people and computers cannot create knowledge. In order to optimally use ICT, employees must already possess the knowledge.

In consulting engineering firms, speed, quality, cost are very important when delivering projects, the use of ICT speeds up a lot of activities during service delivery. ICT offers strategic opportunities to gain competitive advantage, improve productivity and performance, enable new ways of managing and organizing and developing business as suggested by Tan (1996). The contradictions in earlier findings necessitated the study to examine the influence

of ICT usage on the relationship; between knowledge management practices and competitive advantage in consulting engineering firms in Uganda.

2.5 Conclusion

From the literature reviewed, several studies concentrated on knowledge management practices and organisational performance. Other studies concentrated on knowledge management and competitive advantage in the construction industry in developed countries but there were limited studies carried out in developing countries in general and in Uganda in particular. There were many studies carried out especially in manufacturing industries but there were limited in the consulting engineering sector. Thus the study to investigate knowledge management practices and competitive advantage in consulting engineering firms in Uganda. The researcher looked at a number of models and constructs after which a conceptual framework was derived. The next chapter discusses the methodology.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The chapter focuses on the methods and procedures that were used to achieve the objectives of this research. The research design, the study population, sample size and selection procedure, methods of data collection and the research instruments, reliability and validity procedures, data collection and analysis techniques are all herein described.

3.1 Research Design

The research design was basically a cross-sectional survey, investigative and descriptive in nature. This type of study permits an in-depth description of the phenomenon as it exists at that particular time. Other attributes of a cross-sectional design are cost and time efficient as the study could be done quickly. The researcher did not have to worry about participants dropping out of the study, since it only covered one particular point in time. Both quantitative and qualitative paradigms were used in data collection and analysis in accordance with Mugenda & Mugenda (1999) who support the use of both methods as they complement each other. This is also supported by Babbie (2007) who recognizes that the triangulation of both approaches makes a research richer. According to Babbie (2007) cross-sectional studies aim at understanding causal processes that occur over time. The unit of analysis were the individuals professionals working in the consulting engineering firms. The study was more inclined to quantitative approach.

3.2 Study Population

The study population was 210 consisting 194 individual professionals obtained from the

payrolls of the firms; 12 heads of the engineering firms and 4 project engineers from the client who were key informants. The heads of the engineering firms and the project engineers from the client were interviewed face to face in order to gather more information that helped the researcher understand knowledge management practices and competitive advantage within consulting engineering firms in Uganda. All the individual professionals were given a chance to participate in the study because knowledge management practices include all professional employees to ensure the right information is received by the right people, at the right time to enable them to quickly make the best business decisions for their clients (Carrillo, 2004; Leonard-Barton, 1995).

3.3 Sample Size and Selection

The decision on sample size selection is controlled by the extent of precision desired, the acceptable risk in predicting the level of precision, the amount of variability in the population, the time and cost constraints as well as the size of the population (Sekaran, 2003). A sample size from this population, for the three categories from 12 firms that were members of the UACE, was determined and presented in the sampling frame in Table 3.1 hereunder.

Table 3.1 Selection of Sample Size

Category	Population N	Sample n	Sampling Formula
Individuals in the firm	194	131	Mathematical Formula
Heads of the firms (key informants)	12	12	purposive
Project Managers from Client (key informants)	4	4	Purposive
Sample	**210**	**147**	

(Source of individuals in the firm N is from Payrolls of consulting engineering firms, 2008)

Since there were three categories of respondents, different methods were used to select sample size. To determine the sample for individual professionals, two methods were applied

to ensure that the same sample size was derived. The first method was the sampling table by Krejcie and Morgan (1970) obtained from Sekaran (2003, p.294) to determine a sample size for a population of 194 individuals working in the firm. For a population of 190 the sample is 127 and for a population of 200 the sample is 132, the population of 194 therefore fell between a sample size of 127 and 132 which is about 130. To confirm the above sample size, the Yamane (1970) mathematical formula was used. The researcher applied the formula, $n = \frac{N}{1 + N(e)^2}$ where 'n' is the desired sample size, 'N' is the population and 'e' is the confidence level. Using a confidence level of 95%, the sample size was 131 subjects which the researcher decided to use as the representative sample of individual professionals. On the other hand, purposive sampling was used in the selection of the heads of the firms and the project managers from the client side for face to face interviews. The choice of sampling was based on the recommendation by Sekaran (2003) and Amin (2005) who affirmed that purposive sampling should involve subjects who are most advantageously placed or in the best position to provide the required information. The heads of the firms are involved in the recruitment and management of the individual professionals as well as the strategic management of the firms, so they had invaluable information that helped clarify issues of competitiveness in relation to knowledge management practices within their knowledge intensive firms. The project managers supervise the works carried out by the consulting engineering firms and are therefore knowledgeable about the individuals with whom they interact while executing their duties.

3.4 Sampling Techniques and Procedure

After determining a representative sample of 131 individual professionals working in consulting engineering firms, the sampling techniques had to be determined. The study

employed simple random sampling technique to select the sample of the individual professionals. Simple random sampling is the best technique when the findings have to be generalized on the whole population (Sekaran, 2003). This is also supported by Babbie (2007) who argues that the basic principle of simple random sampling is that a sample will be representative of the population from which it is selected since all elements of the population have an equal chance of being selected in the sample. Furthermore, he ascertains that simple random sampling eliminates biases and is likely to be more representative of the population than other types of samples. A comprehensive list of all the 194 professional individuals working in the 12 consulting firms was collated and names of the individuals written on pieces of paper which were tossed and 131 were picked randomly to represent the sample.

3.5 Methods of Data Collection

The study used both primary and secondary research methods for data collection. Primary data were collected for the first time from the field on the variables of interest in the study. Questioning of respondents was done through the use of a self-administered questionnaire which was sent to 131 individuals working in the consulting engineering firms. Interviewing of the 16 key informants through face-to-face interviews was also used to collect primary data that were used in the study. The primary data were useful in gathering perceptions and attitudes of the individuals working in the firms. According to Amin (2005), supported by Mugenda & Mugenda (2003), the technique ensures that interviewees seek clarity and purpose of particular questions which augments the degree of accuracy of the information gathered and helps to obtain more data.

Secondary data were collected by reviewing documents in the firms' records and project reports, professional journals and construction industry analyses in the media. The researcher

reviewed available relevant literature, research papers, that had already been analysed by others in order to understand the variables and study the findings of earlier researchers. The researcher accessed several documents from the firms in form of reports, donor guides, minutes and other company documents. Information from the internet was also reviewed mostly from electronic journals and research papers on knowledge management practices and competitive advantage. Newspapers, text books and research dissertations were also used to collect the required information. According to Amin (2005) secondary data is obligatory for organisational research.

3.6 Data Collection Instruments

The instruments used in data collection were self-administered questionnaires, structured interviews guides and document review checklist.

3.6.1 Self-Administered Questionnaire

A close-ended structured questionnaire was used to capture data on knowledge management practices, competitive advantage and ICT usage. This instrument was used because it was the best instrument to extract information the researcher required in order to answer the research questions, without undue interference and prejudice. The structured questionnaire was considered appropriate as it helps respondents make quick decisions to make a choice thereby saving time as well as helping the researcher to code the information quickly for analysis (Sekaran, 2003; Mugenda & Mugenda, 2003). This was also supported by Amin (2005) who affirmed that a questionnaire offers greater assurance for anonymity especially when handling sensitive issues like the firm's strategy to gain competitive advantage. The survey questionnaire was set in four sections with eighty two items which were mostly adopted from

Gold et al. (2001) and Hoon (2003). Section one has 9 items which were about the respondent's profile and the firm's profile. Section two, knowledge management practices was divided into five subsections A-knowledge acquisition, B-knowledge filtering, C-knowledge configuration, D-knowledge sharing and E-knowledge application, altogether there were 32 items. Section three is the information communication technology usage, the moderating variable, that was divided into two sections, A-ICT infrastructure and B-ICT know-how, both sub-sections had 11 items. Section four, competitive advantage, the dependent variable, was sub-divided into five sub-sections: A-Innovativeness, B-Competency Development, C-Quality Service Support, D-Client Satisfaction, E-Learning and Growth with a total of 32 items. The 5-point Likert scale rating of 1-strongly disagree, 2-disagree, 3-undecided, 4-agree and 5-strongly agree was used for the dependent, independent and moderating variable questions as recommended by Amin (2005) who argued that the Likert scale is very flexible and can be easily constructed than other types of attitude scales.

3.6.2 Interview Guides

The structured interview guide for Chief Executives comprised of 18 open ended questions that were posed during the face-to-face interviews. The use of the interview guide allowed the collection of in-depth information from the heads of the 12 consulting firms who were considered to be more knowledgeable about the strategic plans of their firms and without whose support and commitment knowledge management practices would not be easily implemented by individuals working in the firms (Lin & Wei, 2005). They provided information that reflected the opinion of both their clients and employees.

Another interview guide for Clients was used to get information from project managers from Uganda National Roads Authority, Ministry of Works and Transport, National Water &

Sewerage Corporation, Ministry of Information Communication & Technology to obtain the client's perception of the performance of consulting engineering firms in Uganda.

Interviews penetrate every observation in a deeper way as they focus upon variables that are harder to classify and quantify (Andreasson & Svartling, 1999) as is the case with knowledge management practices and competitive advantage. Data collected during the face-to-face interviews gave a clear understanding of the objectives of the study; clarified questions and helped the researcher to collect additional information not captured by the self-administered questionnaire. A telephone interview where the one key informant was not in office was used in one instance.

3.6.3 Documentary Review Guide

Documentary review checklist was used while gathering secondary data which were crucial for the research from various documents described in section 3.5.3. The guide had eight items that assisted the researcher in collecting the required information.

3.7 Validity and Reliability

Validity and reliability are critical features of research and caution must always be taken in every research undertaking (Mugenda & Mugenda, 2003). They both measure the goodness of measures, to ascertain whether the instrument used was accurately measuring the variable and the concept that the researcher set out to measure as stated by Sekaran (2003).

3.7.1 Validity

Validity refers to the extent to which an empirical measure reflects the real meaning of the concept under consideration (Babbie, 2007). To test for validity, the questionnaire was pre-

tested during the peer review on some Masters programme participants at UMI for content and face validity. This was to ensure that the measure included was adequate and representative set of items to tap the concepts (Sekaran, 2003). The results of the observations made after peer review were discussed with the supervisor and a few adjustments were made where necessary, in order to present a better understanding of what the items meant thereby increasing the credibility of the research. The researcher's supervisors assessed the content validity to ensure that the results obtained from the use of the measure fit the theories used in the study, before the questionnaire was administered to the research participants.

3.7.2 Reliability

Reliability refers to the degree to which a set of variables is consistent with what it is intended to measure (Amin, 2005). Reliability of a measure is established by testing consistency and stability (Sekaran, 2003). Babbie (2007) concurs that reliability is the technique when applied repeatedly to the same object, yields the same results each time. Two pilot tests were conducted on 3 professional engineers who were not currently working in any of the firms to gauge how well they understood the questions and to help debug any ambiguous questions. The pilot tests results indicated that the engineers understood the questions the same way they were intended, which indicated the consistency of the instrument.

According to Sekaran (2003), Cronbach's Alpha is one way of testing goodness of data. In addition, he states that Cronbach's Alpha reliability coefficient indicates how well items in a set are positively correlated with each other and that the closer the results are to 1, the higher the internal consistency reliability. Furthermore, reliabilities less than 0.60 are considered poor, those in the 0.70 range are acceptable and those over 0.80 are good. The reliability of

all variables is shown below in Table 3.2.

Table 3.2 Summary of Reliability Analysis – All Variables

All variables	No. of Items	Standardised Cronbach's Alpha
Knowledge Application	5	0.84
Knowledge Configuration	7	0.84
Knowledge Filtering	6	0.82
Knowledge Acquisition	6	0.81
Knowledge Sharing	8	0.72
Competitive Advantage	30	0.94
ICT usage	11	0.89
Total	**73**	

The Cronbach's Alpha values ranged from 0.72 to 0.94, which implied the suitability of the items since the measures were highly reliable (Amin, 2005; Sekaran, 2003). All the items were therefore administered in the final study.

3.8 Data Management and Analysis

A number of data analysis methods were used in order to answer the research questions and test the hypotheses. The questionnaires were edited for completeness, mutual exclusivity, errors and consistency. After the reliability analysis to test the reliability of the data collected in the questionnaire the quantitative data was coded and entered into the computer using Statistical Package for Social Sciences (SPSS). Qualitative data from key informant interviews were analysed and presented in a narrative form.

3.8.1 Descriptive and frequency Statistics

The SPSS programme was used to generate descriptive statistics in form of arithmetic means, frequencies, percentages to present the raw data in a way that they could be easily interpreted

and understood. The descriptive statistics mainly explained the respondents' and company's profiles. Mugenda & Mugenda (2003) confirmed that descriptive statistics enable the researcher to meaningfully describe the distribution of scores using a few statistics. These results helped to interpret the respondents' responses.

3.8.2 Correlation Analysis

Correlation analysis that enables the measurement of the relationship between the variables (Amin, 2005), was used to establish the relationship between knowledge management practices (Independent Variable) and competitive advantage (Dependent Variable). Correlation analysis indicated the direction and significance of the variables. According to Rowntree (1981), a score of correlation coefficient from 0.0 to 0.2 implies a very weak level of correlation and scores above 0.2 to 0.4 implies a weak correlation and above 0.4 to 0.7 indicates a moderate correlation. He adds that a significance of p=0.05 is generally acceptable, meaning that 95 times out of 100 there is a significant correlation between the variables and a 5% chance that the relationship does not truly exist. Though correlation (r) coefficient indicates the strength of relationship, it does not show how much of the variance in the dependent variable will be explained when several independent variables are theorized to influence it at the same time (Sekaran, 2003).

3.8.3 Multiple Regression Analysis

Once the correlation analysis indicated that the independent variable and the dependant variable were moderately related, multiple regression method of data analysis was used to determine the specific function relating to the dependent and independent variables. The multiple regression provides a means of analyzing how a dependent variable is affected

simultaneously by several independent variables (Babbie, 2007). The linear and multiple regression model is presented in an equation as presented below:

$$Y = \partial 1X1 + \partial 2X2 + \partial 3X3 + \partial 4X4 + \partial 5X5 + en$$

Where: **Y** being Competitive Advantage;

and **∂x1, ∂x2, ∂x3, ∂x4, ∂x5** = knowledge acquisition, knowledge application, knowledge acquisition, knowledge sharing and knowledge filtering, respectively

and **en** being the error term

Multiple regression was carried out to trace the mutual influence of variables on one another, whether they have a tendency to increase together or to change in opposite directions and if so by how much (Gupta, 1999). The R square demonstrated how well the values fit the data and helped the researcher to establish the competitive advantage variance that is explained by knowledge management practices when all interrelations are taken into consideration (Hair et al. 1998; Sekaran, 2003). The coefficient Beta (β) results, between -1 and +1, in the table generated after multiple regression, indicated the magnitude, direction and strength of the relationship, the greater the value the greater the impact.

3.8.4 Hierarchical Regression Analysis

In order to find out how Information Communication Technology Usage (moderator variable) influences the relationship between knowledge management practices and competitive advantage, a hierarchical regression was utilised. Hierarchical regression was done by first entering the dependent variable (competitive advantage), secondly, by entering the control variables that are suspected to affect the relationship if not controlled, thirdly, by entering the independent variables (knowledge management practices) and lastly the moderator variable

(Information Communication Technology Usage). This generated three models of regression each time indicating the change in the relationship between the knowledge management practices and competitive advantage which were later interpreted.

