KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

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COLLEGE OF ART AND BUILT ENVIRONMENT

DEPARTMENT OF BUILDING TECHNOLOGY

INCORPORATING KNOWLEDGE MANAGEMENT IN CIVIL

ENGINEERING CONSTRUCTION FIRMS IN GHANA

BY

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IN

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DECLARATION

I hereby declare that this work was solely undertaken under supervision and is the result of my effort and that all quotations from books and other sources of information have been duly acknowledged and that no part of it has been presented for another award of this university or elsewhere.

....

Benjamin Smith   Date (Student)

I declare that I have supervised the student in undertaking the research reported herein and I confirm that the student has my permission to present it for assessment.

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Mr. Joe Kingsley Hackman   Date

(Supervisor)

I confirm that the student has duly effected all the corrections suggested by the examiners in conformity of the Department"s requirements.

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DEDICATION

I devote this work to the Lord Almighty God for his guidance, my family for their love

and support and my friends for their help and encouragement.

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ABSTRACT

Knowledge management promotes innovation, business performance and client satisfaction. However, knowledge if not well managed renders the organisation less competitive within the global job market. This is a quantitative study that was conducted in some civil engineering construction firms in the Kumasi metropolis and some selected municipalities in the Ashanti region with an aim of exploring the significance of knowledge management practices in civil engineering construction firms in Ghana. The primary research was conducted using survey questionnaires. The structured questionnaires were used to obtain data to ascertain the challenges and measures to improve knowledge management practices. A total number of seventy questionnaires were administered and sixty were retrieved representing a response rate of 85.71%. Relative Importance Index rankings were the main tool used for analysis. The findings of the research revealed the main challenges associated with the adoption of knowledge management as lack of available KM systems, lack of leadership support, lack of awareness of KM practices, lack of understanding knowledge management and employee resistance. However, the main strategic measures to improve knowledge management; innovation, awareness creation, use of knowledge storage, use knowledge management models and adequate financial resources were also ascertained. Further studies have been recommended to improve knowledge management practices in organisations such as the impact of knowledge management practices on the productivity of civil engineering construction firms.

Keywords: Challenges, Construction, Ghana, Knowledge, Knowledge Management.
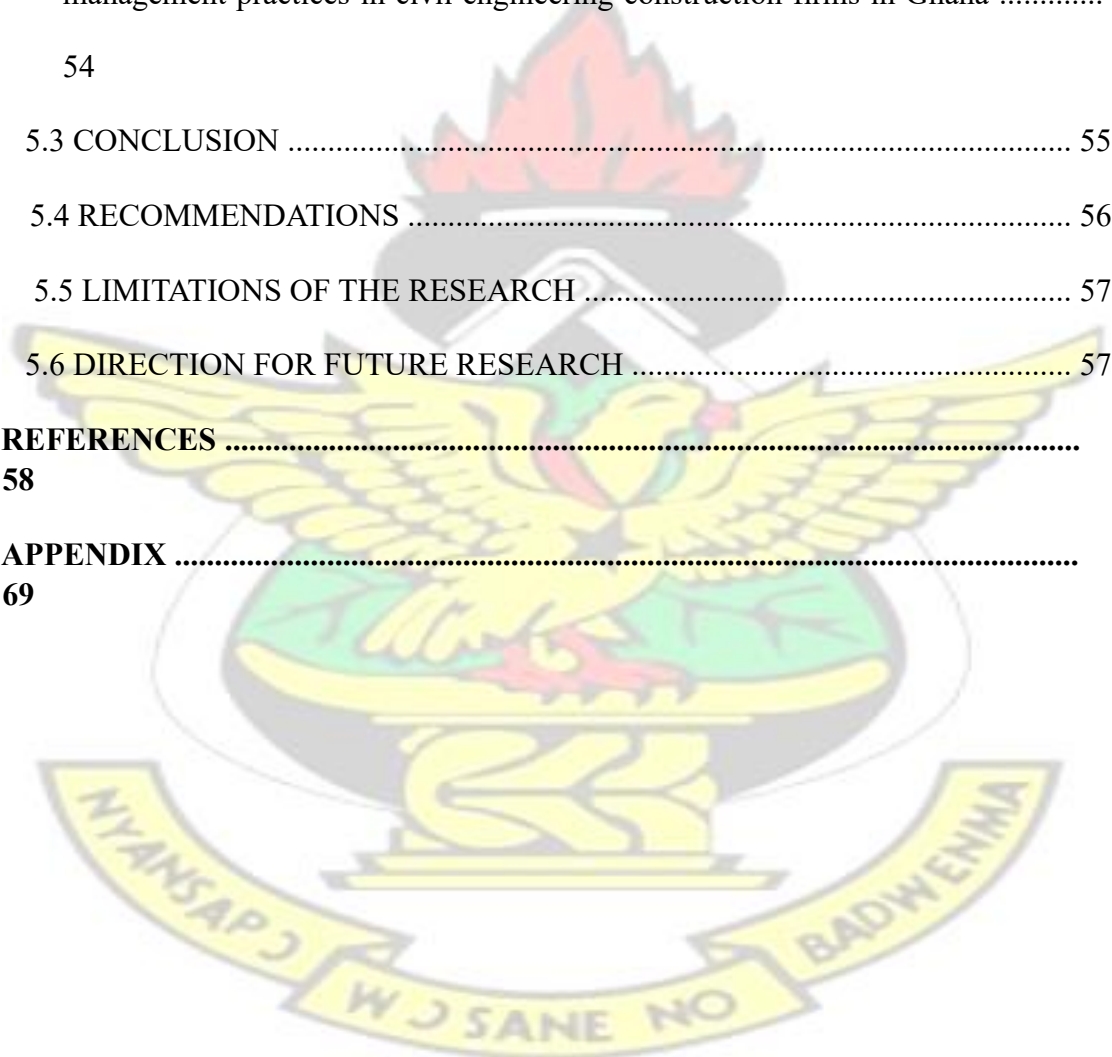
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CHAPTER ONE INTRODUCTION

1.1 BACKGROUND OF STUDY

Knowledge management is as old as the existence of human beings (Wigg, 1999; Lytas and Pouloudi, 2003). Nicou et al., (1994) further affirms that brainpower and knowledge serve as the fundamental requirement that provide professionals with a competitive strategy that exceeds products and services. Convey (2004) stated that business focus keep evolving, it changed from people focus in the 70s to team focus in the 80s, then followed by process focus in the 90s to knowledge and adaptability focus in the 20s. The researchers, academics, businesses and knowledge workers recognised the importance of addressing current and future knowledge management in order to improve the life of human beings.

However, Knowledge Management (KM) was developed when the "Learning Organisation" found out that firms cannot exist without much input in knowledge. This happened in the last two decades through management researchers, just after "Learning Organisation". Learning Organisation is defined as an organisation talented at creating, acquiring and transferring knowledge and modifying its behaviour to reflect new knowledge and insights (Garvin, 1993, as cited in Özorhon, 2004). As construction activities are becoming more and more complex, knowledge begins to develop and widen in the areas such as legal, financial, management, information technology and so on. Knowledge management promotes innovation, business performance and client satisfaction. Considered to be one of the most dynamic and complex industrial environments, the construction industry are a project-based industry within which individual projects are usually custom-built to client specifications (Raiden and Dainty, 2006). There are studies on knowledge management in construction firms (Carillo et al., 2000; Carillo et al., 2004; Robinson et al., 2005; Esmi and Ennals, 2009).

Construction firms have a number of characteristics that are different from other production firms. This is due to the fact that, the challenges in the construction firms are constantly changing with situations on the ground. Hence there is a need for construction firms to keep knowledge in order to remain in the job market. Knowledge is seen as one of the most important resources in any organisation (Ofek and Sarvary, 2001; Smith, 2001). The success or even the survival of any organisation depends on how effectively it manages knowledge present internally and externally (Drucker, 1994; Egbu, 1999; Switzer, 2008).

Furthermore, management literature has recently seen a boom in the number of publications dealing with management of organisational knowledge and intangible dimensions of the organisation (Von Krogh et al., 2001). Knowledge is considered a critical resource for any organisation. Renzel (2008) explained that knowledge has become valuable because it embodies best practices, routines, lessons learned, problem-solving methods and creative processes that cannot be easily imitated by competitors. Knowledge is progressively considered as a survival tool in a dynamic and competitive environment (Loudon and Loudon, 2003). Therefore it cannot be treated as a mere thing. It is now regarded as management assets within the construction organisations since it facilitates organisations to improve their competitive advantage (Kant and Singth, 2011; Kasimu et al., 2012). However, Coulson and Thomas (1997) highlighted that failure to manage effectively would increase the risk for lack of organisation priceless inspiration and creativeness.

1.2 PROBLEM STATEMENT

Knowledge Management is very vital to Civil Engineering (CE) construction firms in creating, identifying, sharing of knowledge on best practices, learning lessons and experiences within the organisation. Therefore, as CE construction projects have

specific goals and unique deliverables that are not the same, there may be difficulties in recording and capturing project knowledge efficiently (Kasimu et al., 2012). Knowledge can be re-used, and shared among engineers and experts that are involved in the construction works to better the construction process and reduce the time and cost of solving problems. Lin and Lin (2006) further indicated that if skill and knowledge are shared, then the same problems in construction projects will not be repeatedly solved. The construction industry is known to be an important and productive sector that helps national growth. However, the construction industry has a poor record in the management of its knowledge and results in huge wastage of resources and detrimental effect to quality. Carrillo et al (2000) further affirmed that the structure and working practices in the construction industry makes it difficult to share knowledge.