3.9 Limitations

The researcher experienced a number of limitations in research design and methodology, the nature of data collected that have a bearing on results, interpretations and generalizations. The researcher is hopeful that future researchers will develop the instrument further, refine the model and constructs, and test it with a diversified sample.

There was limitation due to the questionnaire which was long because of the many variables that had to be tested. The last limitation was caused by the fact that not many people were conversant with knowledge management practices as it is a new discipline. In many cases the researcher had to first explain what knowledge management practices were to some respondents before they agreed to participate in the study.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 Introduction

This chapter presents the descriptive statistics that were used to assess the perceptions of the respondents, the firms' profiles and the computed demographic characteristics of the respondents. Correlation, multiple and hierarchical regression analyses were carried out after which empirical results were presented and interpreted. The results are presented on the basis of the objectives postulated to examine knowledge management practices (knowledge acquisition, knowledge filtering, knowledge configuration, knowledge sharing and knowledge application) and competitive advantage in consulting engineering firms in Uganda. The influence of Information Communication Technology usage on the relationship between knowledge management practices and competitive advantage was also examined.

4.1 Response Rate

Table 4.1 below shows the response rate after analyzing the returned questionnaires.

Table 4.1 Response Rate

Questionnaires distributed	131
Questionnaires Returned	102
Questionnaires Not returned	29
Questionnaires Returned but not usable	21
Questionnaires Returned usable	81
Response rate	78%

Twelve (12) consultancy engineering firms participated in the study. The 12 firms had a total population of 194 male and female professional staff. After determining the sample size in

section 3, the respondents to whom the researcher sent the questionnaire were 131. Out of 131 questionnaires sent out, 102 were returned representing a response rate of 78%. However, only 81 were useable for data analysis after 21 were discarded due to incompleteness. Sekaran (2003) posits that if a significant number of questions, like 25% of the items in the questionnaire, have been left unanswered, it may be better to throw out the questionnaire and not include it in data analysis. The high response rate is attributed to the researcher hand delivering the questionnaires and following up personally. Mugenda & Mugenda (2003) affirm that a response rate of 50% is adequate for analysis and reporting, the response rate of 60% is good and that of 70% and above is very good. Sekaran, (2003) affirms that a response level of 30% is acceptable.

4.2 Demographic Results of Respondents

Before analysing the hypothesis testing results, an analysis of respondents' profiles was done and following are the descriptive analysis results.

4.2.1 Years worked in the firm

Table 4.2 below shows the number of years the respondents had been engaged in the firms which informed the researcher about the experience of the respondents.

Table 4.2 Years worked in the firm

	Category of Years	Frequency	Percent
	1-5	48	59.4
	6-10	12	14.9
	11-15	6	7.5
	16-20	4	4.8
	21-25	4	4.8
	Total	74	91.4
Missing		7	8.6
Total		81	100

The highest percentage, fifty nine point four percent (59.4%) had been employed in their respective firms for a period of between 1 and 5 years, fourteen point nine percent (14.9%) are in the 6-10 years category, seven point five percent 7.5% fall in the 11-15 years range, the categories of 16-20 and 21-25 both have four point eight percent 4.8% each.

All respondents had worked for a year or more and presumed to have a good understanding of the firm's culture, settings and would therefore be in position to give informed responses. The category of 1-5 years had the highest percentage of 59.4% and the explanation from top management was that many of the employees are freelancers who are engaged on project by project basis to cut down the overheads of fulltime employees. Nevertheless, such employees have vast knowledge on the projects and are able to give appropriate responses on the effect of knowledge management practices on competitive advantage.

4.2.2 Age of Respondents

The age of respondents was of interest to the researcher to establish whether the individuals with long accumulated knowledge and experience, nearing the age of retirement, were in regular employment sharing their accumulated knowledge. The results are in Table 4.3.

Table 4.3 Age of Respondents

Category	Frequency	Percent
21-30 years	32	39.5
31-40 years	28	34.6
41-50 years	14	17.3
51-60 years	5	6.2
61+	2	2.5
Total	81	100

The highest percentage of thirty nine point five percent 39.5% (32 respondents) belong to the category of 21-30 years. The category of 31-40 years represents thirty four point six percent (34.6%) (28 respondents). The category of 41-50 years represents seventeen point three percent (17.3%) (14 respondents), and the category of 51-60 years represents six point two percent (6.2%) (5 respondents), the 60 years and above category represents only two point five percent (2.5%) (2 respondents).

The category of 21-30 years had the highest percentage of 39.5%. These are the young engineers who had been engaged for one year and above. The seasoned engineers in the category of 51-60 years and 60 years and above, together represent only eight point seven percent (8.7%) of the respondents which suggests that many of them were either already retired or were not in regular employment.

4.2.3 Category of Job Title

The category of job titles is presented in Table 4.4 below.

Table 4.4 Category of Job Title

Category of Job Title		Frequency	Percent
	General Staff	22	27.2
	Supervisory	24	29.6
	Project Manager	20	25.9
	Administrative	11	13.6
	Total	77	96.3
Missing		3	3.7
Total		81	100

All respondents indicated their job titles except three staff members. General staff represented twenty seven point two percent (27.2%), supervisory staff represented twenty nine point six percent (29.6%), project managers represented twenty five point nine percent

(25.9%) and administrative staff represented thirteen point six percent (13.6%). This indicated that knowledge usage pervades all the professionals working in the firm.

4.3 Demographic Results of the Firms

Likewise the firms' profiles were analysed to give a good background of the consulting engineering firms where data were collected.

4.3.1 Type of Industry

All the firms deal with all sectors that include among others, buildings, road engineering, water and sanitation, and energy. The firms have professionals such as engineers, surveyors, architects, environmentalists and sociologists either in-house or readily available to be engaged as freelancers.

4.3.2 Years the Firm had been operational

In Table 4.5 below, the results of the years the firms had been operational are presented.

Table 4.5 Years the Firm had been operational

Years	Frequency	Percent
1-10	22	27.0
11-20	30	37.1
21-30	10	12.4
31-40	4	5.0
Missing	15	18.5

Twenty seven percent (27%) of the firms had been operating for less than ten years. Thirty seven point one percent (37.1%) had been operational between 11-20 years. Twelve point four percent had been operational between 21-30 years and only five percent had been operational between 31-40 years. A total of fifty four point five percent (54.5%) stated their

firms had been operational for more than ten years. Twenty seven percent (27%) of the respondents confirmed that the firms had been operational for less than ten years. Eighteen point five percent (18.5%) did not know for how long the firms had been operational.

The fifty four point five percent (54.5%) of the respondents that confirmed that their firms had been operational for over ten years suggested that engineering consulting firms were so far sustaining themselves. A construction firm's previous experience and performance are analysed before a job is offered. Given the importance of consulting engineers in the construction process, it is understandable that their clients seek performance information regarding projects previously managed. In the knowledge economy where environments are dynamic, new ways of knowledge management have to be devised to help consulting engineering firms compete better.

4.3.3 Size of firm by number of employees

Table 4.6 below indicates the size of the firm categorised by the number of employees in the firm.

Table 4.6 Size of firm by number of employees

Category	Frequency	Percent
1-20 employees	31	38.3
21-50 employees	41	50.8
51-100 employees	5	6.2
Total	77	95.1
Missing (not answered)	4	4.9
Total	81	100

There were three categories; 1-20 employees which was thirty eight point three percent

(38.3%), 21-50 employees with fifty point eight percent (50.8%) and 51-100 employees which had six point two percent (6.2%). In terms of size categorised by number of employees, most consulting engineering firms are small with the biggest percentage of fifty point eight percent (50.8%) falling between 21-50 employees.

The results are suggestive that in consulting engineering firms, it is the quality of individuals working in the firm that is paramount not the numbers. Consulting engineering firms recruit highly trained and experienced personnel that form good teams that perform with excellence as they possess the best knowledge. This is supported by Pfeffer & Sutton (2000) who affirmed that competitive advantage goes to firms that use knowledge best and not the ones that have the best knowledge.

4.3.4 Average Gross Annual Revenue

The data collected on average gross annual revenue are presented in Table 4.7.

Table 4.7 Average Gross Annual Revenue

Category	Frequency	Percent
50 million Uganda Shillings or less	1	1.2
51-100 million Uganda Shillings	9	11.1
101-200 million Uganda Shillings	3	3.7
201- 500 million Uganda Shillings	13	16.0
Over 500 million Uganda Shillings	31	38.3
Total	57	70.4
Missing (not answered)	24	29.6
Total	81	100

The results above indicate that thirty eight point three percent (38.3%) of the respondents contended that their firms were in the over 500 million Uganda Shillings range, sixteen

percent (16%) in the category of 201-500 million Uganda Shillings, eleven point one percent (11.1%) were in the category of 51-100 million Uganda Shillings, three point seven percent (3.7%) were in the category of 101-200 million Uganda Shillings, only one point two percent (1.2%) were in the 50 million Uganda Shillings or less category and twenty nine point six percent (29.6%) did not know their firm's financial performance.

The figure of twenty nine point six percent (29.6%) of the respondents who did not know information about the firm's financial performance is suggestive that financial matters were not shared with all members of staff. The results show that fifty point eight percent (50.8%) of the respondents agreed that their firms had between 21-50 employees, and the highest number of respondents thirty eight point three percent (38.3%) confirmed that their firms were in the annual income scale of "over 500 million Uganda Shillings" bracket. In Uganda, businesses with annual gross revenue of over 500 million Uganda shillings are considered to be in the large scale category according to the Uganda Manufacturers' classification. The results further suggest that the number of employees does not necessarily affect the financial performance as mentioned earlier in section 4.3.3. Consulting engineering firms in Uganda might be small as far as the number of employees is concerned, but financially they are performing well because the industry requires highly motivated and skilled multidisciplinary employees who possess tacit knowledge which is both unique and relatively immobile that is applied to solve client problems. This is the same knowledge that has to be well managed and preserved in the firm's memory for present and future use and is a prerequisite for competitive advantage.

4.4 Descriptive Statistics of Knowledge Management Practices

4.4.1 Knowledge Acquisition

Knowledge acquisition as a knowledge management practice was tested using the arithmetic mean and standard deviation to establish its relationship with competitive advantage. A total of six (6) items were used to measure the concept and the results of the analysis are indicated in following Table 4.8.

Table 4.8 Descriptive Statistics of Knowledge Acquisition

Knowledge Acquisition	N	Minimum	Maximum	Mean	Std. Deviation
There are processes for generating new knowledge from existing knowledge	81	1	5	3.91	.91
There are processes for acquiring knowledge about clients	81	1	5	3.83	1.03
There are processes for acquiring knowledge about suppliers	81	1	5	3.69	1.02
There are processes for acquiring knowledge about new products/services	81	1	5	3.89	.91
There are processes for acquiring knowledge about competitors within the industry	81	1	5	3.77	.98
There are processes for benchmarking performance	81	1	5	3.94	1.00

Scale: 5=strongly agree, 4=agree, 3=undecided, 2=disagree, 1-strongly disagree

The mean score of knowledge acquisition ranged from 3.69 to 3.94 whereas the standard deviation varied from 0.91 to 1.03. The results indicate that a few respondents agreed that in their firms there were processes for acquiring knowledge about suppliers, clients and competitors within the industry. The results implied that knowledge acquisition was not systematically practiced. On the other hand, the results indicated that most respondents agreed that they were benchmarking their performance and they were generating new knowledge from existing knowledge. Thus the two factors should be enhanced further to

impact on competitive advantage.

4.4.2 Knowledge Filtering

The arithmetic mean and standard deviation of knowledge filtering were computed for all the six (6) items as shown in Table 4.9 below.

Table 4.9 Descriptive Statistics of Knowledge Filtering

Knowledge Filtering	N	Minimum	Maximum	Mean	Std. Deviation
Activities involved in knowledge filtering help in establishing competitive advantage	81	1	5	3.80	.97
There are mechanisms for filtering through unnecessary knowledge	81	1	5	3.28	.95
Only knowledge that will pay off is retained for immediate or later use	81	1	5	3.52	.99
The filtering processes are guided by the organisation's vision, mission and goals	81	1	5	3.58	1.01
There are review teams that determine whether knowledge is valuable in its scope	81	1	5	3.15	1.07
Knowledge from outside the company's traditional boundaries is evaluated before retaining it	81	1	5	3.49	1.09

Scale: 5=strongly agree, 4=agree, 3=undecided, 2=disagree, 1-strongly disagree

The mean score of knowledge filtering varied from 3.15 to 3.80 while the standard deviation varied from 0.95 to 1.09. The results showed that very few respondents agreed that there were review teams to evaluate and filter through unnecessary knowledge in their firms (mean of 3.15 and 3.28 respectively). However many agreed that activities involved in knowledge filtering help in establishing competitive advantage (mean of 3.80). This implied that the filtering practice activities were geared towards gaining competitive advantage which is very important in knowledge intensive firms. This implied that knowledge filtering was focused in consulting engineering firms in Uganda.

4.4.3 Knowledge Configuration

Knowledge configuration was another knowledge management practice measured in this study using seven (7) items. The arithmetic mean and standard deviation of the variable are presented in Table 4.10.

Table 4.10 Descriptive Statistics of Knowledge Configuration

Knowledge Configuration	N	Minimum	Maximum	Mean	Std. Deviation
Knowledge acquired from previous projects is organized and stored	81	2	5	4.32	.91
Geographically dispersed knowledge is integrated in the corporate memory and made available within the company	81	1	5	3.91	1.05
Lessons learnt from different projects are easily accessible to all in the company	81	1	5	3.79	1.13
Databases of good work practices are regularly updated	81	1	5	3.62	1.14
Frequently used handbooks and work guidelines are kept up to date	81	1	5	3.72	1.04
Specific knowledge of individuals is normally documented	81	1	5	3.37	1.03
Experts in certain areas are urged to document the methods for organisational use	81	1	5	3.56	1.06

Scale: 5=strongly agree, 4=agree, 3=undecided, 2=disagree, 1-strongly disagree

The mean score knowledge configuration ranged between 3.37 and 4.32 while the standard deviation varied from 1.03 to 1.14. The results of the analysis implied that few respondents agreed that specific knowledge of individuals is normally documented and that experts document their methods for the firm's use (mean of 3.37 and 3.56, respectively). This suggests that experts retain their knowledge and do not document it so it is difficult to find configured knowledge in the firm. Much as configured knowledge is important in gaining competitive advantage, this was not done systematically as indicated by the study results. However, a large number of participants (mean 4.32) agreed that knowledge acquired from

previous projects is organized and stored in form of project reports. In conclusion, knowledge configuration was not highly practiced to gain competitive advantage.

4.4.4 Knowledge Sharing

Knowledge sharing has a total of eight (8) items whose arithmetic mean and standard deviation were computed and the results are summarised in Table 4.11.

Table 4.11 Descriptive Statistics of Knowledge Sharing

Knowledge Sharing	N	Minimum	Maximum	Mean	Std. Deviation
Knowledge sharing is encouraged by top management	81	2	5	4.48	.63
New members of staff are assigned to mentors who help them to find their way in the organisation	81	2	5	4.11	.87
Colleagues inform each other regularly about positive experiences and successful projects undertaken	81	2	5	4.04	.80
We have a form of inter-colleague review in which members discuss their methods of work	81	1	5	3.26	1.02
I regularly inform my colleagues of what I am working on	81	2	5	3.91	.87
There are processes for exchanging knowledge between individuals	81	2	5	3.59	.83
There are processes for distributing knowledge throughout the organisation	81	1	5	3.41	1.09
Employees fear that sharing their knowledge with others might reduce their influence within the firm	81	1	5	2.04	1.11

Scale: 5=strongly agree, 4=agree, 3=undecided, 2=disagree, 1-strongly disagree

The mean score of knowledge sharing varied from 2.04 to 4.48 and the standard deviation ranged from 0.63 to 1.11. The results indicated that a few respondents (mean of 2.04) agreed that employees did not share their knowledge for fear of reducing their influence within the firm and that processes for distributing knowledge were weak (mean of 3.41). The results were suggestive that knowledge sharing culture was not well established among employees as

acknowledged by the few respondents (mean of 3.26) who agreed that there were inter-colleague reviews where members discussed their methods of work. However, many respondents acknowledged that top management encouraged knowledge sharing (mean of 4.48), that new staff members were mentored (mean of 4.11) and that colleagues inform each other regularly about positive experiences and successful projects undertaken (mean of 4.04).