Various initiatives aimed at improving the construction process have necessitated the need for change and continuous improvement in construction industry. These initiatives are primarily targeted at reducing fragmentation, and have included; (a) the development of alternative procurement strategies to clarify and improve the communication structure among different participants in the construction process (Ashworth, 1991); (b) the use of computer technology to integrate the construction process through electronic sharing of data/information in both directions at the design-construction interface (Howard et al., 1989; Miyatake and Kangari, 1993; Evbuomwan and Anumba, 1996); (c) the adoption of a wide range of concepts, tools and techniques (example total quality management and partnering) to enhance collaboration and improved components, materials and construction methods, including standardisation and pre-assembly (Egan, 1998).

According to Hahn and Subramani (2000) Knowledge Management System Development (KMSD) can be adopted to improve the construction industry but the

industry fails to reflect the nature and locus of knowledge in KM. In the context of the Ghanaian construction industry, it is however not clear whether a study has been conducted in the area of knowledge management and therefore this research seeks to bridge the gap.

1.3 AIM AND OBJECTIVES

1.3.1 Research Aim

The aim of this study was to explore the significance of knowledge management practices in civil engineering construction firms in Ghana.

1.3.2 Objectives

This research work intends to contribute to existing work on the subject from a Ghanaian perspective by fulfilling the following objectives:

1. To explore knowledge management strategies of Civil engineering construction firms in Ghana;

2. To analyse the challenges associated with the adoption of knowledge management in Civil engineering construction firms in Ghana; and

3. To propose measures to improve knowledge management practices in Civil engineering construction firms in Ghana.

1.4 RESEARCH QUESTIONS

1. What are the Knowledge Management strategies of Civil engineering construction firms in Ghana?

2. What are the challenges associated with the adoption of Knowledge Management in Civil engineering construction firms in Ghana?

3. What measures can be adopted to improve Knowledge Management practices in Civil engineering construction firms in Ghana?

1.5 SIGNIFICANCE OF STUDY

In particular, this study is of much significance to the construction industry specifically the civil engineering firms as it will serve as a revival to live up to the need for considering proper Knowledge Management practices as an integral part of their practice. The findings of this study will enable civil engineering construction firms to make changes to their KM duties to give them the impetus to deliver satisfactory deliverables to their clients. The exposition that this study will bring to the fore will enable clients such as government to be aware of their needs in terms of their search for reputable Civil engineering construction firms for engagement. Furthermore the Government of Ghana will be the vital beneficiary of the findings of this study as it will bring about a major revolution leading to delivery of better Civil engineering construction projects. Finally this research is of much significance in academia as it will serve as a major and critical contribution to knowledge and this will consequently spur others on to engage in detailed and advanced level research on

Knowledge Management practices in the Ghanaian Construction Industry.

1.6 SCOPE OF STUDY

Geographically, the scope of this study will be limited to Civil engineering construction firms in the Kumasi Metropolis and other selected Municipalities in the Ashanti Region of Ghana. The Kumasi metropolis is chosen in terms of the geographical scope of this study because of its proximity to the researcher and this will make the retrieval of questionnaire easy.

Undeniably, Civil engineering construction firms in Ghana are more predominant in

Accra and Kumasi metropolis (Ahadzie, 2010); however, this study focused in the Kumasi Metropolis and other selected Municipalities in the Ashanti Region. Kumasi is the capital of the Ashanti region and the second largest city in Ghana and therefore enjoys a significant number of civil engineering construction projects. The dataset was obtained from a sample selection of civil engineering construction firms operating in the Kumasi metropolis and some other municipalities in the Ashanti region.

1.7 RESEARCH METHODOLOGY

The methodology adopted for this study consisted of the critical review of pertinent literature relevant to the Knowledge Management practices adopted by Civil engineering construction firms in Ghana. This aided in the identification of the previous work done, contributions made, criticisms, limitations, current findings and its applications. The literature review will culminate into the development of sound and critical questionnaire, which is pivoted around the aim and objectives of the study to collect data from the field. The number of civil engineering construction firms shall be determined by using the register of registered civil engineering construction firms at the Registrar General's department at the Kumasi metropolis. The sample size for the study will be determined using the snow ball sampling together with purposive sampling techniques in order to realize a sample size of the essential number of respondents since these two sampling techniques have the advantage of ascertaining main respondents in the target population (Kumar, 1999). The tools for analyzing the data collected will consist of descriptive statistics and relative importance index rakings for the various phenomenons identified. There will be a detailed discussion of the research methodology in chapter three.

1.8 STRUCTURE OF REPORT

The structure of the research work was be divided into five (5) interdependent chapters. Chapter1, titled "Introduction", presents the background, problem statement, aim, objectives, research questions and scope of the research. Chapter 2; the literature review shall discuss fully Knowledge Management practices in Civil engineering construction firms in Ghana. Chapter 3; the research methodology will describe the systematic approach to the research and provide discussions on the data collection analytical tools. Chapter 4 shall present the empirical analysis of data and discussions from the field survey that answers all the research objectives and questions. Chapter 5 shall be the Conclusions and Recommendations.
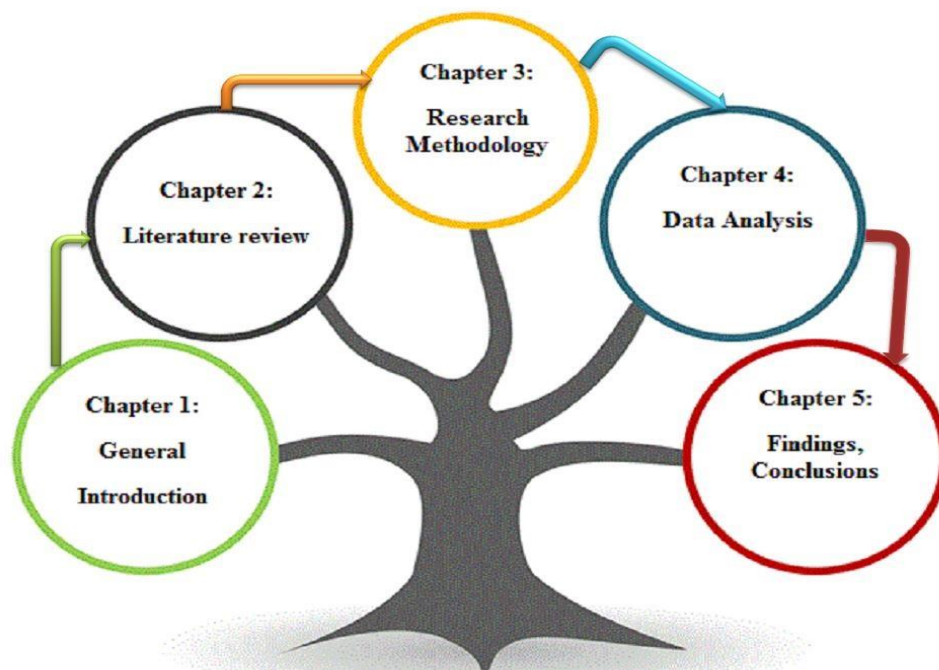
Figure 1.1: Workflow of Study

1.9 CHAPTER SUMMARY

This chapter addresses the background of the study, problem statement, aim and objectives, research questions, scope, methodology, significance of study and the structure of the report. The next chapter deals with the review of literature on the research work.

CHAPTER TWO LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, the relevant benefits and challenges associated with the adoption of knowledge management practices in civil engineering construction firms were reviewed. Content analyses of existing theories were reviewed to ascertain their validity and practicability in the context of the construction industry. These theories are anticipated to aid the identification of the benefits and challenges associated with the implementation of knowledge management practices.

2.2 OVERVIEW OF KNOWLEDGE

Various authors have different definitions for knowledge. Hlupic et al., (2002) stated that the numerous definitions of knowledge indicate the word „knowledge‟ means differently to different people and presents some amount of vagueness and ambiguity. Smith (2001) highlighted that knowledge is considered as a vital resource in any organisation. Davenport and Prusak (1998) defined knowledge as a fluid mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information. Knowledge originates and is applied in the minds of the knower. However, in organisations, knowledge often becomes engrafted not only in the documents but also reflects in the

organisational routines, processes, practices and norms (Davenport and Prusak, 1998). Knowledge does not exist independently of a knower and it is shaped by one"s needs as well as one"s initial stock of knowledge (Fahey and Prusak, 1998). Churchman (1971) further indicated that knowledge resides in the users and also in the collection of stock.

However, Schubert (1998) explained knowledge as a state or fact of knowing with knowing being a condition of understanding gained through experience or study; the sum or range of what has been perceived, discovered or learned. Knowledge is also considered as understanding of a particular situation or event (McQueen, 1998). Leonard and Sensiper (1998) also indicated that knowledge is considered as information which is relevant, actionable and based partially on experience.

Furthermore, knowledge is considered as a collection of data or information that have been organized and process to convey understanding, experience, accumulated learning and expertise that apply to a current activity. Nonaka (1994) defined knowledge as a justified belief that increases an entity"s capacity for taking effective action. Knowledge is further regarded as a mixture of experiences, practices, traditions, values, contextual information, expert insight and a sound intuition that provides an environment and framework for evaluating and incorporating new experiences and information (Convey, 2004). Awad and Ghaziri (2004) also defined knowledge as the facts, skills and understanding that one has gained, especially through learning or experience which enhance one"s ability of evaluating context, making decisions and taking actions when necessary.

In a nutshell, knowledge can be regarded as the actual or potential capacity that an individual possess in order to take the requisite and effective action in a varied and

uncertain situation. Knowledge is however gained through series of experiences that are available to an individual.

2.3 CONCEPTUAL EXPLANATION OF KNOWLEDGE MANAGEMENT

Lytras and Pouloudi (2003) indicated that knowledge management is as old as the existence of human beings. Nicou et al., (1994) further highlighted that the prime commodity for any professional is brainpower and knowledge provides a competitive strategy that goes beyond products and services. Contemporary business focus keep evolving and then changed from people focus in the 70s to team focus in the 80s, then followed by process focus in the 90s to knowledge and adaptability focus in the 20s now (Convey, 2004). Prusak (2001) highlighted that globalization is the most obvious and clearest culprit. Mertins et al., (2003) further noted that a critical mass of researchers, academics, businesses and knowledge workers has been reconfigured, restructured and consolidated into a coherent framework to address current and future research needs for knowledge management. Besides, the increasing number of organizations implementing or interested in the implementation of knowledge management practices demonstrate the relevance of managing organizational knowledge (Al-Ghassani et al., 2002).

Knowledge management can be considered as the effective learning process associated with exploitation and sharing of human knowledge that use appropriate technology and cultural environments to enhance an organisation"s intellectual capital

and performance (Jashapara, 2004). However, Wiig (1997) explained knowledge management as a set of distinct and well-defined approaches and processes that aims at maximizing an enterprises" knowledge related effectiveness and returns from its knowledge assets and be able to renew them constantly. Knowledge management can

be used to describe the panoply of procedures and techniques used to acquire the most from a firm's knowledge assets and require the development of dynamic capabilities and the ability to sense and seize opportunities quickly and proficiently (Teece, 2000).

Beijerse (2000) also defined knowledge management as the management of information within an organisation by steering the strategy, structure, culture and systems and the capacities and attitudes of people with regard to their knowledge.

Knowledge management is considered as the achievement of the organisation's goals by making the factor knowledge productive (Beijerse, 2000).

Knowledge management is regarded as an emerging set of organisational design and operational principles, processes, organisational structure, applications and technologies that helps knowledge workers dramatically leverage their creativity and ability to deliver business values (Lee and Choi, 2003). Mclnerney (2002) also identified knowledge management as an effort to increase useful knowledge within the organisation through encouraging communication, offering opportunities to learn and promoting the sharing of appropriate knowledge artifacts. Knowledge management provides the tools and services for end-users to capture, share, reuse, update and create new experiences, problem solutions and best practices to aid employees in processes such as decision making and innovation without having to spend extra time, effort and resources on reinventing solutions that have already been invented elsewhere in the organisations (Ahmad et al., 2007). In summary, knowledge management can be concluded as developing a set of distinct and well-defined processes and techniques that includes procedures based on technologies and practices that motivate effective creation, capturing, organisation, distribution, use and sharing of knowledge that enable individuals of the organisation to be more effective and productive in their work in order to generate value for the projects and the entire organisation.

2.4 KNOWLEDGE MANAGEMENT DEFINED

Knowledge can be considered in a variety of ways. Classifying knowledge enable organisations to identify the different types of knowledge with different nature that require different procedures, tools and activities to process and manage (Tserng and Lin, 2004; Lin et al., 2006). Knowledge can be classified into two distinct dimensions in an organisation. Polanyi (1966) indicated that knowledge could be considered as tacit or explicit. Tacit dimension of knowledge is rooted in action, experience and involvement in a specific context and is comprised of both cognitive and technical elements (Nonaka, 1994). The cognitive element refers to an individual‟s mental models consisting of mental maps, beliefs, paradigms and viewpoints. However, the technical component consists of concrete know-how, crafts and skills that apply to a specific context. The explicit dimension of knowledge is articulated, codified and communicated in symbolic form and natural language.

2.4.1 Tacit Knowledge

Tacit knowledge is the most valuable type of knowledge and combines information with experiences, skills and understanding of people which enables people to identify prudent solutions and reduce opportunities of repeating mistakes (Awad and Ghaziri, 2004; Baker et al., 1997; Davenport and Prusak, 1998; Gupta et al., 2000; Tiwana, 1999; Tserng and Lin, 2004). In project contexts, tacit knowledge may include work processes, problems faced, problems solved, expert suggestions, know-how, innovations and experiences (Lin et al., 2006). Tacit knowledge is highly personal and hard to manage, share or formalize since it includes experiences, know-how and perceptions which normally reside in individuals‟ heads and memories (Lin et al., 2006; Nonaka, 2007). According to Koch (2002) tacit knowledge cannot be easily articulated with formal language since it is a personal knowledge that is embedded in

people experience and involves intangible factors such as personal beliefs, perspectives, and values. The best way for utilizing tacit knowledge is by using methods and tools that encourage and facilitate collaboration and knowledge sharing among the people of the organisation, such as applying e-messaging and e-meeting tools (Lin et al., 2006; Nonaka, 2007).

However, some tacit knowledge can be captured, mobilized and turned into explicit knowledge by using knowledge management tools, such as knowledge capturing, publishing, categorizing and editing tools. These help to transfer knowledge into more available and accessible forms that may help the organisation to progress rather than requiring its members to relearn from the same stage all the time (Gore and Gore, 1999). Inkpen and Dinur (1998) indicated that although a complete tacit-explicit split cannot be achieved, it is a useful way to understand the different characteristics and nature of different types of knowledge that require different processing, procedures and tools to be managed and dealt with improvements to enhance information management and socially-based mechanisms to enhance knowledge management.

2.4.2 Explicit Knowledge

Explicit knowledge can be expressed in formal and systematic language and shared in the form of scientific formulae, specifications and manuals. Furthermore, explicit knowledge can be easily captured, retrieved, shared and used because it adopts the expression of words and numbers that can be managed more easily. Lin et al., (2006) stated that in project contexts, explicit knowledge may include project-related contents such as specifications, contracts, reports, drawings, changing orders and data.

Koch (2002) described explicit knowledge as being readily available, recorded, codified and/or structured in a way that makes it easily transmissible and available to be retrieved and used which can be identified in a range of diverse sources, such

as human resources data, meeting minutes and the internet. Nickols (2003) further highlighted that explicit knowledge comprises knowledge that has already been articulated or codified in the form of text, tables, diagrams, drawings, photos, audios and videos and can be directly and completely captured, used or shared such as documented articles, books, reports, best practices, manuals, specifications and standards.

2.5 MANAGING KNOWLEDGE IN ORGANISATIONS

Recent interest in organisations has prompted the issue of managing the knowledge to the benefit of the organisation. Von-Krough (1999) stated that knowledge management is a process of identifying, capturing and leveraging the collective knowledge in an organisation to help the organisation compete in the market. Knowledge management is purported to increase innovativeness and responsiveness

(Hackbarth, 1998). Norton (1998) indicated that a recent study of European firms by KPMG Peat Marwick revealed that almost half of the companies reported to have suffered significant damage from losing key staff with 43% experiencing impaired client or supplier relations and 13% facing loss of income as a result of departure of a single employee. Forty-nine percent stated that knowledge of the best practice in a specific area of operations had been lost when an employee left the company.

Furthermore, a study by Cranfield University (1998) indicated that majority of organisations believed that much of the knowledge needed existed inside the organisation but identifying that it existed, locating it and leveraging it remained problematic. However, KPMG (1998) noted that the less critical the type of knowledge was to an organisation"s business, the easier it was to locate it. Although some organisations claim to have been engaged in knowledge management for years, even though they did not refer to it as knowledge management (Cranfield University, 1998),

there is little evidence of the organisations systematically evaluating the outcomes (Alavi and Leidner, 1999).

2.6 KNOWLEDGE MANAGEMENT SPECIFIC TO CONSTRUCTION

Kelleher and Levene (2001) indicated that various forms of knowledge management practices can be adopted in construction and notifiable industries that benefited from the adoption of knowledge management practices include consultancy, consulting firms, financial services and oil companies. According to Koenig and Srikantaiah (2003) a study conducted by Ernst and Young in 1997 among 431 United States and European companies revealed several benefits derived from organizing knowledge management programs. These benefits derived from organizing knowledge management programs include increased innovativeness, enhanced efficiency, better decision making, faster responsiveness, enhanced flexibility, improved quality, reduced duplication of effort and greater employee empowerment.

However, the construction industry delivers large, expensive, custom-built facilities at the end of a construction process. Carrillo et al., (2004) explained that the construction industry possesses a strong knowledge-base that relies heavily on the knowledge input by different participants in a project team. Notwithstanding, Robinson et al. (2004) affirmed that a relatively small proportion of construction industry's organizations implemented knowledge management systems. A recent survey of construction industry's organizations revealed that about 40% of these organisations already have knowledge management strategies and another 41% plan to have a strategy within a year; 81% perceived knowledge management as having the potential to provide benefits to their organizations, and some have already appointed a senior person or group of people to implement their knowledge management strategies (Carrillo et al., 2004).