4.4.5 Knowledge Application

Knowledge application has a total of five (5) items whose arithmetic mean and standard deviation were computed and the results are summarised in Table 4.12.

Table 4.12 Descriptive Statistics of Knowledge Application

Knowledge Application	N	Minimum	Maximum	Mean	Std. Deviation
There are processes to quickly link sources of knowledge in solving problems and challenges	81	2	5	3.72	.99
There are processes for exchanging knowledge with business partners to solve client problems	81	1	5	3.49	.92
There are processes for converting competitive intelligence into plans of action	81	2	5	3.65	.88
There are processes that make knowledge easily accessible to all who need to apply it	81	2	5	3.86	.86
There are processes that encourage inter-departmental knowledge sharing to occur as a matter of course	81	2	5	3.85	.81

Scale: 5=strongly agree, 4=agree, 3=undecided, 2=disagree, 1-strongly disagree

The mean score of knowledge application varied from 3.49 to 3.86, whereas the standard deviation varied from 0.81 to 0.99. These results indicated that a few respondents (mean 3.49) agreed that there were processes for exchanging knowledge with business partners to solve client problems and converting competitive intelligence into plans of action (mean 3.65). Consulting engineering firms have to improve the above factors to ensure knowledge

application is enhanced to gain competitive advantage. However, most respondents agreed that knowledge is made available to those who wanted to apply it. Overall knowledge application was moderately practiced as it is the only way for consulting engineering firms to sell their knowledge and solve client problems.

After computing the descriptive statistics, the researcher embarked on correlation analysis to establish the relationship between the variables.

4.5 Correlation analysis results

A correlation analysis was computed to establish the degree, direction and strength of relationship between knowledge management practices (knowledge acquisition, knowledge filtering, knowledge configuration, knowledge sharing and knowledge application) referred to as the independent variable, and competitive advantage, referred to as the dependent variable. The mean of the five dimensions that made up competitive advantage that included innovativeness, competencies development, quality service support, client satisfaction and learning and growth, was computed and used to test its relationship with knowledge management practices.

A summary of the results of the Pearson's correlation coefficient are shown in Table 4.13.

Table 4.13 Correlation Analysis Results

	VARIABLES	1	2	3	4	5	6
1	Competitive Advantage	1					
2	Knowledge Acquisition	.620**	1				
3	Knowledge Filtering	.629**	.680**	1			
4	Knowledge Configuration	.634**	.702**	.722**	1		
5	Knowledge Sharing	.563**	.611**	.555**	.650**	1	
6	Knowledge Application	.615**	.587**	.666**	.675**	.661**	1

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

The results confirmed that the relationship between knowledge management practices and competitive advantage exists at 99% level of confidence in all cases. According to Rowntree, scores from 0.0 to 0.2 indicate a very weak correlation coefficient (r), above 0.2 to 0.4 indicate a weak correlation, whereas scores from 0.4 to 0.7 indicate a moderate correlation coefficient. The correlation results indicated that all the five dimensions of knowledge management practices were moderately correlated with competitive advantage.

4.6 Multiple Regression Analysis of Knowledge Management Practices and Competitive Advantage

In this study, after establishing that the variables were moderately correlated the researcher proceeded to analyse the cause and effect using the multiple regression method to ascertain if knowledge management practices affect competitive advantage and how much of the variance in dependent variable is explained by each independent variable and also test the hypotheses. The model summary results of the multiple regression are presented in Figure 4.1.

Figure 4.1 Model Summary of Multiple Regression

Model Summary[c]

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	.217[a]	.047	.035	.40	.047	3.722	1	75	.057	
2	.796[b]	.634	.602	.26	.586	22.406	5	70	.000	1.850

a. Predictors: (Constant), Gender

b. Predictors: (Constant), Gender, Knowledge Configuration, Knowledge Sharing, Knowledge Acquisition, Knowledge Application, Knowledge Filtering

c. Dependent Variable: Competitive Advantage

According to the model summary above, the correlation coefficient is R=0.796 (80%), indicating the strength of the association between knowledge management practices and

competitive advantage, when all the interrelations among the variables are taken into account. The square of the multiple regression referred to as R^2 or R Square is =0.634. This is the amount of variance in competitive advantage that is explained by knowledge management practices, meaning that 63% of the variance in competitive advantage, the dependent variable, has been explained by knowledge management practices, the independent variables, and the remaining 37% is explained by other factors. The Adjusted R Square is 0.602 which implies that 60% of the variance in competitive advantage is explained by knowledge management practices taking into account all the variables and the sample size. The remaining variations of 40% are explained by other factors. The results in the Model Summary, were statistically significant (Sig. = 0.000) meaning that 60% of competitive advantage was significantly explained by the knowledge management practices.

The results in the multiple regression coefficient table help the researcher to establish which among the independent variables influences most the variance in the dependent variable. The results of the coefficients also determine whether the hypotheses are substantiated or not. Table 4.14 below gives extracts of the coefficient results of the multiple regression analysis, the table with the full results has been attached in Appendix 10.

Table 4.14 Summarised results of the multiple regression coefficient

Hypotheses	Independent Variables	Standardized Coefficients Beta	Sig.	Results of hypothesis
H1	Knowledge Acquisition	.040	.722	**not supported**
H2	Knowledge Filtering	.454	.000***	**supported**
H3	Knowledge Configuration	.053	.664	**not supported**
H4	Knowledge Sharing	.118	.261	**not supported**
H5	Knowledge Application	.210	.074*	**supported**

Dependent Variable: Competitive Advantage

*significant at 10% level; **significant at 5% level; *** significant at 1% level

4.7 Interpretation of Results

The overall objective of the study was to establish the effect of knowledge management practices on competitive advantage in consulting engineering firms in Uganda. The following sub-sections present the interpretations of the findings of the study objective by objective.

4.7.1 The Effect of Knowledge Acquisition on Competitive Advantage

The multiple regression results in Table 4.14 on page 60 indicated that knowledge acquisition has no significant relationship with competitive advantage.. This means that an increase in knowledge acquisition does not improve competitive advantage and neither does a decrease in knowledge acquisition lower competitive advantage. This was not surprising as evidenced by the respondents who agreed that knowledge acquisition was not systematically carried out as most a few of the activities that lead to knowledge acquisition. The chief executives, the key informants, also confirmed that there are huge volumes of data but they struggle to turn them into information they can quickly act on. They also affirmed in some projects the time for project implementation is underestimated so they try to complete the project on time and within budget which makes acquiring or creating knowledge during project implementation very difficult.

4.7.2 The Effect of Knowledge Filtering on Competitive Advantage

The multiple regression results indicated that knowledge filtering positively affects competitive advantage and the relationship is significant at 99% level of confidence (β=0.454, p=0.000). The results suggest that the more knowledge is filtered to remain with only value adding knowledge, the more the firms gain competitive advantage from that knowledge and in the absence of knowledge filtering, competitive advantage is lowered.

The chief executives agreed that knowledge filtering happens as they carry out their work as each project requires specific knowledge because every project is unique. Though knowledge filtering was the highest contributor of competitive advantage in consulting engineering firms in Uganda, the chief executives agreed that the practice was not carried out systematically. The terrain may be different, requiring different disciplines so the knowledge required has to also be filtered and specific knowledge applied. That probably explains why knowledge filtering was the highest predictor of competitive advantage in the study.

4.7.3 The Effect of Knowledge Configuration on Competitive Advantage

The multiple regression results indicated a positive relationship between knowledge configuration and competitive advantage as indicated by $\beta=0.053$, but the relationship was not significant ($p=0.664$). This means that an increase in knowledge configuration does not improve competitive advantage and neither does a decrease in knowledge configuration lower competitive advantage. This was also the feeling of the respondents as evidenced by the results of the descriptive statistics in Table 4.10 where the low mean score suggested that only a few respondents agreed that specific knowledge of individuals was normally documented and a few experts in certain areas were documenting their methods of work for the firm's use. This confirmed that expert knowledge was kept in the heads of experts and rarely documented for the firm's use. However many respondents concurred that knowledge acquired from previous projects is organized and stored though databases of good work practices are not regularly updated and disseminated for learning. The results indicate that much as knowledge configuration was important in gaining competitive advantage, it was not systematically practiced as indicated by the study results. The key informants also confirmed that there was no time to configure knowledge systematically as their objective was to

complete a project on time and solicit for the next project.

4.7.4 The Effect of Knowledge Sharing on Competitive Advantage

The multiple regression results indicated that knowledge sharing has a positive relationship with competitive advantage but the relationship was not significant (β=0.118, p=0.261). This means that an increase in knowledge sharing does not improve competitive advantage and neither does a decrease in knowledge sharing lower competitive advantage. This was also the feeling of the respondents as evidenced by the results of the descriptive statistics in Table 4.11 that indicated there were very few who had inter-colleague review teams that discussed their work methods and that there were processes for distributing knowledge throughout the firm, indicating that the knowledge sharing culture barely existed. Many respondents agreed that the processes for sharing knowledge were neither well developed nor systematic.

However, many respondents agreed that top management encouraged knowledge sharing though the individuals were not adhering to this as they still considered that "knowledge is power" and therefore horde it. Many respondents indicated that new members of staff were assigned to mentors who helped them in their work but since many did not have enough time to train them, knowledge sharing is just in theory and could therefore have no significant impact on competitive advantage. The chief executives also indicated that inter-firm knowledge sharing was not common practice as firms were competing with each other and therefore horded their knowledge which is the source of their competitive advantage.

4.7.5 The Effect of Knowledge Application on Competitive Advantage

Knowledge application was found to positively affect competitive advantage as indicated by β=0.210 and the relationship was significant (p=0.074) at 90% level of confidence. This

means that an increase in knowledge application increases competitive advantage and a decrease in knowledge application lowers competitive advantage. The regression results are also in line with the mean scores in the descriptive statistics in Table 4.12 that indicated that knowledge application was moderately practiced. The were a few respondents who agreed that knowledge was usually exchanged with business partners to solve client problems which suggested that firms could not learn from each others successes or failures resulting from knowledge application. However, there was a moderate number of respondents who agreed that there were processes for converting competitive intelligence into plans of action and that there were processes to quickly link sources of knowledge in solving problems and challenges meaning that knowledge could not be quickly and easily accessed to be applied. These processes need to be improved if knowledge application is to have a greater impact on competitive advantage. The chief executives intimated that firms were not encouraged to innovate especially in the road sector as specifications were already predetermined and the projects given to local consulting engineers were small in size.

In conclusion, the two variables of knowledge filtering and knowledge application explain 0.634 of the variance in competitive advantage, R^2=0.634 and Adjusted R^2=0.602. Knowledge filtering was the highest β=0.454 at 99% level of confidence. Knowledge application was the other knowledge management practice that impacted competitive advantage and had β=0.210 at 90% level of confidence. The results implied that the two variables have a significant effect on competitive advantage. Both explain an Adjusted R^2=0.60 which according to Amin (2005), represents a good fit of the model as the adjusted R^2 is above the recommended 0.5 and takes into account the number of independent variables and the sample size. However knowledge filtering has a much higher significant and positive

impact on competitive advantage, implying that firms that filter their knowledge are likely to be more competitive than their competitors that do not carry out this practice and knowledge application had a lower impact on competitive advantage. The findings substantiate the hypothesis for knowledge filtering and knowledge application. The remaining independent variables of knowledge acquisition, knowledge configuration and knowledge sharing had no significant impact on competitive advantage according to the multiple regression results.

4.8 The Influence of ICT Usage on the Relationship between Knowledge Management Practices and Competitive Advantage

To examine the influence of information communication technology usage on the relationship between knowledge management practices and competitive advantage a hierarchical regression was carried out and results are presented in Figure 4.2.

Figure 4.2 Results of Model Summary of the Hierarchical Regression of ICT Usage

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	.179[a]	.032	.020	.49	.032	2.618	1	79	.110
2	.741[b]	.549	.512	.35	.517	16.947	5	74	.000
3	.804[c]	.646	.589	.32	.097	3.776	5	69	.004

a. Predictors: (Constant), Gender

b. Predictors: (Constant), Gender, Knowledge Configuration, Knowledge Sharing, Knowledge Acquisition, Knowledge Application, Knowledge Filtering

c. Predictors: (Constant), Gender, Knowledge Configuration, Knowledge Sharing, Knowledge Acquisition, Knowledge Application, Knowledge Filtering, ICT UsageXKnowledge Sharing, ICT UsageXKnowledge Filtering, ICT UsageXKnowledge Application, ICT UsageXKnowledge Acquisition, ICT UsageXKnowledge Configuration

The results in the model summary above show an R value of 0. 804 (80%), and R Square of 0.646 (65%), and Adjusted R Square of 0.589 (59%). The R Square results mean that the variance in the relationship between knowledge management practices, the independent variable and competitive advantage, the dependent variable is moderated by ICT usage by sixty five percent (65%) at 95% level of confidence (p=.004) taking all the interrelations of

the variables into account, the remaining 35% is moderated by other factors. The Adjusted R Square of 59% represents a good fit of the model adopted and according to Rowntree an Adjusted R above 0.5 is good.

To establish which among the relationships between knowledge management practices (knowledge acquisition; knowledge filtering; knowledge configuration; knowledge sharing and knowledge application) and competitive advantage is mostly influenced by ICT usage, a hierarchical regression was computed and the coefficient results as presented in Table 4.15 were analysed.

Table 4.15 Hierarchical Regression Results

Hypothesis	Variables	Standardized Coefficients Beta	Sig.	Results of hypothesis
$H6^1$	ICT Usage x Knowledge Acquisition	-2.358	.032	**supported**
$H6^2$	ICT Usage x Knowledge Filtering	2.577	.028	**supported**
$H6^3$	ICT Usage x Knowledge Configuration	-2.910	.048	**supported**
$H6^4$	ICT Usage x Knowledge Sharing	2.875	.010	**supported**
$H6^5$	ICT Usage x Knowledge Application	0.060	.954	**Not supported**

Dependent Variable: Competitive Advantage
*significant at 10% level; **significant at 5% level; *** significant at 1% level

The results indicated that ICT usage has an effect (at 90% level of confidence) on the relationship between knowledge acquisition, knowledge filtering, knowledge configuration and knowledge sharing and competitive advantage. The relationship between knowledge application and competitive advantage was not moderated by ICT usage. This means that knowledge acquisition, knowledge filtering, knowledge configuration and knowledge sharing may have had low impact on competitive advantage, their impact is likely to increase with

increased ICT usage.

4.8.1 The Influence of ICT Usage on the Relationship between Knowledge Acquisition and Competitive Advantage

The results indicate that ICT usage significantly influences the relationship between knowledge acquisition and competitive advantage. This implies that the chances of ICT usage having a significant influence on the relationship between knowledge acquisition and competitive advantage are 90%. Since the results indicate a negative direction (β= -2.358), it can therefore be concluded that an increased usage of ICT reduces the impact of knowledge acquisition on competitive advantage. This could be attributed to the fact that a lot of individual knowledge is tacit and embedded in people's heads and may not be easily extracted and manipulated by ICT usage in order to increase competitive advantage. Hence the conclusion that an increase in knowledge acquisition may lower a firm's competitive advantage when there is a high ICT usage.

4.8.2 The Influence of ICT Usage on the Relationship between Knowledge Filtering and Competitive Advantage

The results show that ICT usage influences the relationship between knowledge filtering and competitive advantage at 90% level of confidence (p=0.028). This also implies that in 90% of the time ICT usage will improve the impact of knowledge filtering on competitive advantage. Our assumption is that with proper ICT usage, chances of only retaining relevant and important information and knowledge are high hence the increased ability of firms to innovate, improve service support, satisfy clients and develop competency are likely to increase.

4.8.3 The Influence of ICT Usage on the Relationship between Knowledge Configuration and Competitive Advantage

The results indicate that ICT usage significantly influences the relationship between knowledge configuration and competitive advantage. This implies that the chances of ICT usage having a significant influence on the relationship between knowledge configuration and competitive advantage are 90%. Since the results indicate a negative direction (β= -2.910), it can therefore be concluded that an increased usage of ICT reduces the impact of knowledge configuration on competitive advantage. This could also be attributed to the fact that a lot of individual knowledge is tacit and embedded in people's heads and may not be easily extracted and manipulated by ICT usage. Hence the conclusion that an increase in knowledge configuration may lower a firm's competitive advantage when there is a high ICT usage.

4.8.4 The Influence of ICT Usage on the Relationship between Knowledge Sharing and Competitive Advantage

The results show that ICT usage influences the relationship between knowledge sharing and competitive advantage at 90% level of confidence (p=0.028). This also implies that in 90% of the time ICT usage will improve the impact of knowledge sharing on competitive advantage. It is therefore assumed that with proper ICT usage, chances of sharing relevant and important information and knowledge are high hence the ability of firms to innovate, improve service support, satisfy clients and develop competency are likely to increase.

4.8.5 The Influence of ICT Usage on the Relationship between Knowledge Application and Competitive Advantage

The results indicate that ICT usage does not influence the relationship between knowledge application and competitive advantage. This was supported by many interviewees who acknowledged that though computers are in place, they cannot make individuals more knowledgeable, they only facilitate the rapid search, access and retrieval of information and support communication and collaboration among employees at the same time help overcome geographical boundaries (Lin, 2007; Carrillo & Chinowsky, 2006; Carrillo et al., 2000; Khalifa & Liu, 2003). These results were evidenced by the few respondents (mean score 3.89) who observed that IT tools are regularly upgraded in line with new development in the IT field and the few who agreed (mean scores 2.89) that there was regular training in the use of IT tools. Much as some mean scores were high, above 4, whereby many respondents agreed they possessed computers and had easy access to the internet, the available ICTs were not used to their full potential.

In summary ICT usage significantly moderates the relationship between knowledge acquisition, knowledge filtering, knowledge configuration, knowledge sharing and competitive advantage. The relationship between knowledge application and competitive advantage was not significantly influenced by ICT usage.

4.9 Conclusion

This chapter was devoted to presentation and interpretation of results of the analyses. The following Chapter Five presents the discussions of the results, recommendations and conclusions drawn from the results of the analyses.

CHAPTER FIVE

SUMMARY, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The study examined knowledge management practices (knowledge acquisition, knowledge filtering, knowledge configuration, knowledge sharing and knowledge application) and competitive advantage in consulting engineering firms in Uganda. The influence of ICT usage on the relationship between knowledge management practices and competitive advantage was also of interest in the study. This chapter summarises and discusses key research findings identified in Chapter Four. Based on these findings, conclusions and recommendations of the study that have managerial, academic and policy interests are discussed. The limitations of the study and recommendations for possible future research are also herein discussed.

The researcher formulated six objectives to guide the study and the consequent research questions and hypotheses were formulated as presented in Chapter One. The multiple and hierarchical regression results were processed and discussed.

5.1 Discussions of the Study Findings

The results of the findings of the study presented in the previous chapter were based on the six research objectives in Chapter One. The findings are discussed in detail using objective by objective approach.

5.1.1 The Effect of Knowledge Acquisition on Competitive Advantage

The first research objective sought to establish the effect of knowledge acquisition on competitive advantage in consulting engineering firms in Uganda. The correlation results

indicated that knowledge acquisition was moderately correlated with competitive advantage. The multiple regression results indicated a positive relationship though insignificant. The results mean that an increase in knowledge acquisition does not improve competitive advantage, nor does a decrease in knowledge acquisition lower competitive advantage.

The multiple regression results were inconsistent with earlier findings that hypothesized that knowledge acquisition is significantly related to competitive advantage as it is considered the beginning of the knowledge management cycle (Jashapara, 2004). Other research findings in the literature postulated that a firm that acquires relevant knowledge faster than the competitor will have a competitive edge over its competitors (Payne & Sheehan, 2004; Hoon, 2003). In addition, Nonaka & Takeuchi (2004) argued that the success of firms depends on their unique approach to managing the creation of new knowledge that results in innovation which is a prerequisite to competitive advantage. Furthermore, Gupta & Daniels (2002) stated that Yli-Renko et al. (2001) produced research findings that indicated that knowledge acquisition has a significant relationship with competitive advantage.

However, Lubit (2001) argued that not all knowledge acquired is useful because all knowledge is not made equal. This argument was supported by Sveiby (2001) who affirmed that it is only actionable knowledge that is important which he termed as the "capacity to act". This was further supported by Nonaka & Takeuchi (1995) who acknowledged that it is only knowledge that facilitates the creation of new ideas and adds value to the firm that should be acquired in order to increase the firm's competitiveness.

In consulting engineering firms in Uganda, the phenomenon of knowledge acquisition being insignificantly related to competitive advantage could be explained by the few respondents who agreed that there existed processes for acquiring knowledge about suppliers and the

moderate number of those who agreed that there were processes for acquiring knowledge about competitors within the industry. In order to gain competitive advantage, intelligence about other individuals working in rival firms has to be gathered in order to strategically leverage against competitors.

In addition, during the face to face interviews with the chief executives it was confirmed that there was no time to acquire or create new knowledge on a continuous basis because when a firm wins a project, the main objective is to get the job completed on time and within budget, while at the same time sourcing for the next project. Project teams are like small virtual multidisciplinary organizations created for the sole purpose of carrying out a project as they break up at project close out. Once a project is completed, there are no project reviews to collect lessons learnt that would be referred to in subsequent projects as teams disperse to new projects or leave the firm to join other firms. The project managers also recognized that a firm's past dictates its present ability to deal with new experience, and the technical know-how accumulated from previous projects plays a very important role in construction, that is why the past experience of firms in the evaluation of bids is significant. Knowledge in consulting engineering work is acquired through experience but in most cases highly experienced individuals are outsourced and they have little time to train and transfer their knowledge to others. This means that knowledge is just moving in and out of the office as the individuals move in and out of office. Consulting engineering firms in Uganda operate in dynamic environments where technology keeps changing thus the need to create new knowledge from existing knowledge and create new knowledge is important for creativeness and innovativeness to keep ahead of competition.

5.1.2 The Effect of Knowledge Filtering on Competitive Advantage

The second research objective sought to investigate knowledge filtering and competitive advantage in consulting engineering firms in Uganda. The correlation results indicated that the knowledge filtering and competitive advantage were moderately correlated. The multiple regression results also indicated that knowledge filtering positively and significantly affects competitive advantage at 99% level of confidence. This means that an increase in knowledge filtering improves competitive advantage and the decrease in knowledge filtering lowers competitive advantage. This is explained by Prusak (1998) who argued that a firm may have hordes of information and no knowledge because knowledge is not filtered for its usefulness. Filtering knowledge is therefore important since knowledge is not all made equal as stated by Lubit (2001). This is also in agreement with earlier research that postulated that when knowledge is filtered it will help to avoid making mistakes already made by others and thus reduce duplication of work ensuring efficiency and effectiveness (Payne & Sheehan, 2004). The filtered knowledge ensures faster and reliable decision making to effectively and efficiently solve client problems leading to competitive advantage of firms.

In consulting engineering firms in Uganda, knowledge once acquired, is evaluated for its usefulness using the different mental models, as each individual has different mental model as hypothesised by Senge (1994). As each project carried out requires different knowledge due to the fact that each project is unique, the filtering process makes it easy to retain only actionable knowledge, implying that for any new project, appropriate knowledge would be at hand to avoid time wasting searching for it. Out of the five Knowledge Management Practices, knowledge filtering was the most practiced in Consulting Engineering Firms in Uganda as it contributed highly to competitive advantage as this is the knowledge that is eventually applied. This would most probably explain why fifty four point five percent

(54.5%) of the firms have been operational for over ten years.

5.1.3 The Effect of Knowledge Configuration on Competitive Advantage

The third objective sought to examine the effect of knowledge configuration on competitive advantage in consulting engineering firms in Uganda. Correlation results confirmed that knowledge configuration was moderately correlated with competitive advantage. However, multiple regression results indicated a positive but insignificant relationship. This implied that an increase in knowledge configuration does not necessarily improve competitive advantage nor does a decrease in knowledge configuration lower competitive advantage in consulting engineering firms in Uganda.

The results were contrary to earlier findings by Gupta & McDaniel (2002) that hypothesised that consulting engineering firms operated in dynamic environments where configured knowledge is always needed to urgently solve client problems. Configured knowledge increases the speed of knowledge exchange and facilitates individuals to quickly innovate leading to competitive advantage. Gupta & McDaniel (2002) further contended that when knowledge available to the company has been thoroughly examined for its strategic and pragmatic usefulness, mechanisms must be developed for organizing and storing this knowledge for future use. Egbu et al. (2005) also confirmed that the faster useful knowledge is accessed, the faster client problems can be solved and this will lead to effective and efficient service delivery that will give a firm competitive edge and ensure client satisfaction. Ahmed et al. (2002) also opined that successfully configured knowledge will result in improved innovation and creativity that will lead to improved products and services, improved decision making, quicker problem solving, fewer mistakes, reduction in product development time, enhanced customer care, service satisfaction and reduced costs on

collaborative ventures that give a firm a competitive advantage.

The contrary results were expected considering that a few number of respondents agreed that specific knowledge of individuals working in the firm was documented and that few experts were urged to document their methods of work for the firm's use. This implies that individuals keep their tacit knowledge in their heads and that knowledge of the highly qualified staff is not tapped for the firm's present and future use. Most knowledge in consulting engineering firms in Uganda is made explicit and kept in form of project reports and other documents that are safely stored away in boxes or in not so accessible mysterious filing systems. Knowledge is not systematically configured for the firms future use.

5.1.4 The Effect of Knowledge Sharing on Competitive Advantage

The fourth objective sought to investigate the effect of knowledge sharing on competitive advantage in consulting engineering firms in Uganda. The correlation results indicated that there was a moderate relationship between knowledge sharing and competitive advantage. Since correlation analysis does not show cause and effect relationship, the multiple regression carried out confirmed that the relationship though positive was insignificant. This means that knowledge sharing did not increase competitive advantage because the knowledge sharing culture hardly existed among the individuals working in these firms according to the interview results.

The results did not tally with earlier findings that stipulated that knowledge sharing enhances innovation performance and reduces redundant learning that leads to competitive advantage (Scarbrough, 2003; Lin, 2007). This same line of thinking was also supported by Chinowsky & Carrillo (2007) who hypothesised that failure to share knowledge can result in losses to the firm and accelerate the competitor's advantage. This was consistent with the findings by Kim

& Nielson, (2000) who stated that knowledge sharing with customers and suppliers leads to greater innovation and creativity. Furthermore, Scarbrough (2003) argued that sharing knowledge and experiences creates opportunities to maximize the ability to meet the firm's objectives that lead to competitive advantage.

The results are explained by the high number of respondents who feared that sharing their knowledge with others would reduce their influence within the firm. Since it is believed that knowledge grows with use, the number of respondents sharing their knowledge was not high enough to make a great impact on competitiveness of the firm. Knowledge is still horded because individuals tend to use knowledge as a source of power for personal advantage rather than as a firm's resource; hence, the contrary results because individuals still believe in the old adage of "knowledge is power".

5.1.5 The Effect of Knowledge Application on Competitive Advantage

The fifth objective sought to determine the effect of knowledge application on competitive advantage. The correlation results indicated that knowledge application was moderately correlated with competitive advantage. The multiple regression results also confirmed that the relationship was positive and significant. The results mean that when knowledge application is increased competitive advantage is also increased and vise versa. The results are consistent with earlier findings that hypothesised that knowledge application affects competitive advantage because consulting engineering business involves selling knowledge. Furthermore Pfeffer & Sutton (2000) posited that it is the firm that sells the best knowledge that gains competitive advantage not the one that has the best knowledge. Knowledge application is the last process in knowledge management cycle and it is through application of knowledge that the competitiveness of firms is determined because value is added only through practice not

through talk (Spender, 2006). For consulting engineering firms to solve client problems and keep winning jobs, they have to apply the best knowledge in order to provide the best solution. This is consistent with the findings of Davenport & Prusak (1998) who noted that knowledge application contributes to competitive advantage of firms and that for knowledge to create value, it must be applied within a specific business context. The continuous sharing and applying of knowledge therefore facilitates its retention within the firm following completion of the project, and thereafter, becomes available for use in subsequent projects (Kamara et al., 2003; Ebgu, 2004; Anumba et al., 2002).

5.1.6 To Examine the Influence of Information Communications Technology Usage on the Relationship between Knowledge Management Practices and Competitive Advantage

The sixth objective sought to examine the influence of ICT usage on the relationship between knowledge management practices and competitive advantage. The results were partially supported. The hypothesis that postulated that ICT usage significantly influences the relationship between knowledge acquisition, knowledge filtering, knowledge configuration, knowledge sharing and competitive advantage in consulting engineering firms in Uganda was fully supported. The findings imply that when individuals working in these consulting engineering firms utilize ICT, the greater the influence will be on the relationship between knowledge acquisition, knowledge filtering, knowledge configuration, knowledge sharing and competitive advantage. However, the hypothesis that stipulated that ICT usage influences the relationship between knowledge application and competitive advantage was the only one not supported. According to Lin (2007), ICT can only be used to facilitate the rapid search, access and retrieval of information and support communication and collaboration among individuals in the firm, but it will not solve client problems. This is in line with earlier

researchers, in particular, Davenport & Prusak (1998) who argued that knowledge is tacit and belongs to the knower and that it can only be passed on from person to person through experience and training and not by the aid of ICT. Knowledge is "Knowing how" that includes insights, intuition, and hunches of the individuals which are often built by experience and are tacit and cannot be easily formalized and shared (Connell et al; 2003; Nonaka, 1998; Carrillo & Chinowsky, 2006). Furthermore, Davenport & Takeuchi (1998) contend that ICT usage may facilitate the quick storing and retrieving of stored information but not knowledge which is personal and therefore tacit in nature. Additionally, Davenport & Prusak (1998) stated that computers are not knowledgeable and cannot make firms or individuals working in the firms more "knowledgeable". This was also supported by Egbu (2004) who contended that ICT is an important enabler as "it enables the process, people and the knowledge content". Supporting the same argument Civi (2000) opined that knowledge originates from the people and computers cannot create it. Hence the conclusion that knowledge application will not necessarily increase the firm's competitive advantage when there is a high incidence of ICT usage in consulting engineering firms in Uganda.

5.2 Conclusion

The conclusions of this study are based on the findings and are hereby presented objective by objective.

5.2.1 Objective One: The Effect of Knowledge Acquisition on Competitive Advantage

Knowledge acquisition was the least practiced in consulting engineering firms and had no effect on competitive advantage. This could be explained by the fact that systematic knowledge acquiring processes were not in place in consulting engineering firms. Knowledge is acquired by recruiting people with specific expert knowledge when there is a new project

to be handled and ultimately the expert leaves with his knowledge at project close out. There were no efforts made to compile lessons learnt from previous projects for future use after completion of project. Transfer of knowledge through experience from experts with accumulated knowledge was taking place randomly as these experts did not have enough time to train their colleagues during project implementation.