Although there is an increasing awareness of the importance of knowledge management concept, the construction industry still gets reluctant in investing in this concept.

2.6.1 Knowledge Management Processes

Discrepancies in literature appear in the delineation of the knowledge management processes. Davenport et al., (1996) identified four key processes: finding existing knowledge, creating new knowledge, packaging knowledge created and externally using existing knowledge. KPMG (1998) however, presents seven processes involved in knowledge management:

- creation

- application within the organisation

- exploitation outside the organisation

- sharing and dissemination

- encapsulation (capturing and recording experiences)

- sourcing (locating a person) learning.

Teece (1998) also identified eight basic processes: generating new knowledge, accessing valuable knowledge from outside sources, using accessible knowledge in decision making, embedding knowledge in processes, products and services, representing knowledge in documents, databases and softwares, facilitating knowledge growth through culture and incentives, transferring existing knowledge into other parts of the organisation and measuring the value of knowledge assets and impact of knowledge management.

Furthermore, Probst (1998) also identified four aspects for knowledge management: generating, reserving, transferring and applying Knowledge. Jashapara (2004) believed

that knowledge management is a four –step process: an effective learning process along with knowledge generation, knowledge organisation, knowledge sharing and knowledge application, which jointly improves organisational performance. Shu et al., (2013) explained knowledge generation as a process that produces, gathers and integrates the new and current knowledge. Knowledge is generated through converting the implicit and explicit knowledge (Nonaka and Takeuchi, 1994). Soergel (2008) also indicated that knowledge organisation is the process of sorting the knowledge elements inside a structure. Furthermore, Low (2008) also highlighted that knowledge sharing is a voluntary diffusion of the acquired skills and experiences to other people. Finally, knowledge application refers to the fact that acquired knowledge regardless of its source can be certainly used if it is fruitful. This would indicate mixing the knowledge with practice, utilizing it and its reflection in services (Kwakman, 2004).

2.6.2 Knowledge Management Models

Several researchers have developed models to help improve Knowledge Management in organisations. Van de Spek and de Hoog (1995) developed a knowledge management model which identified knowledge management as a recurring process of categorizing knowledge assets which are possibly valuable to the organization, analysing the knowledge assets to determine which ones need to be managed well, selecting actions which distribute, apply or manage these knowledge assets and finally reviewing progress to agree on the next action to undertake.
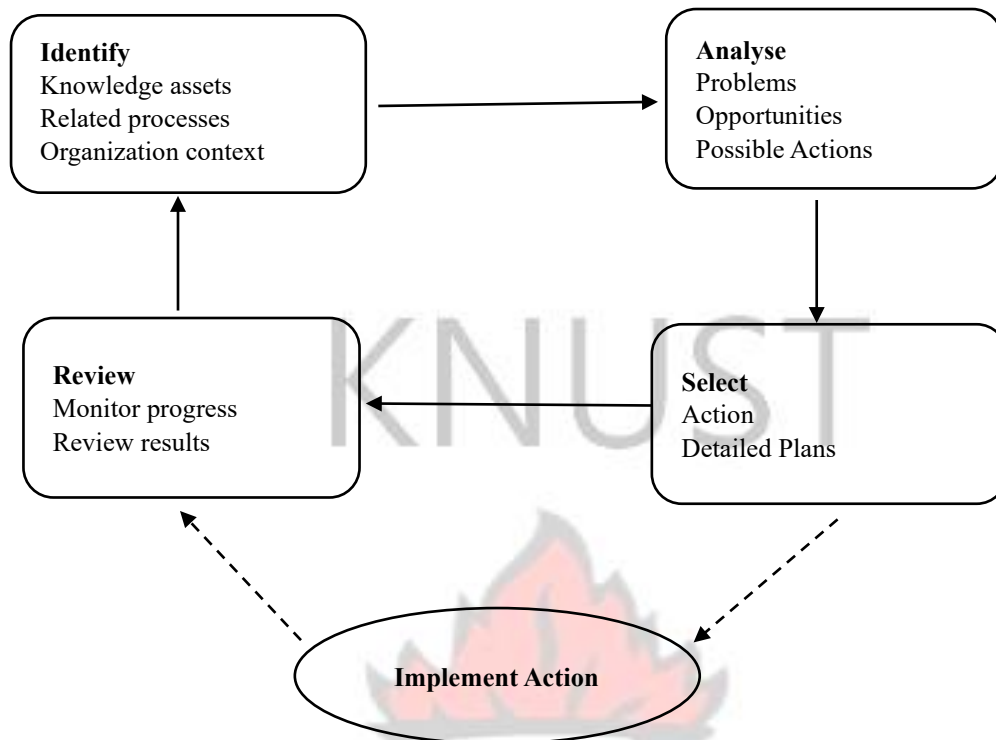
Figure 2.1: Knowledge Management Model

Source: (Adopted from Van der Spek and de Hoog, 1995)

Petrash (1996) also indicated that a full-scale measurement framework could be developed as an organization evolves to a stage where KM implementation is fully understood, well-coordinated and sustained. However, Dentand (2004) highlighted that organisations at lower levels of KM maturity may require basic qualitative performance measures to monitor and review its benefits.

External and internal developments

Conceptualize
- Draw up inventory
- Analyze strong and weak points

Retrospect
- Evaluate results achieved
- Compare old and new situation

Reflect
- Establish required improvement
- Plan the improvement process

Act
- Developing knowledge
- Distributing knowledge
- Combining knowledge

External and internal developments
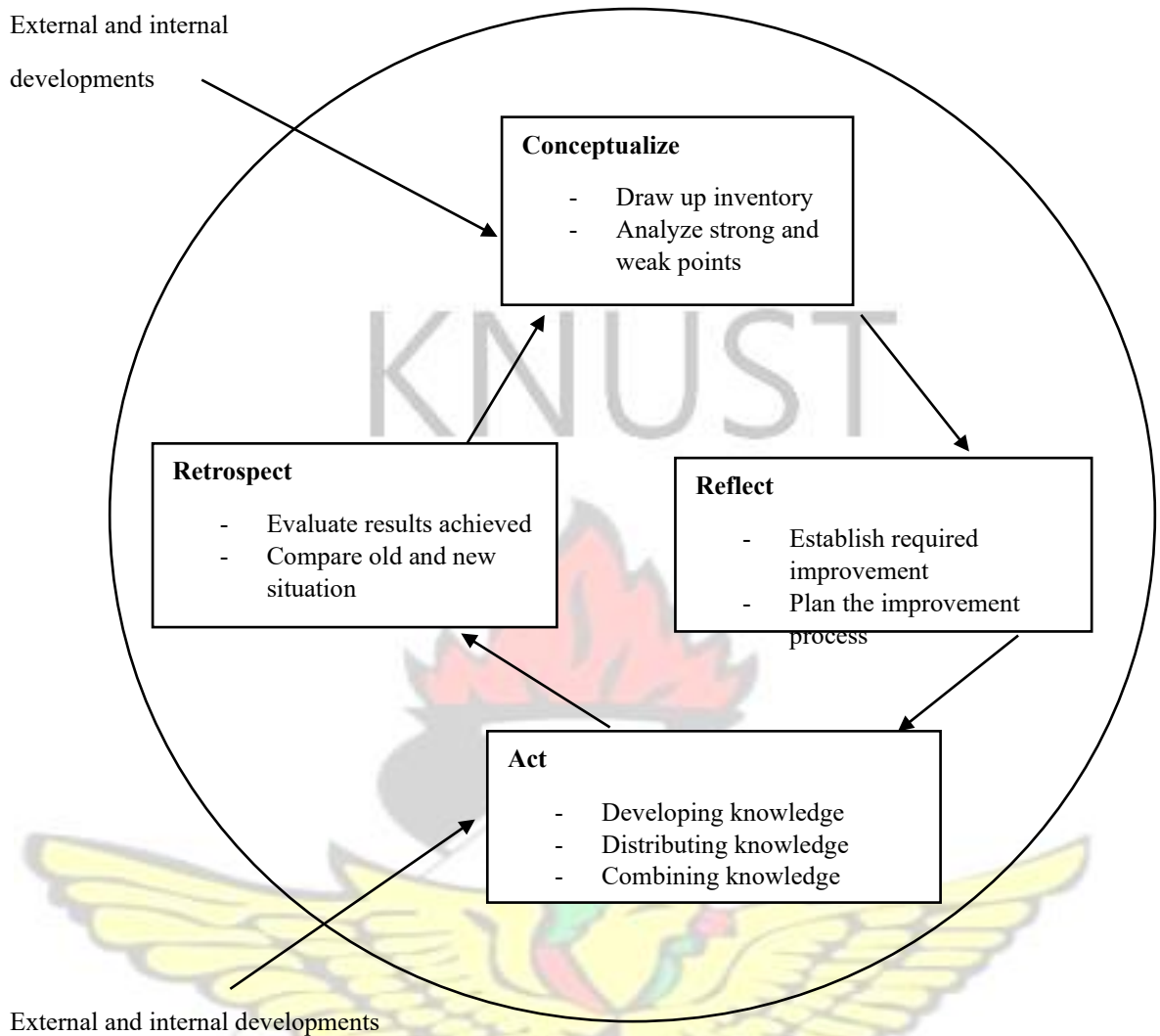
Figure 2.2: Framework for Knowledge Management

Source: (Adopted from Petrash, 1996)

2.7 KNOWLEDGE MANAGEMENT TECHNIQUES AND STRATEGIES

The aim of knowledge management is to seek best practices in all business activities to provide a better service to its clients. Knowledge management also improves project or business performance and indirectly increases profitability. Robinson et al., (2005) indicated that about ninety per cent (90%) of the knowledge captured in two main areas of expertise of the firm will be lost if the people involved leave the organization. It is

therefore prudent to develop knowledge management techniques to address both tacit and explicit knowledge.