5.2.2 Objective Two: The Effect of Knowledge Filtering on Competitive Advantage

Knowledge filtering was the most highly practiced of all the knowledge management practices and had a very high effect on competitive advantage. This means that only actionable knowledge that creates value was being applied for client problem solving which would explain why over half of the firms in the study have been sustaining their activities for more than ten years. However, knowledge acquired from outside the firm's boundaries was not often optimally evaluated before its retention and the process of knowledge filtering was not guided by the organization's vision, mission and goals which left room for improvement. It is therefore imperative that knowledge is filtered to use the right knowledge to solve the different problems.

5.2.3 Objective Three: The Effect of Knowledge Configuration on Competitive Advantage

Knowledge configuration did not significantly affect competitive advantage in consulting engineering firms in Uganda and it was the second least practiced after knowledge acquisition. There were hardly any processes in place to document knowledge of experts and their working methods. In some firms, previous project reports were not easily accessible they had been already stored away to create space for ongoing projects.

5.2.4 Objective Four: The Effect of Knowledge Sharing on Competitive Advantage

Knowledge sharing does not significantly affect competitive advantage in consulting engineering firms in Uganda because the knowledge sharing culture does not exist. There were no inter-colleague review teams in which members could discuss their methods of work in order to benchmark performance. A large number of respondents agreed that individuals feared to exchange and share knowledge with each other for fear of losing their influence within the firm. Knowledge was not easily distributed as the processes for distributing knowledge throughout the firm were not well established.

5.2.5 Objective Five: The Effect of Knowledge Application on Competitive Advantage

Knowledge application moderately affected competitive advantage in consulting engineering firms in Uganda. The processes for converting competitive intelligence into plans of action and processes to quickly link sources of knowledge in solving problems and challenges was not very strong. The chief executives confirmed that they did not have a knowledge management strategy in place and some of them had not heard about knowledge management as a management discipline. Knowledge was hardly ever exchanged with business partners to solve client problems. If there is improvement in these processes, the impact on competitive advantage would probably be higher.

5.2.6 Objective Six: To Examine the Influence of Information Communications Technology Usage on the Relationship between Knowledge Management Practices and Competitive Advantage

The results indicated that in the presence of ICT usage, knowledge management practices namely, knowledge acquisition, knowledge filtering, knowledge configuration and

knowledge sharing are likely to increase competitive advantage. A well developed ICT system would make it easy to quickly store and retrieve knowledge so that it can be quickly accessed and used by everybody in the firm. Since the model indicated that ICT usage moderated the relationship between Knowledge Management Practices and competitive by 65%, ICT usage in consulting engineering firms should be enhanced by way of investing substantially in ICT.

In Consulting Engineering firms the use of ICT is likely to make the internal and external collaboration faster and more efficient. As consulting engineering firms work towards time and cost saving, the use of the computer as a tool to organize, store, and retrieve knowledge as soon as it is required would be beneficial towards the firm's objectives.

5.3 Recommendations of the Study

The recommendations of the study are derived from the conclusions drawn from the research findings. The recommendations are given according to the study objectives.

5.3.1 Objective One: The Effect of Knowledge Acquisition on Competitive Advantage

In order to compete well and provide value for money service to clients, consulting engineering firms have to ensure that they have mechanisms in place to acquire new knowledge or create knowledge from existing knowledge. Consulting engineering firms in Uganda should not acquire knowledge by chance as there were no processes in place to systematically gather knowledge about clients and suppliers. Since knowledge becomes stale, knowledge has to be collected or acquired regularly in order to give the client a service that exceeds the client's expectations. Knowledge about competitors within the industry should be gathered so that consulting engineering firms are aware of what their competitors

are doing so as to be able to strategically position themselves in the market place.

5.3.2 Objective Two: The Effect of Knowledge Filtering on Competitive Advantage

Much as the hypothesis that stipulated that knowledge filtering affected competitive advantage in the study was supported, implying that an increase in knowledge filtering improves competitive advantage and the decrease in knowledge filtering lowers competitive advantage there was still room for improvement. To improve the knowledge filtering processes review teams should evaluate new knowledge acquired from outside the company's traditional boundaries. At project completion, project reviews should be held to capture learning, this way knowledge would be filtered and stored for future reference and application.

5.3.3 Objective Three: The Effect of Knowledge Configuration on Competitive Advantage

The effect of knowledge configuration on competitive advantage was not significant in consulting engineering firms in Uganda. There is need to improve the way firms store the knowledge they possess. Knowledge acquired from previous projects need to be well organized and stored in the firms' memory so that it can be easily accessible. Experts in specific areas should be urged to document their methods of work for the firm's use. Individuals have to benchmark their performances and best work practices. The frequently used handbooks and work guidelines need to be regularly updated as the industry is dynamic and environments keep changing.

All filtered knowledge must be well configured and stored to ensure quick access for future problem solving. The bidding process for new projects will be faster as there will no wasting

searching for the required knowledge. Since the goal of knowledge management practices is to improve the organization's ability to execute its core business functions more efficiently and effectively, efficiency and effectiveness will be assured through a systematic knowledge management that will ensure value for money service to the client.

5.3.4 Objective Four: The Effect of Knowledge Sharing on Competitive Advantage

Processes to distribute knowledge throughout the firm should be well established in the firm as a matter of policy to encourage a knowledge sharing culture that should have top management support because whenever an individual walks out the door of a company, the knowledge possessed by that individual about services and procedures of the firm may not be returning. Organizations must find ways to motivate employees to share what they know and to apply the knowledge of others, contributing to a knowledge sharing culture.

5.3.5 Objective Five: The Effect of Knowledge Application on Competitive Advantage

Although the study revealed that knowledge application significantly affected competitive advantage, there is room for improvement. Systems should be established to ensure knowledge is filtered before its application, specific knowledge is required for specific problems, for example to repair a broken bridge and potholed road, you require different knowledge.

In the 21st century knowledge management strategies should be designed for knowledge based competition. It is therefore recommended that all the five knowledge management practices should be well established in order for firms to gain competitive advantage as the knowledge management cycle starts with knowledge acquisition and ends with knowledge application.

5.3.6 Objective Six: To Examine the Influence of Information Communications Technology Usage on the Relationship between Knowledge Management Practices and Competitive Advantage

In this knowledge age, all individuals should be trained to use ICT tools by experts engaged by the firms in order for individual workers to utilise them to their full potential and capability. All engineering firms must budget sufficiently for ICT usage.

5.4 Contributions of the Study

This study is among the first empirical researches that investigated knowledge management practices and competitive advantage within consulting engineering firms in Uganda and indeed within all sectors of the economy. The study is an important addition to the limited existing literature on knowledge management practices in consulting engineering firms in Uganda and will encourage the establishment of a concrete conceptual foundation in this area of research.

This study was conducted in a different environment, different culture and context from the previous studies, and the results will contribute significantly to the existing knowledge management and competitive advantage research. Most of the studies accessed investigated knowledge management practices and organisational performance and not knowledge management and competitive advantage with ICT as a moderator variable. The results of this study will probably encourage future research to explore knowledge management and competitive advantage in other industrial sectors as knowledge management is for all types of firms in different trades.

5.5 Implications of Findings

The implications of this study are discussed under three perspectives namely, theoretical, managerial and policy. Managers and policy makers have to draw conclusions from this research to be able to address the various challenges that hinder consulting engineers to the leverage their knowledge to gain competitive advantage. The following should be emphasized in consulting engineering firms:

5.5.1 Theoretical Implications

The theoretical implication of the knowledge based view of the firm where knowledge is considered as a resource that has to be explored and exploited in order for it to be further developed and leveraged to gain competitive advantage was found to support the two theories, the resource-based and knowledge-based, that underpin our conceptualization.

5.5.2 Managerial Implications

The results of this study could help managers exploit a knowledge management strategy to create opportunities and face challenges related to competitive advantage. For a knowledge management programme to be successful, top management should give it their full support. Managers need to identify the knowledge presently existing in the firm, protect it and use it to create more knowledge through Socialization, Externalization, Combination and Internalization (SECI) (Nonaka & Takeuchi, 1995).

Employees: Management should allocate redundant time for employees to learn and to brainstorm on pertinent issues in communities of practice since "knowledge starts and ends with people". Employees should be motivated and empowered by allowing them to experiment with new ideas and make mistakes in order to be more creative.

Top management: Top managers should support a knowledge management strategy by provision of sufficient resources, allowing networks, experiments, in order to cultivate attitudes and environments that will make it easier to leverage knowledge of their employees.

5.5.3 Policy Implications

Consulting engineering firms would ensure that they deliver value for money service if they are assured of automatically getting projects. Fair distribution of projects through bodies like UACE on a roster system of selection guaranteeing that work is automatically rotated among competent consulting engineering firms using a number of specific selection criteria, would make firms more effecient and vigilant in service delivery. Firms would endeavour to deliver value for money service in order to stay on the roster.

5.6 Recommendations for Future Research

This study is among the first empirical research to investigate knowledge management practices and competitive advantage within consulting engineering firms in Uganda contributed to the body of knowledge in the area of knowledge management practices and competitive advantage in consulting engineering firms. Future empirical research should endeavour to explore metrics to measure competitive advantage when leveraging knowledge within engineering firms or in other industrial sectors. Since the study was only limited to consulting engineering firms, knowledge management practices in other industrial sectors could be empirically researched as is believed to be the future competitive advantage for all types of firms (Nonaka & Takeuchi, 1998). The role of information communications technology should also be further studied to establish its moderating role.

A longitudinal study is recommended for future research to measure the before and after

knowledge management implementation and ascertain the effect of knowledge management practices on competitive advantage. Future research could consider antecedents of knowledge management practices and competitive advantage, these could include individual factors, organizational factors, technology factors taking into consideration the cultural, economic and social context of Uganda.

It is also hoped that additional research will be undertaken to build upon this work to foster a better understanding of the importance of knowledge management practices towards enhancing competitive advantage in consulting engineering firms. The ICT-centric strategy should further be investigated to establish the influence of ICT on the relationship between knowledge management practices and competitive advantage.

REFERENCES

Ahmed, P. K., Lim, K. K. & Loh, A. Y. E. (2002). *Learning through Knowledge Management*. Butterworth Heinenmann.

Alavi, M (1997). *KPMG Peat Marwick U.S.: One giant brain*, Harvard Business School, Boston, MA.

Alavi, M. & Leidner, D. (2001). Knowledge management and knowledge management systems: conceptual foundations and research issues, *Management Information Systems*, Quarterly, pp.107-36.

Al-Ghassani, A.M., Kamara, J.M., Anumba, C.J. & Carrillo, P.M. (2004). An innovative approach to identifying knowledge management problems. *Engineering, Construction and Architectural Management,* Vol. 11, No. 5 pp. 349-357.

Anantatmula V. S. (2007). Linking KM effectiveness attributes to organizational performance. *The Journal of Information and Knowledge Management Systems*, Vol. 37, No. 2 pp. 133-149, Emerald Group Publishing Limited.

Andréasson, M. & Svartling, A. (1999). The Balanced Scorecard – A Tool for Managing Knowledge?

Anumba, C. J., Baugh, C. & Khalfan, M. M. A. (2002). Organisational Structure to Support Concurrent Engineering in Construction. *Industrial management and Data Systems*, Vol. 102 No 5 pp. 260-270.

APQC (2001). Measurement for Knowledge Management. *American Productivity & Quality Centre* (APQC), Houston, TX.

Argote, L. & Ingram, P. (2000). Knowledge Transfer: A Basis for Competitive Advantage in Firms. *Organisational Behaviour and Human Decision Processes*, Vol. 82, No. 1, pp. 150-169.

Babbie, E. (2007). *The practice of social research, eleventh edition*, Thomson Wadsworth.

Balanced Scorecard Institute, (2002). The Balanced Scorecard and Knowledge Management www.balancedscorecard.org (accessed September 2007).

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Knowledge Management*, Vol. 17 No.1, pp.99-120.

Bhatt, G. D. (2001). Knowledge Management in Organisations: Examining the Interaction between Technologies, Techniques and People. *Journal of Knowledge Management,* Vol. 5, No. 1. pp. 68-75.

Bhatt, G. & Gupta, J.N.D. (2005). An exploratory study of groupware use in the knowledge management process. *The Journal of Enterprise Information Management*, Vol. 18 No.1, pp. 28-46.

Birkinshaw, J. (2001). Why is knowledge Management so difficult. *Business Strategy Review*, Volume 12 Issue 1, pp. 11-18.

Buckley, P. J. & Carter M. J. (2000). Knowledge Management in Global Technology Markets Applying Theory to Practice. *Long Range Planning,* Vol. 33.

Carrillo, P., Anumba, C. J., & Kamara, J. M. (2000). Knowledge Management Strategy for Construction: Key IT and Contextual Issues. *Construction Informatics Digital Library, http://itc.scix.net/.*

Carrillo, P. (2004a). Managing Knowledge: A North American perspective. *Proceedings of ICE, Civil Engineering*, Vol. 157, Paper 13573, pp. 187-192.

Carrillo, P. (2004b). Managing Knowledge: Lessons from the oil and gas sector. *Construction Management and Economics,* Vol. 22, No. 6, pp. 631-42.

Carrillo, P. & Chinowsky, P. (2006). Exploiting knowledge management: The engineering and construction perspective . *Journal of Management in engineering ASCE.*

Chinowsky, P., Carrillo, P.(2007). Knowledge Management to Learning Organisation Connection. *Journal of Management in Engineering ASCE*, Vol 23 No. 3.

CHOGM roads under probe. *(2008, The New Vision 16)* pp 1.

Chong, S. C., Wong, K. Y. & Binshan L. (2007). Criteria for measuring knowledge management performance outcomes in organisation. *Industrial Management & Data Systems*, Vol. 106 No. 7 pp. 917-936, Emerald Group Publishing Limited.

Chong, S.C. (2005). *Implementation of knowledge management among Malaysian ICT companies: An empirical study of success factors and organisational performance*. Unpublished academic dissertation. Multimedia University, Malaysia, 2005.

Chong, S.C. & Choi, Y.S. (2005). Critical factors of knowledge management implementation success. *Journal of Knowledge Management Practice,* Vol. 6, available at: *www.tlainc.com/articl90.htm* (accessed June 2005).

Chong, S. C. (2006). KM critical success factors A comparison of perceived importance versus implementation in Malaysian ICT companies. *The Learning Organization,* Vol. 13 No. 3 pp. 230-256, Emerald Group Publishing Limited.

Civi, E. (2000). Knowledge management as a competitive asset: A review marketing intelligence and planning. *Journal of Knowledge Management*, Vol.18 No. 4, pp. 166 – 174.

Cohen, W. M. & Levinthal, D. A. (1990). Absorptive Capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, Vol. 35, pp. 128-152.

Collapsing buildings dent the image of Uganda's engineers. (2008, February 1). *Daily Monitor*, pp12.

Construction Industry registers 13% growth. *(2008, The New Vision 29)* pp 21-26.

Davenport, T., & Prusak, L. (1998). Working Knowledge: How Organisations Manage What They Know. *Harvard Business School Press*, Boston, MA.

Dawson, R. (2000). Knowledge capabilities as the focus of organisational development and strategy. *Journal of Knowledge Management*, Vol. 4, No. 4, pp. 327-327, MCB UP Ltd.

Drucker, P. F. (1998). The Coming of the New Organisation. *Harvard Business Review on Knowledge Management, Harvard Business Review,* Boston, MA.

Dunford, R. (2000). Key challenges in the search for the effective management of knowledge in management consulting firms. *Journal of Knowledge Management,* Vol. 4 No. 4, pp 295-302.

Egbu, C. O. (2004). Managing Knowledge and intellectual capital for improved organisational innovations in the construction industry: an examination of critical success factors. *Engineering, Construction and Architectural Management,* Vol. 11 No. 5 pp. 301-315.

Egbu, C.O., Hari, S., & Renukappa, S.H. (2005). Knowledge Management for Sustainable Competitiveness in Small and Medium Surveying Practices. *Structural Survey*, Vol. 23 No.1, pp.7-21.

Eight crushed at NSSF building site. (2008, October 15). *Daily Monitor*, pp1.

Eliufoo K. H. (2005). *Knowledge creation and transfer in construction organisations in Tanzania*. Doctoral Thesis. Royal Institute of Technology, 2005.

Fairchild, A. M. (2002). *Knowledge Management Metrics via a Balanced Scorecard Methodology*. Proceedings of the 35th Hawaii International Conference on System Sciences.

Faniran, O. O., Love, P. E. D., Treloar, G., & Anumba, C. J. (2001). Methodological issues in design-construction integration. *Logistics Information Management,* Vol. 14 No. 5/6 pp. 421-428, MCB UP Ltd.

Frey, R. S. (2001). Knowledge Management, Proposal Development and Small Businesses. *Journal of Management Development,* Vol. 20 No.1, pp. 38-54.

Goh, S.C. (2002). Managing effective knowledge transfer. *Journal of Knowledge Management*, Vol. 6 No.1, pp.23-30.

Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems,* Summer 2001, Vol. 18, No. 1, pp. 185-214.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal,* Vol. 17, Special Issue, pp. 109-122.

Gupta, A., & McDaniel, J. (2002). Creating Competitive Advantage by Effectively Managing Knowledge: A Framework for Knowledge Management. *Journal of* Knowledge *Management Practice.*

Hibbard, J. & Carrillo, K (1998). Knowledge revolution. *Information week, 663,* pp49-54.

Hoon, H. T. (2003). *Knowledge Management: An Exploratory Study on Malaysian Organizations*. Dissertation for the Masters of Business Administration, Pusat Pengajian Pengurusan Universiti Sains Malaysia.

Holsapple, C. W., & Joshi, K. D. (2002). Understanding knowledge management solutions: the evolution of frameworks in theory and practice. *Knowledge Management Systems : Theory and Practice,* Thomas Learning.

How Museveni learnt of roads corruption. (2008, May 14). *Daily Monitor*, pp1.

International Federation of Consulting Engineers (FIDIC), (2001). Engineering our Future.

International Federation of Consulting Engineers (FIDIC), (2002). Industry as a partner for sustainable Development, Consulting Engineering.

Jasphara, A. (2004). Knowledge Management: An integrated approach. Pearson Education Ltd.

Kamara, J.M., Anumba, C. J., Carrillo, P., & Bouchlaghem, N. (2003). Conceptual Framework for Live Capture and Reuse of project Management. *Construction Informatics Digital Library* http://itc.scix.net/ 2003.

Kaplan, R.S., & Norton, D.P. (1992). The balanced scorecard – measures that drive performance. *Harvard Business Review*, Vol. 70 No.1, pp.71-9.

Kaplan, R., Norton, D. (1996). Using the balanced scorecard as a strategic management system. *Harvard Business Review*, Vol. 74 No.1, pp.75-87.

Kotter, J. P. (1996). Leading Change. *Havard Business School Press*, Boston, MA.

Laudon, K.C., & Laudon, P.L. (1998). *Management Information Systems*. Prentice-Hall, Englewood Cliffs, NJ.

Lee, S. M., & Hong, S. (2002). An enterprise-wide knowledge management system infrastructure. *Industrial Management and Data Systems,* Vol. 102, No. 1.

Leonard, D. (1995). Wellsprings of knowledge: Building and sustaining the source of innovation. *Harvard Business School Press,* Boston, MA.

Li, H., & Love, P. E. D. (1998). *Visualisation of building interior design to reduce rework.* Proceedings of the International Conference on Information Visualisation, School of Oriental and African Studies*,* University of London, 29-31 July, London, pp. 187-91.

Lin, C-M., & Wei, C-C. (2005). Establishing the key performance indicators of knowledge management. *International journal of the Computer, the Internet and Management*, Vol. 13 No.2 , pp. 67-87.

Lin, C.H., & Tseng, S.M. (2005). The implementation gaps for the knowledge management system. *Industrial Management & Data Systems*, Vol. 105 No.2, pp.208-22.

Lin, H-F. (2007). Knowledge Sharing and Firm Innovation Capability: an Empirical Study International. *Journal of Manpower*, Vol. 28 No.3/4, pp. 315-332.

Lubit, R. (2001). Tacit knowledge and knowledge management: the keys to sustainable competitive advantage. *Organizational Dynamics*, Vol. 29 No.4, pp.164-78.

Ma, H. (1999). Anatomy of Competitive Advantage. *Management Decision*, Vol. 37 No. 9, pp 709-718 MCB University Press.

Malhotra, Y. (1998). Knowledge Management, Knowledge Organisation and Knowledge Workers: A View from the Front Lines. Published in Maeil Business Newspaper (On-line) Available at *http://Brint.com.*

Marr, B., & Neely, A. (2004). Intellectual capital – defining key performance indicators for organizational knowledge assets. *Business Process Management Journal,* Vol.10 No. 5 pp. 551-569, Emerald Group Publishing Limited.

Markides, C., & Williamson, P. (1996). Corporate diversification and organizational structure: a resource-based view. *Academy of Management Journal*, Vol. 39 No.2, pp.340-67.

Massey, A. P., & Montoya-Weiss, M. (2003). *A performance environment perspective of knowledge management*. Proceedings of the 36th Hawaii International Conference on System Sciences.

Mugenda O. M., & Mugenda, A. G. (1999). *Research Methods.* African Centre for technology studies press Nairobi.

Ng, S. T., & Chow, L-K. (2004). Evaluating engineering consultants' general capabilities during the pre-selection process – a Hong Kong study. *Engineering, Construction and Architectural Management,* Vol. 11 No. 3, pp. 150-158 , Emerald Group Publishing Limited.

Nonaka, I. (1998). The knowledge creating company. *Harvard Business Review on Knowledge Management. Harvard Business Review,* Boston, MA.

Nonaka, I., & Takeuchi H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*, Oxford University Press, New York.

Oppenhiem, A. N. (1992). *Questionnaire design, interviewing and attitude measurement*. Pinter Publishers, London.

Palmer, A. & Hartley, B. (2006), *The business Environment*. 5th Edition, McGraw Hill, UK.

Papoutsakis, H.(2006). Linking Knowledge Management and Information Technology to Business Performance: A Literature Review and Propose Model. *Journal of Knowledge Management Practice*, Vol. 7, No. 1.

Passemard D., & Kleiner, B. H. (2000). Competitive Advantage in Global Industries, Vol. 23 No. 7/8

Pathirage, C. P., Amaratunga, D. G. & Haigh, R. P. (2007). Tacit Knowledge and Organisational Performance: Construction Industry Perspective. *Journal of Knowledge Management,* Vol. 11 No. 1, pp 115-126.

Payne, J. & Sheehan, T. (2004). Demystifying knowledge management: A best practice guide for the construction industry. *Constructing Excellence.*

Pfeffer, J. & Sutton, R.I. (2000). *The knowing-doing gap: How smart companies turn knowledge into action*. Cambridge, MA: Harvard Business School Press.

Polanyi, M. (1962). Personal *Knowledge, Towards a Post Critical Philosophy*, London, UK: Routledge & Kegan.

Porter, M. E. (1980). *Competitive Strategy*. Free Press, New York, NY.

Porter, M. E. (1985). *Competitive Advantage: Creating and sustaining superior performance*. New York: Free Press.

Prahalad, C. K. & Hamel. G. (1990). The Core Competence of the Corporation. *Harvard Business Review,* Vol: 68, May-June, pp. 79-91.

Rampersad, H. (2002). Increasing organizational learning ability based on A Knowledge Management Quick Scan. *Journal of Knowledge Management Practice October 2002*, QM Consulting, Netherland.

Reed, R., DeFillippi, R. (1990). Causal ambiguity, barriers to imitation and sustainable competitive advantage. *Academy of Management Review*, Vol. 15 pp.88-102.

Robinson, H.S., Carrillo, P.M., Anumba, C.J., Al-Ghassani, A.M. (2005). Knowledge Management Practices in Large Construction Organisations. *Engineering, Construction and Architectural Management*, Vol.12 No.5, pp 431-445.

Rollo, C. (2002). The knowledge strategy within a business context, The Third European Conference on organisational knowledge, Learning and Capabilities OKLC 2002, 5th – 6th April, Athens, Greece, (on-line) Available *http://www.alba.edu.fr/OKLC2002/Proceedings/pdf files,* ID139.pdf.

Scarbrough, H. (2003). Knowledge management, HRM and Innovation Process. *International Journal of Manpower,* Vol. 24, No. 5, pp 501-16.

Senge, P. (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*. Doubleday-Currency, New York, NY.

Sekaran, U. (2002). *Research Methods for Business, A Skill Building Approach*. John Wiley & Sons, Inc.

Shankar, R., Singh, M. D, Gupta, A., & Narain, R. (2003). Strategic Planning for knowledge management implementation in engineering firms. *Work Study* , Vol. 52, No. 4, pp. 190-200 MCB UP Ltd.

Sharkie, R. (2003). Knowledge Creation and its place in the development of sustainable competitive advantage. *Journal of Knowledge Management,* Vol. 7 No.1 pp. 20-31, MCB UP Ltd.

Singh, M.D., Shankar, R, Narain,R., & Kumar, A. (2006). Survey of knowledge management practices in Indian manufacturing industries. *Journal of Knowledge Management*, Vol. 10 No. 6 pp. 110-128, Emerald Group Publishing Limited.

Sveiby, K-E., (2001). A Knowledge-based Theory of the Firm to Guide Strategy Formulation. *Journal of Intellectual Capital,* Vol. 2 No. 4, pp 344-358, MCB UP Ltd.

Szulanshi, G., (2000). The Process of Knowledge Transfer: A diachronic analysis of stickiness. *Organisational Behaviour and Human Discussion Processes,* 82, 9-27.

Tan, R. T. (1996). Information technology and perceived competitive advantage: an empirical study of engineering consulting firms in Taiwan. *Construction Management and Economics*, Vol. 14, pp. 227-2.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, Vol. 18 No. 7, pp. 509-33.

Teece, D. J. (1998). Capturing value from knowledge assets: The new economy, markets for know-how and intangible assets. *California Management Review*, Vol. 40, No. 3, pp. 55-79.

Teerajetgul, W. & Charoenngam, C. (2006). Factors inducing knowledge creation: empirical evidence from Thai Construction Projects. *Engineering, Construction and Architectural Management,* Vol. 13 No. 6 pp. 584-599 Emerald Group Publishing Limited.

Tiwana, A. (2004). *The knowledge management toolkit*. Pearson Education, Inc. (Second Indian Reprint by Rahul Graphics).

Wernerfelt, B. (1984). A Resource-based view of the firm: Ten years After. *Strategic Management Journal,* Vol. 5, pp. 171-80.

Wernerfelt, B. (1995), The Resource-based view of the firm: Ten years After. *Strategic Management Journal,* Vol. 16, pp. 171-174.

Zack, M.H. (1999). Developing a Knowledge Strategy. *California Management Review*, Vol. 41, No.3, pp.125-145.

Quinn, J. B., Anderson P., & Finkelstein, S., (1998). Managing Professional Intellect: Making the Most of the Best Harvard Business Review on Knowledge Management**.** *Harvard Business Review.*

.

APPENDIX 1: LETTER OF INTRODUCTION FROM UMI

UGANDA MANAGEMENT INSTITUTE

Telephones: 256-41-4259722 /4223748 /4346620
256-31-2265138 /39 /40
256-75-2259722
Telefax: 256-41-4259581 /314
E-mail: admin@umi.ac.ug

Plot 44-52, Jinja Road
P.O. Box 20131
Kampala, Uganda
Website: http://www.umi.ac.ug

Your Ref:

Our Ref: **G/35** **7 July 2008**

Ms. Kabaza Beatrice Kabuza
07/MMSPPM/13/013

Dear Ms. Kabaza,

FIELD RESEARCH

Following a successful defense of your proposal before a panel of Masters Defense Committee and the inclusion of suggested comments, I wish to recommend you to proceed for fieldwork.

Please note that the previous chapters 1, 2 and 3 will need to be continuously improved and updated as you progress in your research work.

Wishing you the best in the field.

Yours sincerely,

Benon Basheka
HEAD, HIGHER DEGREES DEPARTMENT/
PROGRAMME MANAGER MMS

APPENDIX 2: LETTER TO PARTICIPANTS

8th July, 2008

To All Participants

RESEARCH ON KNOWLEDGE MANAGEMENT PRACTICES AND COMPETITIVE ADVANTAGE IN CONSULTING ENGINEERS FIRMS IN UGANDA

Dear Respondent:

Thank you for taking the time to respond to the attached questionnaire. The questionnaire should take no longer than 20 minutes to complete.

The purpose of this research is to explore the impact of Knowledge Management Practices on Competitive Advantage in consulting engineering firms in Uganda. The contribution of this study will help us understand how organizations can better manage their knowledge to gain competitive advantage.

The results of this survey will be made available to all that participated.

Once again, thank you for your participation. Your answers are of the greatest importance to the success of this study.

Should you need any further clarification, do not hesitate to contact me on mobile telephone no. 0772 435756.

Thank you in advance,

Yours faithfully.

Mrs. B. Kabaza

kabazabk@gmail.com

APPENDIX 3: QUESTIONNAIRE

RESEARCH ON KNOWLEDGE MANAGEMENT PRACTICES AND COMPETITIVE ADVANTAGE IN CONSULTING ENGINEERING FIRMS IN UGANDA

These questions seek information regarding the background of your firm, whether your firm practices Knowledge Management and leverage it to gain Competitive Advantage and the role of Information Communication Technology. Your responses to the following questions will be treated with utmost confidentiality. Please kindly fill in the questionnaire using the guidelines beside the questions in Section 1 and on top of each Section for the rest of the sections. Thank you.

SECTION 1: BACKGROUND INFORMATION

A. Respondent's Profile

1. Gender: a. Female b. Male *(Please circle the correct answer)*
2. How long have you served in this firm? _____ year(s) *(write number of years)*
3. What is your age? *(tick applicable category)*
   A. 21 – 30 years
   B. 31 – 40 years
   C. 41 – 50 years
   D. 51 – 60 years
   E. 61 +
4. What promotion have you got so far *(mark the correct answer)*
   A. Supervisory
   B. Project Manager
   C. Administrative
   D. None
5. In which category is your job title? *(mark the correct answer)*
   A. General staff
   B. Supervisory
   C. Project Manager
   D. Administrative

B. Firm's Profile

6. State the number of years your firm has been operational _____ year(s) *(write number of years)*
7. Indicate the number of employees in your firm *(tick applicable category)*
   A. 1 – 20 employees
   B. 21 – 50 employees
   C. 51 – 100 employees
   D. Above 100 employees
8. What is the average gross annual revenue of your firm? (*please tick applicable answer*)
   A. 50 million Uganda Shillings or less
   B. 51 - 100 million Uganda shillings
   C. 101 - 200 million Uganda shillings
   D. 201 - 500 million Uganda shillings
   E. Over 500 million Uganda shillings

APPENDIX 3: QUESTIONNAIRE

9. In which sector does your firm offer its services? (*Please tick whatever is applicable)*
   A. Building
   B. Roads Engineering
   C. Water and Sanitation
   D. Energy
   E. Others, please specify _____

SECTION 2 : KNOWLEDGE MANAGEMENT PRACTICES

Please indicate by ticking ☑ your opinion by using the following Likert Scale where 1 is Strongly Disagree and 5 is Strongly Agree.