According to Davis et al., (2007) two strategic philosophies are associated with knowledge management, codified and personalized strategies. Zack (1999) noted that codified knowledge is associated with explicit knowledge which can be more precisely expressed and formulated even when removed from its context. Codified approach describes how the system can help to capture the experience and knowledge of experts within the civil engineering construction firms before the team members leave (Davis et al., 2007). A codified technique revolves around explicit knowledge captured and leveraged using information technology tools comprising software such as expert systems, artificial intelligence and data mining tools. However, the personalized approaches express that the knowledge, experience and skills can be captured via interviewing, protocol analysis, questionnaire surveys and observation and simulation.

Suman and Psunder (2008) noted that the personalized approach is adopted in civil engineering construction firms to facilitate the communications between the various personnel in the organization, so as to easily transfer and share knowledge and information within the arena of projects. Personalized strategy virtually revolves around tacit knowledge using non-information technology tools or human interactive systems such as peer tutoring, regular meetings and training, a supervision/mentoring system, a reward system and lessons that are learned (Davis et al., 2007). In a codified strategy, information technology can be used to make intelligent decisions, whereas in a personalization strategy, information technology provides communication support. To encourage the use of knowledge management, the civil engineering construction firms should be given a clearer concept of knowledge management and more guidelines for its implementation. The exact knowledge management approach relies heavily on the

type and size of the organisation. Hansen et al., (1999) suggest that a firm should choose to adopt one of the strategies with the other acting as a support mechanism or the focus of the approach would be lost. Hansen et al., (1999) proceeded further to suggest an 80% -20% approaches that indicates that one strategy or the other will be dominant. However, a mixed approach is not advocated as the focus of the knowledge strategy would be reduced.

2.8 BENEFITS OF KNOWLEDGE MANAGEMENT PRACTICES

Knowledge management practices present numerous benefits to organisations. Practical experiences with systematic and explicit knowledge management reported by advanced and early adopter organizations indicate that benefits can be substantial. Most direct benefits tend to be operational while tactical and strategic benefits often are indirect and take longer to realize. According to Liebowitz (2000) the benefits of knowledge management practices include improved service quality, rapid and effective enterprise-wide problem solving, improved decision-making, increased revenue, business growth, increased innovation, practice and process improvement, higher levels of expertise and knowledge, increased customer satisfaction, enhanced employee capability and organization learning, increased employee morale, creativity and ingenuity, employee stimulation and motivation, increased flexibility and adaptability and raising the company"s professional image.

In order to survive and grow in the future, civil engineering construction firms must respond quickly and creatively to the challenges of accelerating social, technological, economic and environmental changes. RICS (1991) indicated that an essential element in the future success of organisations is the knowledge base at the core of professional practice. It is believed that knowledge management is a relatively quicker and more effective way to enhance civil engineering professionalism, compared with improving

the education of the new generation of civil engineers or reformatting of the profession. The civil engineering profession is characterized by a wealth of experiential knowledge, which is tacit and cannot be written down easily. It is crucial that civil engineering construction firms realise their true potential assets, which can be determined by the knowledge management system as it enables the firm to realise its needed requirements. Most firms face the problem of losing knowledge due to the retirement or resignation of key personnel.

Delong (2005) stated that losing knowledge may have impacts that are very tangible and financially quantifiable, or impacts can be intangible and hard to measure. With the help of a knowledge system, knowledge is shared and stored and thus the risk of losing the knowledge can be minimized. BSI2 (2003) argues that knowledge management does not only increase the profitability of the organisation but also reduces mistakes and waste of resources. Companies are realizing that their competitive edge is mostly the brainpower or intellectual capital of their employees and management. Davenport (1999) indicated that despite knowledge management is not yet tied to enterprise strategy and performance in practice, establishing a knowledge management system involves time, cost and changes in the original operating system which can be the reluctance of the invest. Egbu and Botterill (2000) explained that knowledge management when implemented would result in new technologies and new processes that would benefit the organisation and promote productivity.

2.9 CHALLENGES ASSOCIATED WITH ADOPTION OF KNOWLEDGE MANAGEMENT PRACTICES

Several challenges hinder the implementation of knowledge management practices within organizations. Culture has been a recurrent theme in the knowledge management literature as it can enable or inhibit an organization‟s knowledge management strategy. Coopers and Lybrand (1998) explained that culture concerns the values, beliefs, history

and traditions, which reflects the deeper foundations of an organisation. It has also been identified as one of the most crucial factors contributing to the success of a knowledge management design and perhaps the most difficult constraint that knowledge managers must deal with (Davenport, 1998). Culture has been identified as the most significant challenge in the implementation of knowledge management practices in construction organisations especially civil engineering construction firms. This is consistent with the findings from a survey of 431 US and European organisations which identified culture as the biggest impediment to knowledge transfer (Ruggles, 1998). Based on a rating scale from 1 (most significant) to 5 (least significant) barriers, the survey responses were averaged to give an overall rating score for each factor. The culture of formal and informal sharing of knowledge is important. However, Wiig (1999) highlighted that culture cannot be changed directly but only through indirect means such as incentives, role models and the like. One senior manager felt that the culture of the organisation is such that knowledge management is not always taken seriously and there is a need to repeat the message continuously.

The lack of standard work processes has also been identified as a key challenge. The significant merger and acquisition activities over the past decade have transformed many construction organisations, and the implication is that organisations have inherited new processes. Many construction organisations now suffer from having too many different processes for performing similar activities. The lack of standard processes and systematic procedures, combined with the lack of awareness of the importance and future benefits of knowledge management causes the need for a more coherent and structured approach for managing and utilizing the different types of knowledge within organisations (Hari et al., 2005).

Gann (2001) argued that construction organisations may have strong capabilities in project management but are often much weaker in organizing their internal business processes. However, preliminary evidence from on-going case studies with selected organisations reveals that there is a now recognition in some organisations for a rationalization or synchronization of some processes to improve the possibility of reusing knowledge of best practice and sharing experience. Time constraint is also considered as a challenge in construction organisations given that projects are characterized by fixed time scales, associated with clients" need to deliver at particular times. Many construction organisations consider their organisational structure too lean -to exploit knowledge management to full, as people want to share knowledge but the pressure to deliver under tight project schedule does not often permit the recording of experience and sharing of knowledge before, during and after projects.

Furthermore, poor organisation of internal business processes means that projectbased construction organisations often struggle to learn from project to project (Gann, 2001). This means that the scope for reduction in project duration and the subsequent time available to document lessons learnt from previous projects are often very limited. Sharing knowledge demands additional effort and may be minimized by work practices and the introduction of better knowledge sharing tools.

Construction projects are always working to tight deadlines. Anything that detracts from the main business is seen as of diminished importance. Another challenge to the implementation of knowledge management is employee resistance, which is closely associated with cultural factors. Cultural factors tend to be either negative or positive in orientation with respect to employees. Positive orientation refers to situations where individuals have a positive attitude to the creation and sharing of knowledge. Negative

orientation reflects the reverse situation where there are knowledge inhibitors as people feel insecure about their job situation, do not trust their employers and are therefore less likely to share knowledge (Gann, 2001).

Other challenges identified include available knowledge management systems; employees may be tempted into thinking the data required is always easily accessible. In fact, it would take considerable time to get a spread of working knowledge management systems. This may lead to employees losing faith in the system because it does not deliver immediate benefits in their own individual areas. Many of the existing systems rely on information technology for delivery. Construction offices may be port cabins in isolated environments with inadequate infrastructure. The information technology support, a key element in knowledge management systems must be present to deliver the knowledge required and long term organisational commitment, lack of understanding of knowledge management and conflicting priorities on the demand for resources. Knowledge management is a long-term goal without any short cuts. If it is to bring long-term benefit to the organisation, it will take a considerable period to have systems up and running with sufficient time to be validated and for benefits to percolate to the organization‟s performance. The various stages involves in knowledge management are complex. It is easy to envisage the utopian world of delivering knowledge to different members of the project team as and when required for different stages of the construction process. However, in reality, for a company embarking on knowledge management, it is best to undertake very small projects that are self-contained with little input from external parties. One major obstacle is how organisations capture knowledge on projects that cuts across organisational boundaries.