SCALE	1 Strongly Disagree	2 Disagree	3 Undecided	4 Agree	5 Strongly Agree

		1	2	3	4	5
A.	**Knowledge Acquisition *(getting new knowledge)***					
	My firm has processes…					
10	for generating new knowledge from existing knowledge					
11	for acquiring knowledge about clients					
12	for acquiring knowledge about suppliers					
13	for acquiring knowledge about new products/services					
14	for acquiring knowledge about competitors within industry					
15	for benchmarking performance					
B.	**Knowledge Filtering *(sorting and retaining useful knowledge)***					
	In my firm…					
16	activities involved in knowledge filtering help in establishing competitive advantage					
17	there are mechanisms for filtering through unnecessary knowledge					
18	only knowledge that will pay off is retained for immediate or later use					
19	the filtering processes are guided by the firm's vision, mission and goals					
20	there are review teams that determine whether knowledge is valuable in its scope					
21	knowledge from outside the company's traditional boundaries is evaluated before retaining it					
C.	**Knowledge Configuration *(organizing and storing knowledge)***					
	In my firm…					
22	knowledge acquired from previous projects is organized and stored					
23	geographically dispersed knowledge is integrated in the corporate memory and made available within the company					
24	lessons learnt from different projects are easily accessible to all in the company					
25	databases of good work practices are regularly updated					
26	frequently used handbooks and work guidelines are kept up to date					
27	specific knowledge of individuals is normally documented					
28	experts in certain areas are urged to document the methods for the firm's use					

APPENDIX 3: QUESTIONNAIRE

Please indicate by ticking ☑ your opinion by using the following Likert Scale where 1 is Strongly Disagree and 5 is Strongly Agree.

SCALE	1 Strongly Disagree	2 Disagree	3 Undecided	4 Agree	5 Strongly Agree

		1	2	3	4	5
D.	**Knowledge Sharing**					
	In my firm…					
29	knowledge sharing is encouraged by top management					
30	new members of staff are assigned to mentors who help them to find their way in the firm					
31	colleagues inform each other regularly about positive experiences and successful projects undertaken					
32	we have a form of inter-colleague review in which members discuss their methods of work					
33	I regularly inform my colleagues of what I am working on					
34	there are processes for exchanging knowledge between individuals					
35	there are processes for distributing knowledge throughout the firm					
36	employees fear that sharing their knowledge with others might reduce their influence within the firm					
E.	**Knowledge Application *(using knowledge)***					
	My firm has processes…					
37	to quickly link sources of knowledge in solving problems and challenges					
38	for exchanging knowledge with business partners to solve client problems					
39	for converting competitive intelligence into plans of action					
40	that make knowledge easily accessible to all who need to apply it					
41	that encourage interdepartmental knowledge application to occur as a matter of course					
	SECTION 3 : INFORMATION COMMUNICATION TECHNOLOGY USAGE					
A.	**ICT Infrastructure**					
	In my firm…					
42	every senior member of staff has a personal computer					
43	we have a local area network (LAN) to distribute information and share knowledge with colleagues at work					
44	all staff members are connected to the intranet					
45	all staff members have easy access to the internet					
46	the use of intranet is number one choice in exchanging information					
47	we have an efficient ICT system					
48	Our IT tools are regularly upgraded in line with new development in the IT field					
B.	**ICT Know-How**					
49	The majority of staff members in our institution have sufficient computer skills					

APPENDIX 3: QUESTIONNAIRE

Please indicate by ticking ☑ your opinion by using the following Likert Scale where 1 is Strongly Disagree and 5 is Strongly Agree.

SCALE	1 Strongly Disagree	2 Disagree	3 Undecided	4 Agree	5 Strongly Agree

		1	2	3	4	5
50	I use the computer often to share knowledge and information with my colleagues					
51	We regularly receive training in the use of IT tools					
52	All staff know how to use the internet					
	SECTION 4: COMPETITIVE ADVANTAGE					
A.	**Innovativeness**					
	In my firm…					
53	we often use innovative technologies in new product development					
54	our products always reflect state-of-the-art of the technology					
55	we are very proactive in the development and deployment of new technologies					
56	we have the wit and the capacity to develop a technological breakthrough					
57	we utilise alliances to bring in new skills					
B.	**Competency Development**					
	In my firm…					
58	in order to be open for new technologies, coworkers at all hierarchical levels are constantly ready to contribute with knowledge and experience					
59	we find it easy to change established procedures to cater to the needs of new products					
60	we easily replace one set of knowledge to adapt new technology products					
61	we aggressively pursue new technologies even if they cause existing investments to lose value					
C.	**Quality Service Support**					
	In my firm…					
62	we endeavour to commence and complete jobs on the schedule					
63	we co-ordinate the various engineering disciplines, to bring all within the agreed budget					
64	we allocate sufficient resources including back-up resources to ensure good quality and timely work					
65	we apply established quality control procedures to detect and eliminate errors rapidly					
66	we are aware of and conform to, requisite regulations, e.g. standards and codes					
67	we take initiative to anticipate issues of concern to the client					

D.	**Client Satisfaction**					
68	There is an extremely high level of commitment in serving clients' needs in our firm					
69	Our products and services are driven by the goal of increasing client value					
70	Our business objectives are driven by client satisfaction					
71	Our clients have confidence in our professional services					
72	We pay close attention to remedial services after project completion					
73	Our clients are confident with our technical know-how					

APPENDIX 3: QUESTIONNAIRE

Please indicate by ticking ☑ your opinion by using the following Likert Scale where 1 is Strongly Disagree and 5 is Strongly Agree.

SCALE	1 Strongly Disagree	2 Disagree	3 Undecided	4 Agree	5 Strongly Agree

		1	2	3	4	5
74	We respond promptly to client requests for information					

E.	**Learning and Growth**					
	In my firm…					
75	we have a comprehensive program for employee learning					
76	employee learning is a topic that is discussed intensively by top management					
77	Managers agree that our firm's ability to learn is the key to our competitive advantage					
78	opportunities are provided for individual development, other than formal training such as work assignments and job rotation					
79	we have effective internal procedures for transferring best practices throughout the firm					
80	the culture and spirit within the firm are positive					
81	employees are actively encouraged to participate in decision making processes					
82	employees are committed and motivated					

Thank you very much for being part of this study.

APPENDIX 4: INTERVIEW GUIDE FOR CHIEF EXECUTIVES

INTERVIEW GUIDE FOR CHIEF EXECUTIVES

1. Have you heard of knowledge management as a discipline?
2. Do you have a knowledge management strategy?
3. How many employees do you have in the company?
4. Are employees all on permanent contracts?
5. How do you recruit your staff?
6. Do new employees get mentored and coached by the senior employees?
7. How do you train your staff?
8. Do you have a training budget?
9. Do you have regular meetings to share project information?
10. What is your average gross annual revenue?
11. In which sectors does your organization offer its services?
12. Do you specialize in a particular field or you diversify your capabilities?
13. Do you carry out project review, compile lessons learnt and apply them on your next project?
14. Do you update your guidelines and standard specifications?
15. How are your clients, do satisfy their needs?
16. Are they fair when selecting consultants?
17. What is the most important criteria for selecting consultants, price or technical responsiveness?
18. Do you think Uganda Association of Consulting Engineers would be more useful if they had the mandate to carry out what they propose to do?

APPENDIX 5: INTERVIEW GUIDE FOR CLIENTS

INTERVIEW GUIDE FOR CLIENTS ABOUT THE CONSULTING ENGINEERING FIRMS

1. Timeliness of deliverables;
2. Quality of services;
3. Effectiveness of project cost control;
4. Reliability in providing solutions or suggestions and in attending to problems;
5. Added value to a project in terms of problem solving or improved coordination of team members;
6. Responsiveness to client's needs;
7. Overall satisfaction with their services;
8. Willingness to award future projects;
9. Willingness to recommend services to other industry players.

APPENDIX 6: DOCUMENT REVIEW GUIDE

DOCUMENT REVIEW GUIDE

Documents reviewed included:

- Company strategic plans
  Look at the each strategic plan
  Look at the mission and vision statements, if any

- Minutes of Staff meetings
  How often are staff meetings held
  Is knowledge shared during these meetings

- Training Policy (budget, programme)

- Recruitment Policy (guidelines, contract agreements)

- Final Project Completion Reports

- Lessons Learnt Reports

- Technical / Standard Specifications (how often they are they updated)

- Donor Guidelines

APPENDIX 7: RESULTS OF THE RELIABILITY ANALYSIS

Knowledge Acquisition

****** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

Covariance Matrix

	BA9	BA10	BA11	BA12	BA13
BA9	.8299				
BA10	.5599	1.0698			
BA11	.4105	.6585	1.0410		
BA12	.3903	.4806	.6153	.8250	
BA13	.3045	.5965	.3767	.2736	.9568
BA14	.2446	.2642	.1682	.2431	.3978

	BA14
BA14	1.0086

Correlation Matrix

	BA9	BA10	BA11	BA12	BA13
BA9	1.0000				
BA10	.5942	1.0000			
BA11	.4416	.6240	1.0000		
BA12	.4717	.5115	.6639	1.0000	
BA13	.3417	.5896	.3774	.3080	1.0000
BA14	.2673	.2543	.1642	.2664	.4050

	BA14
BA14	1.0000

N of Cases = 81.0

Reliability Coefficients 6 items

Alpha = .8114 Standardized item alpha = .8121

APPENDIX 7: RESULTS OF THE RELIABILITY ANALYSIS

Knowledge Filtering

_REQUEST 48

****** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

Covariance Matrix

	BB15	BB16	BB17	BB18	BB19
BB15	.9355				
BB16	.6318	.9059			
BB17	.2787	.1384	.9778		
BB18	.5535	.4707	.4079	1.0216	
BB19	.3796	.4949	.2597	.6005	1.1528
BB20	.4738	.4330	.2282	.5474	.6384

	BB20
BB20	1.1781

Correlation Matrix

	BB15	BB16	BB17	BB18	BB19
BB15	1.0000				
BB16	.6863	1.0000			
BB17	.2914	.1471	1.0000		
BB18	.5662	.4893	.4081	1.0000	
BB19	.3656	.4843	.2446	.5533	1.0000
BB20	.4513	.4192	.2127	.4989	.5478

	BB20
BB20	1.0000

N of Cases = 81.0

Reliability Coefficients 6 items

Alpha = .8152 Standardized item alpha = .8156

APPENDIX 7: RESULTS OF THE RELIABILITY ANALYSIS

Knowledge Configuration

_REQUEST 49

****** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

Covariance Matrix

	BC21	BC22	BC23	BC24	BC25
BC21	.8207				
BC22	.3656	1.1049			
BC23	.3307	.5691	1.2679		
BC24	.3869	.5040	.7312	1.2892	
BC25	.4173	.4627	.7147	.7400	1.0809
BC26	.2546	.3324	.5162	.5560	.4815
BC27	.2069	.2736	.4306	.5653	.3722

	BC26	BC27
BC26	1.0611	
BC27	.6042	1.1250

Correlation Matrix

	BC21	BC22	BC23	BC24	BC25
BC21	1.0000				
BC22	.3839	1.0000			
BC23	.3242	.4808	1.0000		
BC24	.3761	.4223	.5719	1.0000	
BC25	.4431	.4234	.6105	.6269	1.0000
BC26	.2729	.3070	.4450	.4754	.4496
BC27	.2154	.2454	.3605	.4694	.3376

	BC26	BC27
BC26	1.0000	
BC27	.5530	1.0000

N of Cases = 81.0

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

Reliability Coefficients 7 items

Alpha = .8365 Standardized item alpha = .8345

APPENDIX 7: RESULTS OF THE RELIABILITY ANALYSIS

Knowledge Sharing

****** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

Covariance Matrix

	BD28	BD29	BD30	BD31	BD32
BD28	.4028				
BD29	.1833	.7500			
BD30	.1819	.3708	.6361		
BD31	.0986	.2208	.3528	1.0444	
BD32	.1796	.3097	.3907	.4352	.7549
BD33	.1736	.2958	.2903	.4444	.3519
BD34	.0889	.3667	.2347	.3431	.3106
BD35	.0319	-.1667	-.0889	-.3097	-.2093

	BD33	BD34	BD35
BD33	.6944		
BD34	.4806	1.1944	
BD35	-.1222	-.5278	1.2361

Correlation Matrix

	BD28	BD29	BD30	BD31	BD32
BD28	1.0000				
BD29	.3336	1.0000			
BD30	.3595	.5369	1.0000		
BD31	.1520	.2495	.4328	1.0000	
BD32	.3258	.4116	.5639	.4901	1.0000
BD33	.3283	.4099	.4367	.5219	.4859
BD34	.1282	.3874	.2693	.3071	.3271
BD35	.0453	-.1731	-.1002	-.2726	-.2166

	BD33	BD34	BD35
BD33	1.0000		
BD34	.5276	1.0000	
BD35	-.1319	-.4343	1.0000

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

N of Cases = 81.0

Reliability Coefficients 8 items

Alpha = .6674 Standardized item alpha = .7157

APPENDIX 7: RESULTS OF THE RELIABILITY ANALYSIS

Knowledge Application

****** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

Covariance Matrix

	BE36	BE37	BE38	BE39	BE40
BE36	.9809				
BE37	.5045	.8531			
BE38	.4256	.5603	.7790		
BE39	.2485	.4554	.4775	.7438	
BE40	.2324	.3491	.3856	.4296	.6528

Correlation Matrix

	BE36	BE37	BE38	BE39	BE40
BE36	1.0000				
BE37	.5515	1.0000			
BE38	.4869	.6874	1.0000		
BE39	.2909	.5717	.6272	1.0000	
BE40	.2904	.4678	.5408	.6166	1.0000

N of Cases = 81.0

Reliability Coefficients 5 items

Alpha = .8374 Standardized item alpha = .8405

APPENDIX 7: RESULTS OF THE RELIABILITY ANALYSIS

Competitive Advantage

****** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

N of Cases = 81.0

Inter-item Covariances	Mean	Minimum	Maximum	Range	Max/Min	Variance
	.2340	.0106	.6869	.6762	64.5072	.0117

Inter-item Correlations	Mean	Minimum	Maximum	Range	Max/Min	Variance
	.3506	.0128	.7322	.7194	57.2162	.0209

Reliability Coefficients 30 items

Alpha = .9376 Standardized item alpha = .9418

APPENDIX 7: RESULTS OF THE RELIABILITY ANALYSIS

ICT Usage

****** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

		Mean	Std Dev	Cases
1.	CA41	4.6914	.6827	81.0
2.	CA42	4.4568	1.0130	81.0
3.	CA43	4.2840	1.1962	81.0
4.	CA44	4.4938	.9100	81.0
5.	CA45	4.1728	1.0343	81.0
6.	CA46	4.0370	.8131	81.0
7.	CA47	3.8889	.9874	81.0
8.	CB48	4.3951	.7014	81.0
9.	CB49	4.2346	.8842	81.0
10.	CB50	2.8889	1.2042	81.0
11.	CB51	4.3333	.9083	81.0

N of Cases = 81.0

Item Means	Mean	Minimum	Maximum	Range	Max/Min	Variance
	4.1706	2.8889	4.6914	1.8025	1.6239	.2291

Item Variances	Mean	Minimum	Maximum	Range	Max/Min	Variance
	.9096	.4660	1.4500	.9840	3.1113	.1070