The construction industry is full of individuals, skilled trade workers and professionals who have years of experience of doing specific tasks. Converting their tacit knowledge

to explicit knowledge for the benefit of others is a problem, which is difficult to conduct within a reasonable period and at an acceptable cost. The construction industry consists of a large proportion of small to medium-sized enterprise (SMEs). These organisations have more pressing concerns than knowledge management and in many cases do not see the need nor do they have the commitment and resources to undertake knowledge management. Some project team members may belong to different divisions or even different companies. Managing knowledge with such a team within a limited time period is difficult. Each team member will be working towards the agenda set by their employer. The benefits of knowledge management may be seen as limited to the life of the individual project unless in longterm partnering type relationships. Despite efforts to encourage the construction industry to view itself as a manufacturing enterprise, it still regards each project as a one-off. This reinforces the view that knowledge management on individual projects will be wasted as the next project may be quite different. Because of the view of the industry producing unique projects, there has also been a failure to learn from past mistakes. In many circles, the construction industry is regarded as a national (rather than international) industry and there is an unwillingness to learn from internal and external sources. Carrillo et al., (2000) stated knowledge management is a concept which is relatively new to the construction industry and has the fundamental need to manage its knowledge in a formal and structured way from project to project, given that participants must work with various interested stakeholders.

2.10 MEASURES TO IMPROVE KNOWLEDGE MANAGEMENT PRACTICES

Knowledge management practices enable organisations to succeed into the future and also maximize productivity. Measures such as knowledge storage could be adopted to improve knowledge management practices within an organisation. Knowledge storage

includes a series of items which try to cover the way the firm implements mechanisms and tools for gathering knowledge and promotes their best use in the organization.

Based on existing literature (Alavi and Leidner, 2001; Bontis et al., 2002; Alavi and Tiwana, 2003; Wang and Ahmed, 2004) knowledge storage can be adopted to improve knowledge management practices in an organisation.

Knowledge management modelling could also be used to improve knowledge management practices in an organisation. Models are used to help people to understand the complexity of real systems by representing the main features and dividing the large systems into its parts, which will simplify understanding and managing (Abdullah et al., 2002). Models help to provide a more structured approach to understand, implement, apply and evaluate knowledge management systems within a firm. Many researchers however, have developed knowledge management models to help organisations in implementing and applying knowledge management practices successfully.

However, in modern contemporary organisations knowledge is no more adequately possessed at individual levels. New technologies and an abundance of competition require that knowledge be shared and utilized at an organizational level if a company hopes to survive. Hendricks and Vrien (1999) suggest that the knowledge assets possessed by a company create the possibility for sustainable competitive advantage. This being the case, a learning organization actively adapts individual knowledge into information that can be readily used to the benefit of the organization as a whole. Aside from extracting and clarifying knowledge from the individual, learning organizations organize and provide structure to knowledge so that it can be used consistently to update existing practices. Furthermore, a strategic imperative for establishing a successful KM program is the need to implement new practices on a regular basis. Collins (2001)

indicated that the greatest threat to achieving greatness is an organisation that is content with being very good at what it does. However, a key element to successfully introducing these new practices is the development of a change management program that provides a framework for the implementation process. A central thread in change management is the need to have multiple individuals collaborating and sharing knowledge to successfully introduce the

practice.

Innovation can also be employed to improve knowledge management. The ability to innovate is a fundamental requirement for long-term performance improvement. This need for innovation has been overlooked and undervalued within the construction industry. Toole (2001) highlighted that there are significant economic, organisational and industry structural barriers within construction organisations of all sizes towards innovation improvement. Notwithstanding, innovation occurs when individuals exchange knowledge and believe that a greater opportunity exists to improve performance than what is currently being achieved (Katzenback and Smith, 1993).

CHAPTER THREE RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter attends to the detailed discussion of the methodology used for the study. It is important to know not only the research methods necessary for the study but also the systematic procedure was used to achieve the objectives of the study (Rajasekar, 2013). Therefore, the key issues bothering the philosophical stance of the researcher as well as the strategies adopted for the study is explicitly discussed. Also, a brief discussion of the strategy used in the questionnaire design, the population, the sample size required and the questionnaire administration. Lastly, the mode of data

presentation in addition to the statistical tools to be used for the critical analysis of the data gathered is discussed.

3.2 PHILOSOPHICAL CONSIDERATION AND STANCE OF THE RESEARCH

Three key philosophical considerations (ontology, epistemology and axiology) were adopted as a guide in the data collection, analysis and the subsequent interpretation of the findings in order to attain a stout research devoid of the researcher‟s opinion and influence. Koeting (1996) and Christou (2008) reached an agreement that

philosophical subjects such as existence, knowledge and value play a vital role in the research design. These subjects are enlightened and then the connection between them are investigated (Scotland, 2012). Hence, such philosophical issues of ontology, epistemology and axiology need to be explicitly addressed as they shape the stance and choice of the research assumptions. Healy and Perry (2000) indicated that ontological suitability, conditional validity and epistemology involve numerous perceptions of partakers and associate researchers.

Marsh and stoker (2002) explained that the term ontology refers to the questioning of the existence of a „real‟ world that is sovereign of our knowledge, thus, the theory of living beings. Crotty (1989) also affirmed that ontology is the study of existence which involves ontological assumptions that are connected with what composes reality, in other terms *what is*. It can therefore be deduced that, ontology connotes the existence of occurrence where things appear in different ways in different traditions of philosophical thinking. This consideration is therefore relevant for this research because knowledge management practices in civil engineering construction firms in Ghana have lost generalization and hence contradictory empirical conclusions are arrived at by different authors. The stance adopted by the researcher is that of objectivism.

According to Cohen et al., (2007) epistemology involves the nature and methods of knowledge. Furthermore, De Vos (1998) also indicated that epistemology is related to the relationship of the researcher to reality and the road that will be followed in search for the truth, thus, the question of „how knowledge is created?‟ To this effect, literature identifies two epistemological stands: positivism and interpretivism. Bryman (1992) noted that whilst for positivist, scientific knowledge is established through the accumulation of facts verified (free from the researcher‟s effects), interpretivist on the other hand, uphold that social phenomenon do not exist independently of our interpretation or meaning of them, rather it is this interpretation or meaning of social phenomenon which affects social reality (Osei-Hwedie, 2010).

The researcher, however, adopts the positivist stance of knowledge in this study; hence, the researcher is of the view that the identification and analysis of knowledge management practices in civil engineering construction firms will be better to be carried out in an objective way which cannot be faux.

Finally, Bosse (2006) explains axiology as a field of philosophical investigation which considers problems like the difference between a matter of fact and value. Bosse (2006) further added that the axiology position can be realism or social constructivism. Social constructionist are of the view that researchers have value and these values helps to determine what are recognized as facts and interprets which are made; whilst the realists hold the view that the choice of study can be examined by an objective criteria. Accordingly, the stance of the researcher in this regard is that of realism. The researcher is of the view that the choice of how to study knowledge management practices in civil engineering construction firms must be determined by objective criteria (see Osei-Hwedie, 2010). The sum of the above considerations are that, the research adopts a scientific and a positive rather than a normative position in determining what were

recognized as facts and their corresponding interpretations which were made in addressing the research concerns.

3.3 RESEARCH STRATEGY

According to Naoum (1998), research strategy is defined as the way in which the research objectives can be questioned. Naoum (1998) further stated that two types of research strategies exist that is, „quantitative research" and „qualitative research". However, the study, type and information available for the research work determine the particular strategy to adapt (Naoum, 1998; c.f Baiden, 2006). Hence, a quantitative approach consisting of both desktop and field study would be adopted.

Polit and Hungler (1985) explained that quantitative research collects numerical data in order to explain, predict and / or control phenomenon of interest. Aliaga and Gunderson (2000) further highlighted that qualitative research denotes to elaborating phenomena by accumulating numerical data that are scrutinized using mathematically based methods in specific statistics. Furthermore, quantitative research is associated with the use of structured questionnaires where response options have been predetermined and a large number of respondents are involved. It can also be regarded as the process of enquiry based on testing a theory composed of variables / numbers and analyzed using statistical techniques / tools. The goal is to develop generalization that contributes to theory that enables the researcher to predict, explain and understand phenomenon. The researcher remains distant and independent of what is being researched.

Data analysis is mainly statistical; the results of which are numbers or series of numbers presented in tables, graphs or other form of statistical representation.

3.4 RESEARCH DESIGN

Research designs are strategies and the measures for research that cover the decisions from broad expectations to thorough methods of data collection and analysis. Creswell (2003) indicated that in the past two decades, research approaches have increased to a stage at which investigators or inquirers have many preferences. Three types of designs are progressive: qualitative, quantitative and mixed methods.

Indisputably, the three approaches are not as distinct as they first seem. Newman and Benz (1998) highlighted that qualitative and quantitative approaches should not be observed as polar opposites or contradictions; instead, they signify diverse ends on a continuum.

However, this research work adopts a quantitative strategy with structured questionnaire in the quest to explore the knowledge management practices in civil engineering construction firms. Naoum (1998) highlighted that the structured questionnaire is probably the most widely used data collection technique for conducting surveys to find out facts, opinions and views. The survey questionnaire is selected because of the need for generalization on the findings across the construction industry. Oppenheim (1996) further explained that it enhances the reliability of observations and improves replications because of the inherent standardized measurement and sampling procedures.