Inter-item Covariances	Mean	Minimum	Maximum	Range	Max/Min	Variance
	.3671	.0514	.8830	.8316	17.1832	.0319

Inter-item Correlations	Mean	Minimum	Maximum	Range	Max/Min	Variance
	.4217	.0483	.8112	.7629	16.8072	.0292

Reliability Coefficients 11 items

Alpha = .8816 Standardized item alpha = .8891

APPENDIX 7: Reliability Results

APPENDIX 8 : DESCRIPTIVE STATISTICS OF ALL VARIABLES

		N	Minimum	Maximum	Mean	Std. Deviation
	Knowledge Acquisition					
10	there are processes for generating new knowledge from existing knowledge	81	1	5	3.91	.91
11	there are processes for acquiring knowledge about clients	81	1	5	3.83	1.03
12	there are processes for acquiring knowledge about suppliers	81	1	5	3.69	1.02
13	there are processes for acquiring knowledge about new products/services	81	1	5	3.89	.91
14	there are processes for acquiring knowledge about competitors within the industry	81	1	5	3.77	.98
15	there are processes for benchmarking performance	81	1	5	3.94	1.00
	Knowledge Filtering					
16	activities involved in knowledge filtering help in establishing competitive advantage	81	1	5	3.80	.97
17	there are mechanisms for filtering through unnecessary knowledge	81	1	5	3.28	.95
18	only knowledge that will pay off is retained for immediate or later use	81	1	5	3.52	.99
19	the filtering processes are guided by the organisation's vision, mission and goals	81	1	5	3.58	1.01
20	there are review teams that determine whether knowledge is valuable in its scope	81	1	5	3.15	1.07
21	knowledge from outside the company's traditional boundaries is evaluated before retaining it	81	1	5	3.49	1.09
	Knowledge Configuration					
22	knowledge acquired from previous projects is organized and stored	81	2	5	4.32	.91
23	geographically dispersed knowledge is integrated in the corporate memory and made available within the company	81	1	5	3.91	1.05
24	lessons learnt from different projects are easily accessible to all in the company	81	1	5	3.79	1.13
25	databases of good work practices are regularly updated	81	1	5	3.62	1.14
26	frequently used handbooks and work guidelines are kept up to date	81	1	5	3.72	1.04
27	specific knowledge of individuals is normally documented	81	1	5	3.37	1.03
28	experts in certain areas are urged to document the methods for organisational use	81	1	5	3.56	1.06
	Knowledge Sharing					
29	knowledge sharing is encouraged by top management	81	2	5	4.48	.63
30	new members of staff are assigned to mentors who help them to find their way in the organisation	81	2	5	4.11	.87
31	colleagues inform each other regularly about positive experiences and successful projects undertaken	81	2	5	4.04	.80
32	we have a form of inter-colleague review in which members discuss their methods of work	81	1	5	3.26	1.02
33	I regularly inform my colleagues of what I am working on	81	2	5	3.91	.87
34	there are processes for exchanging knowledge between individuals	81	2	5	3.59	.83

APPENDIX 8 : DESCRIPTIVE STATISTICS OF ALL VARIABLES

		N	Minimum	Maximum	Mean	Std. Deviation
35	there are processes for distributing knowledge throughout the organisation	81	1	5	3.41	1.09
36	employees fear that sharing their knowledge with others might reduce their influence within the firm	81	1	5	2.04	1.11
	Knowledge Application					
37	there are processes to quickly link sources of knowledge in solving problems and challenges	81	2	5	3.72	.99
38	there are processes for exchanging knowledge with business partners to solve client problems	81	1	5	3.49	.92
39	there are processes for converting competitive intelligence into plans of action	81	2	5	3.65	.88
40	there are processes that make knowledge easily accessible to all who need to apply it	81	2	5	3.86	.86
41	there are processes that encourage interdepartmental knowledge sharing to occur as a matter of course	81	2	5	3.85	.81
	ICT Usage					
42	every senior member of staff has a personal computer	81	2	5	4.69	.68
43	we have a local area network (LAN) to distribute information and share knowledge with colleagues at work	81	1	5	4.46	1.01
44	all staff members are connected to the intranet	81	1	5	4.28	1.20
45	all staff members have easy access to the internet	81	1	5	4.49	.91
46	the use of intranet is number one choice in exchanging information	81	1	5	4.17	1.03
47	we have an efficient ICT system	81	2	5	4.04	.81
48	Our IT tools are regularly upgraded in line with new development in the IT field	81	1	5	3.89	.99
49	The majority of staff members in our institution have sufficient computer skills	81	2	5	4.40	.70
50	I use the computer often to share knowledge and information with my colleagues	81	1	5	4.23	.88
51	We regularly receive training in the use of IT tools	81	1	5	2.89	1.20
52	All staff know how to use the internet	81	1	5	4.33	.91
	Innovativeness					
53	we often use innovative technologies in new product development	81	1	5	3.58	.93
54	our products always reflect state-of-the-art of the technology	81	1	5	3.51	1.00
55	we are very proactive in the development and deployment of new technologies	81	1	5	3.59	.97
56	we have the wit and the capacity to develop a technological breakthrough	81	1	5	3.63	.91
57	we utilise alliances to bring in new skills	81	1	5	3.83	1.00
	Competency Development					
58	in order to be open for new technologies, coworkers at all hierarchical levels are constantly ready to contribute with knowledge and experience	81	2	5	3.81	.85
59	we find it easy to change established procedures to cater to the needs of new products	81	1	5	3.51	.78
60	we easily replace one set of knowledge to adapt new technology products	81	1	5	3.48	.91
61	we aggressively pursue new technologies even if they cause existing investments to lose value	81	1	5	3.15	1.13

APPENDIX 8 : DESCRIPTIVE STATISTICS OF ALL VARIABLES

		N	Minimum	Maximum	Mean	Std. Deviation
	Quality Service Support					
62	we endeavour to commence and complete jobs on the schedule	81	2	5	4.51	.76
63	we co-ordinate the various engineering disciplines, to bring all within the agreed budget	81	2	5	4.27	.72
64	we allocate sufficient resources including back-up resources to ensure good quality and timely work	81	2	5	4.30	.78
65	we apply established quality control procedures to detect and eliminate errors rapidly	81	2	5	4.31	.74
66	we are aware of and conform to, requisite regulations, e.g. standards and codes	81	2	5	4.56	.61
67	we take initiative to anticipate issues of concern to the client	81	2	5	4.48	.61
	Client Satisfaction					
68	There is an extremely high level of commitment in serving clients' needs in our organisation	81	2	5	4.60	.65
69	Our products and services are driven by the goal of increasing client value	81	2	5	4.51	.73
70	Our business objectives are driven by client satisfaction	81	2	5	4.49	.73
71	Our clients have confidence in our professional services	81	2	5	4.60	.63
72	We pay close attention to remedial services after project completion	81	2	5	4.21	.80
73	Our clients are confident with our technical know-how	81	2	5	4.56	.65
74	We respond promptly to client requests for information	81	2	5	4.33	.79
	Learning and Growth					
75	we have a comprehensive program for employee learning	81	1	5	3.27	1.00
76	employee learning is a topic that is discussed intensively by top management	81	1	5	3.46	.98
77	Managers agree that our organisation's ability to learn is the key to our competitive advantage	81	1	5	3.83	.89
78	opportunities are provided for individual development, other than formal training such as work assignments and job rotation	81	1	5	3.80	.95
79	we have effective internal procedures for transferring best practices throughout the organisation	81	2	5	3.72	.78
80	the culture and spirit within the organisation are positive	81	2	5	4.12	.76
81	employees are actively encouraged to participate in decision processes	81	1	5	3.79	.97
82	employees are committed and motivated	81	2	5	3.93	.77

APPENDIX 9-RESULTS OF CORRELATION ANALYSIS

Correlations

		Competitive Advantage	Knowledge Acquisition	Knowledge Filtering	Knowledge Configuration	Knowledge Sharing	Knowledge Application
Competitive Advantage	Pearson Correlation	1.000	.620**	.629**	.634**	.563**	.615**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000
	N	81	81	81	81	81	81
Knowledge Acquisition	Pearson Correlation	.620**	1.000	.680**	.702**	.611**	.587**
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000
	N	81	81	81	81	81	81
Knowledge Filtering	Pearson Correlation	.629**	.680**	1.000	.722**	.555**	.666**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000
	N	81	81	81	81	81	81
Knowledge Configuration	Pearson Correlation	.634**	.702**	.722**	1.000	.650**	.675**
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000
	N	81	81	81	81	81	81
Knowledge Sharing	Pearson Correlation	.563**	.611**	.555**	.650**	1.000	.661**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000
	N	81	81	81	81	81	81
Knowledge Application	Pearson Correlation	.615**	.587**	.666**	.675**	.661**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.
	N	81	81	81	81	81	81

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

APPENDIX 10: MULTIPLE REGRESSION KNOWLEDGE MANAGEMENT PRACTICES AND COMPETITIVE ADVANTAGE

Descriptive Statistics

	Mean	Std. Deviation	N
Competitive Advantage	4.06	.41	77
Gender	1.82	.39	77
Knowledge Acquisition	3.88	.67	77
Knowledge Filtering	3.48	.74	77
Knowledge Configuration	3.79	.73	77
Knowledge Sharing	3.62	.50	77
Knowledge Application	3.74	.71	77

Model Summary[c]

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	.217[a]	.047	.035	.40	.047	3.722	1	75	.057	
2	.796[b]	.634	.602	.26	.586	22.406	5	70	.000	1.850

a. Predictors: (Constant), Gender

b. Predictors: (Constant), Gender, Knowledge Configuration, Knowledge Sharing, Knowledge Acquisition, Knowledge Application, Knowledge Filtering

c. Dependent Variable: Competitive Advantage

APPENDIX 10: MULTIPLE REGRESSION KNOWLEDGE MANAGEMENT PRACTICES AND COMPETITIVE ADVANTAGE

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.600	1	.600	3.722	.057[a]
	Residual	12.087	75	.161		
	Total	12.687	76			
2	Regression	8.039	6	1.340	20.177	.000[b]
	Residual	4.648	70	6.640E-02		
	Total	12.687	76			

a. Predictors: (Constant), Gender

b. Predictors: (Constant), Gender, Knowledge Configuration, Knowledge Sharing, Knowledge Acquisition, Knowledge Application, Knowledge Filtering

c. Dependent Variable: Competitive Advantage

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	3.640	.220		16.511	.000					
	Gender	.229	.119	.217	1.929	.057	.217	.217	.217	1.000	1.000
2	(Constant)	1.784	.256		6.960	.000					
	Gender	.212	.079	.201	2.694	.009	.217	.307	.195	.938	1.066
	Knowledge Acquisition	2.401E-02	.067	.040	.357	.722	.590	.043	.026	.426	2.348
	Knowledge Filtering	.252	.066	.454	3.833	.000	.713	.417	.277	.373	2.684
	Knowledge Configuration	2.961E-02	.068	.053	.437	.664	.620	.052	.032	.358	2.797
	Knowledge Sharing	9.645E-02	.085	.118	1.134	.261	.571	.134	.082	.482	2.076
	Knowledge Application	.121	.067	.210	1.812	.074	.678	.212	.131	.390	2.567

a. Dependent Variable: Competitive Advantage

APPENDIX 11: RESULTS OF THE HIERARCHICAL ANALYSIS

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	.179[a]	.032	.020	.49	.032	2.618	1	79	.110
2	.741[b]	.549	.512	.35	.517	16.947	5	74	.000
3	.804[c]	.646	.589	.32	.097	3.776	5	69	.004

a. Predictors: (Constant), Gender

b. Predictors: (Constant), Gender, Knowledge Configuration, Knowledge Sharing, Knowledge Acquisition, Knowledge Application, Knowledge Filtering

c. Predictors: (Constant), Gender, Knowledge Configuration, Knowledge Sharing, Knowledge Acquisition, Knowledge Application, Knowledge Filtering, ICT UsageXKnowledge Sharing, ICT UsageXKnowledge Filtering, ICT UsageXKnowledge Application, ICT UsageXKnowledge Acquisition, ICT UsageXKnowledge Configuration

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.640	1	.640	2.618	.110[a]
	Residual	19.322	79	.245		
	Total	19.962	80			
2	Regression	10.955	6	1.826	14.999	.000[b]
	Residual	9.008	74	.122		
	Total	19.962	80			
3	Regression	12.890	11	1.172	11.433	.000[c]
	Residual	7.072	69	.102		
	Total	19.962	80			

a. Predictors: (Constant), Gender

b. Predictors: (Constant), Gender, Knowledge Configuration, Knowledge Sharing, Knowledge Acquisition, Knowledge Application, Knowledge Filtering

c. Predictors: (Constant), Gender, Knowledge Configuration, Knowledge Sharing, Knowledge Acquisition, Knowledge Application, Knowledge Filtering, ICT UsageXKnowledge Sharing, ICT UsageXKnowledge Filtering, ICT UsageXKnowledge Application, ICT UsageXKnowledge Acquisition, ICT UsageXKnowledge Configuration

d. Dependent Variable: Competitive Advantage

APPENDIX 11: RESULTS OF THE HIERARCHICAL ANALYSIS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	3.576	.263		13.619	.000	3.053	4.098					
	Gender	.229	.141	.179	1.618	.110	-.053	.510	.179	.179	.179	1.000	1.000
2	(Constant)	1.348	.336		4.009	.000	.678	2.018					
	Gender	.213	.104	.167	2.056	.043	.007	.419	.179	.232	.161	.928	1.077
	Knowledge Acquisition	.134	.086	.189	1.558	.123	-.037	.306	.620	.178	.122	.416	2.405
	Knowledge Filtering	.163	.088	.239	1.861	.067	-.012	.338	.629	.211	.145	.370	2.700
	Knowledge Configuration	.113	.090	.169	1.261	.211	-.066	.292	.634	.145	.098	.338	2.956
	Knowledge Sharing	.108	.114	.108	.940	.350	-.120	.335	.563	.109	.073	.461	2.168
	Knowledge Application	9.732E-02	.090	.136	1.086	.281	-.081	.276	.615	.125	.085	.390	2.563
3	(Constant)	1.809	.337		5.362	.000	1.136	2.482					
	Gender	.176	.101	.138	1.740	.086	-.026	.378	.179	.205	.125	.817	1.224
	Knowledge Acquisition	1.480	.582	2.078	2.543	.013	.319	2.641	.620	.293	.182	.008	129.991
	Knowledge Filtering	-1.225	.606	-1.793	-2.021	.047	-2.434	-.016	.629	-.236	-.145	.007	153.316
	Knowledge Configuration	1.458	.698	2.182	2.090	.040	.066	2.850	.634	.244	.150	.005	212.343
	Knowledge Sharing	-1.704	.667	-1.713	-2.554	.013	-3.035	-.373	.563	-.294	-.183	.011	87.613
	Knowledge Application	2.536E-02	.513	.035	.049	.961	-.998	1.049	.615	.006	.004	.010	99.780
	ICT UsageXKnowledge Acquisition	-.295	.135	-2.358	-2.190	.032	-.565	-.026	.698	-.255	-.157	.004	225.744
	ICT UsageXKnowledge Filtering	.316	.141	2.577	2.248	.028	.036	.596	.676	.261	.161	.004	255.966
	ICT UsageXKnowledge Configuration	-.329	.163	-2.910	-2.016	.048	-.655	-.003	.645	-.236	-.144	.002	405.640
	ICT UsageXKnowledge Sharing	.413	.156	2.875	2.641	.010	.101	.724	.613	.303	.189	.004	230.836
	ICT UsageXKnowledge Application	6.910E-03	.120	.060	.058	.954	-.232	.246	.621	.007	.004	.005	208.915

a. Dependent Variable: Competitive Advantage