In other to design a comprehensive survey instrument which addresses the objectives advanced for the research work, an in-depth literature appraisal pertinent to the study was first conducted. Simple and straightforward words and sentences were used in the instrumentation, thus, making it easy to understand and hence, providing a more accurate and reliable data from the respondent. The questionnaire was divided into two

main sections: the first section was the respondent's profile and the second section addressed the specific objectives. The questionnaires were designed to include only scaled-response questions. A five point Likert scale of 1-5 was employed to measure the strength or intensity of respondent's opinion.

3.5 RESEARCH PROCEDURE

The sampling method, data collection instruments, and procedures are addressed in this section of the research methodology. It entails explanations to each of the methods employed and adopted to address the aim, objectives, and research questions.
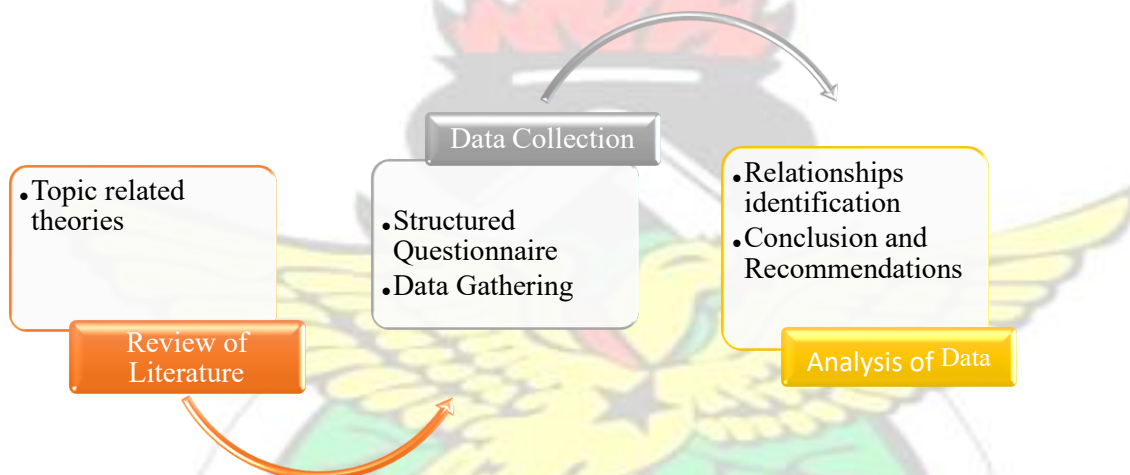
Figure 3.1: Flow process chart of research procedures

3.6 POPULATION

The population of the study provides information on individuals, organizations, groups and communities on which data will be collected. Saunders (2009) explained that it includes the full set of cases from which a sample is taken. The population for the study is management professionals of civil engineering construction firms in the Kumasi metropolis and other management professionals selected from municipalities such as Engineers, Quantity Surveyors, Project Managers and Managing Directors.

3.7 SAMPLING TECHNIQUES AND SAMPLE SIZE

Webster (1985), defines „sample" as a finite part of a statistical population whose properties provide information about the whole population. „Population" on the other hand as defined by (Mugo, 2002) is a group of individuals, objects or items from which samples are chosen for measurement. The researcher adopted Purposive sampling technique which is a procedure that involves the selection of persons who represent the desired population. Polit and Hungler (1999) affirms that, purposive sampling technique is a non-probability sampling method which involves the conscious selection of certain subjects to be included in the study where the actual population is unknown purposive sampling is used because a specific information is needed from a particular group of people due to their speciality in the area of study.

The researcher adopts the snowball sampling technique to locate the civil engineering construction firms in the Kumasi Metropolis and other selected Municipalities in the Ashanti region because of the difficulties encountered in assessing the population size. Kumar (1996) describes the snowball sampling technique as a process of selecting a sample by networking. The snowball sampling is an approach for locating information on rich-key informants. De Vos (1998) affirmed that snowball sampling is valuable in research since it is directed at individuals that are difficult to identify. Using this approach, a few potential respondents would be contacted and then asked whether they know any other respondent with the characteristics being sort for in the research. This technique would be adopted to reach hard-to-get respondents. The civil engineering construction firms which would be easy to locate in the metropolis and other municipalities would be first contacted and they would give leads to other firms with the same characteristics.

3.8 QUESTIONNAIRE ADMINISTRATION

Data collection is a term used to describe a process of preparing and collecting data and purpose of these processes is to obtain information to keep on record, to make decisions about important issues, and to pass information on to others. The developed questionnaires would be distributed to and retrieved from the offices of the management professionals in the selected civil engineering construction firms. Ahadzie (2007) highlighted that the process of distribution and retrieving of the questionnaires in person would be for two reasons. Firstly, to make sure that the questionnaires gets to the intended recipients and secondly, to help improve the response rate. The management professionals (Architects, Quantity Surveyors, Engineers, Project Managers and Managing Directors) would be given the questionnaires for responses. Follow-ups would be made to the respondents to remind them to complete the questionnaires via telephone calls and personal visits.

3.9 DATA PRESENTATION AND STATISTICAL TOOLS FOR ANALYSIS

The questionnaires once collected from the respondents would be aggregated to give a large unit for the analysis. Two statistical softwares that would be used in the analysis are Statistical Packages for Social Sciences (SPSS version 17) and Microsoft Office Excel 2013. The findings from the analyzed data would be presented in a form of numbers or series of numbers, charts and tables.

Descriptive statistics would be first used to analyze the background information on the data collected on the civil engineering construction firms. Aside the descriptive statistics, relative importance index (RII) would also be used because the extant literature pertaining to knowledge management practices in civil engineering

construction firms present too much surface complexity and thus requires a deeper understanding of the pattern of correlations (covariances) between measures.

3.10 CHAPTER SUMMARY

This chapter addressed the research methodology of this study, explained the research strategy, design, sample selection, describes the procedure that were used in designing the instrument and collecting the data, and provided an explanation of the statistical procedures that were used to analyze the data.

The next chapter focused on the analysis and discussion of the survey results.
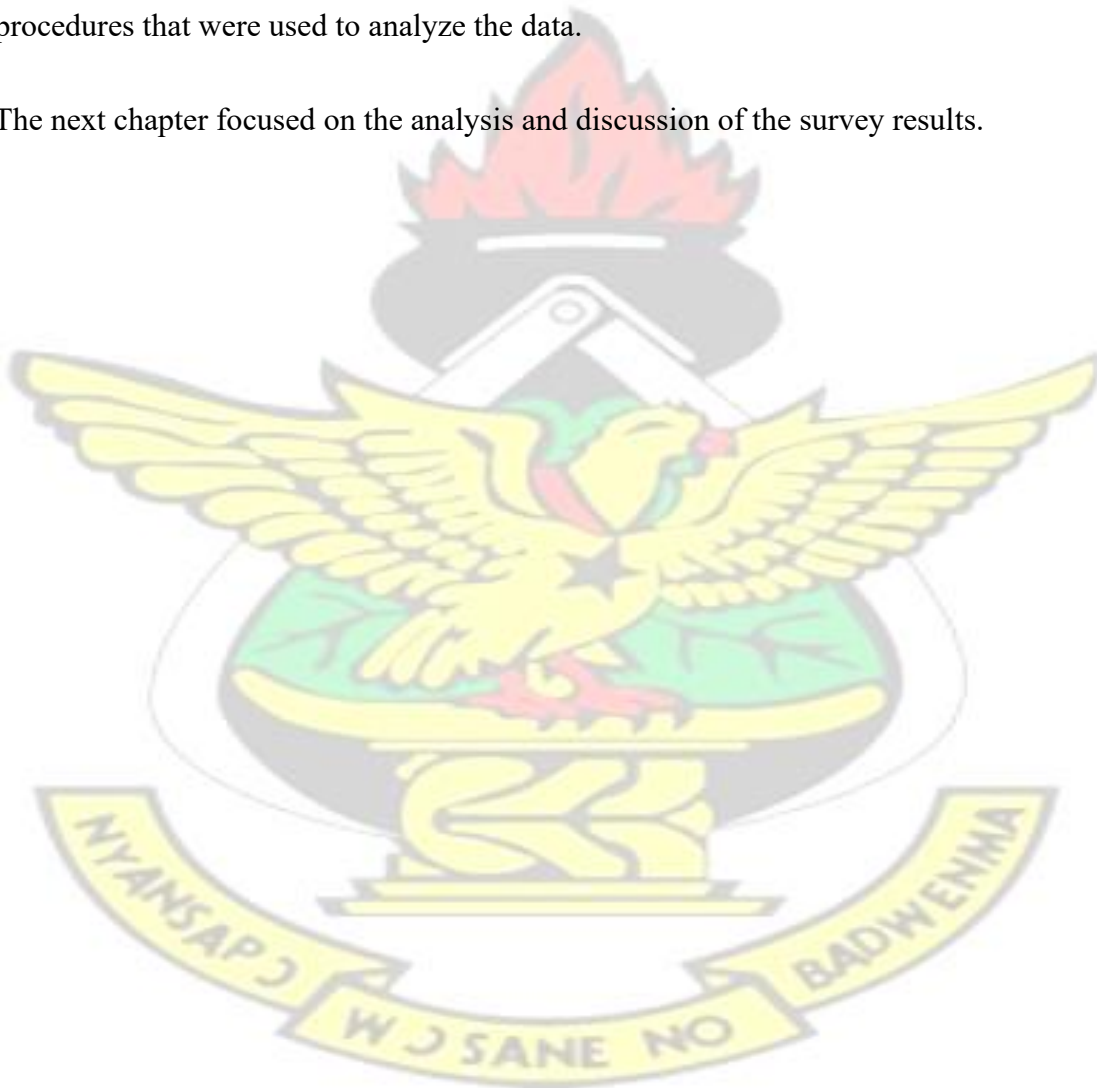
CHAPTER FOUR RESULTS AND DISCUSSION OF RESULTS

4.1 INTRODUCTION

This chapter presents the results, analysis, discussions and findings of the data collected. Analysis of responses was done according to the research objectives. The field study was conducted in the Kumasi metropolis and other selected municipalities in the Ashanti region to explore the significance of knowledge management practices in civil engineering construction firms in Ghana. However, a purposive sample of seventy (70) questionnaires were designed and administered to civil engineering construction firms within the study area. Out of the 70 questionnaires distributed to civil engineering construction firms, 60 questionnaires representing 85.71% were retrieved.

Furthermore, the analyses then employed **Relative Importance Index (RII)**, a powerful statistical tool to calculate the relative importance value of each variable as already stated. Using the formula the relative importance index of each factor is given by:

Relative Importance Index (RII) = $\dfrac{\Sigma W}{A*N}$ Where,

W = the weighting given to each variable by the respondents, ranging from 1 to 5;

A = the highest weight (i.e. 5 in the study)

N = the total number of samples. (i.e. 60 in the study)

After the analyses the criterion with the highest RII emerged 1st indicating high importance and vice versa.

4.2 PRESENTATION AND DESCRIPTIVE ANALYSIS OF DATA (DEMOGRAPHIC)

The first section deals with the respondents" profile and the influence such attributes have on the research. The other part also details out the analysis of the specific

objects of the study in relation to knowledge management practices in civil engineering construction firms in Ghana.

4.2.1 Years in the Construction Industry

The intention of this question was to identify the level of experience of the respondents in the construction industry because how long respondents have been in the construction industry will affect the quality of responses that will be given. Figure 4.1 indicates the number of years of the respondents in the construction industry. Respondents were asked to indicate how long they have been in the construction industry. 3% indicated they have existed in the construction industry between 2-3 years, 14% existed between 3-5 years whilst the majority of the respondents constituting 83% indicated they have also existed in the construction industry for more than 5 years.
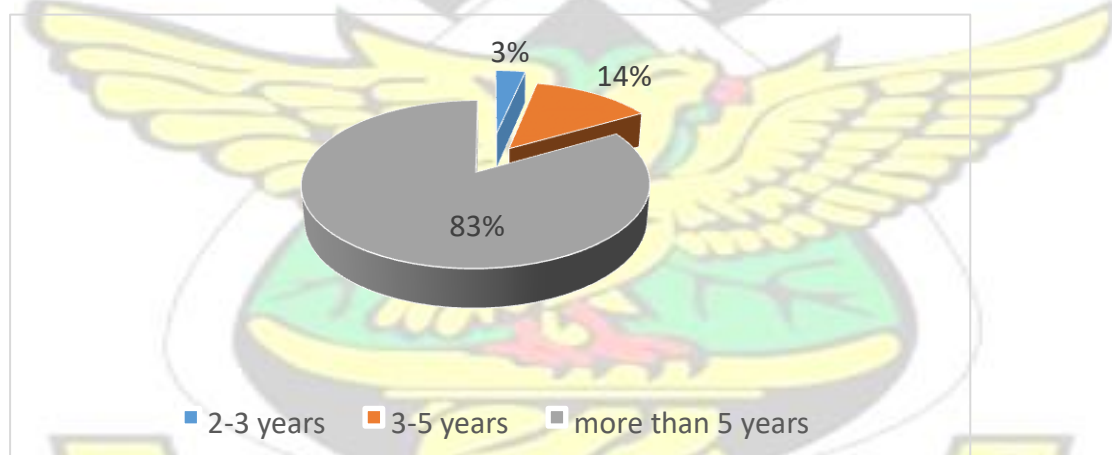
Figure 4.1: Years of existence in the Construction Industry

Source: Survey data, 2015

4.2.2 Position in Firm

The intent of this question was to identify the various positions respondents occupy within the company. The various positions respondents occupy would present an idea of the reliability of the data collected. Figure 4.2 established the various positions respondent hold within the company and it posits itself to the following interpretation;

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39 of the respondents representing majority were Engineers, 16 were Quantity Surveyors whilst the remaining 5 respondents indicated they were Project Managers.
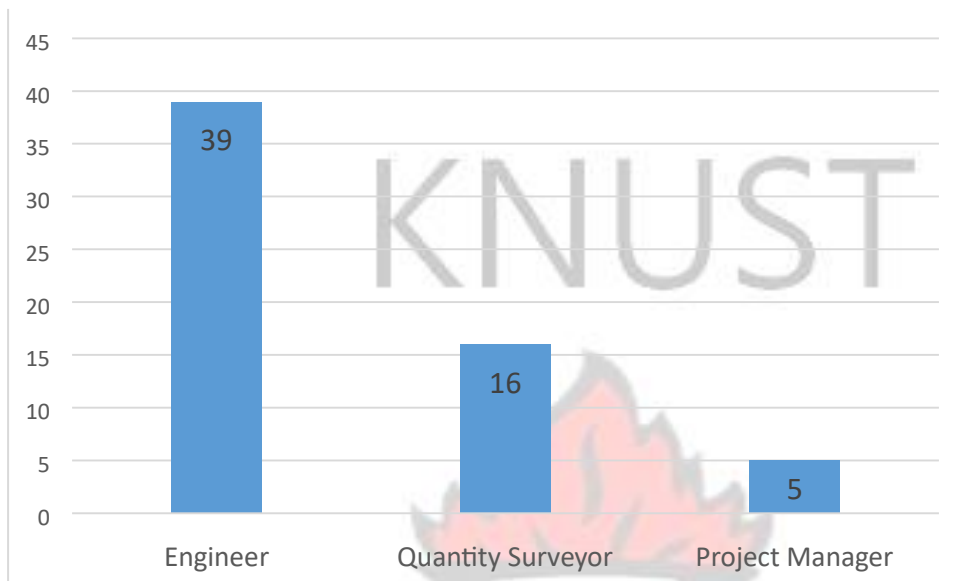
Figure 4.2: Position of Respondents

Source: Survey data, 2015

4.2.3 Highest Level of Education

The intention of this question was to identify the highest level of education of respondents because the highest level of education of the respondent will affect the quality of responses that will be given. Figure 4.3 indicates the highest level of education of the respondents. Respondents were asked to indicate their highest level of education. 25% indicated they held MSc. certificates, whilst the majority of the respondents constituting 42% indicated they also held BSc. certificates. However, the remaining 33% of respondents were HND holders.
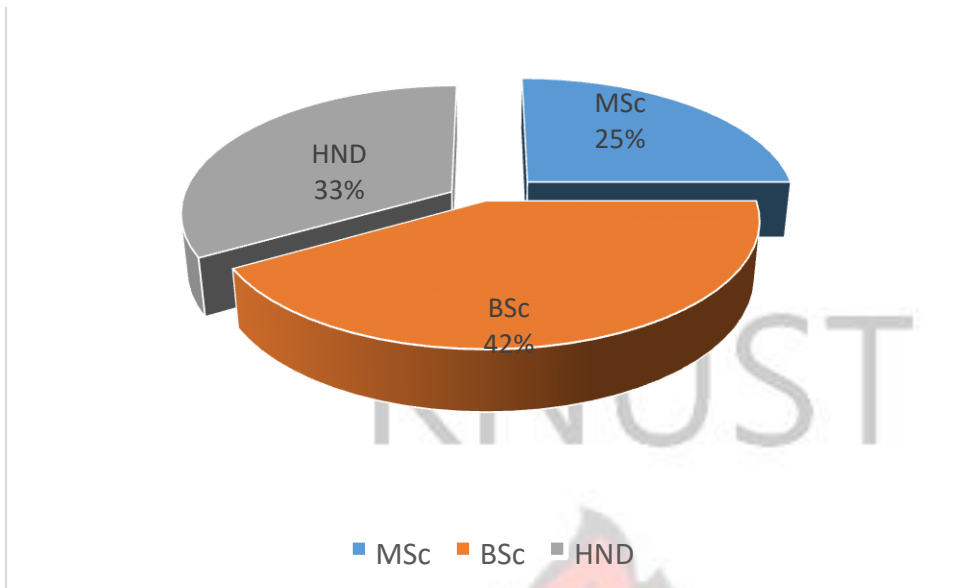
Figure 4.3: Educational levels of Respondents

Source: Survey data, 2015

4.2.4 Legal Status of Firm

The legal framework determines the control of the business, acquisition of capital, extent of risks, the distribution of profits and losses, legal formalities, taxation payment and where legal liabilities rest (Owusu-Manu and Badu, 2011). The government of Ghana works requires that firms are legally registered in order to conduct businesses. Respondents were asked to indicate the legal status of their firms. The results indicate that majority of respondents constituting 50 respondents belong to public limited company and 6 respondents also belong to private limited company.

However, the remaining 4 respondents belong to sole proprietorship (see fig.4.4).
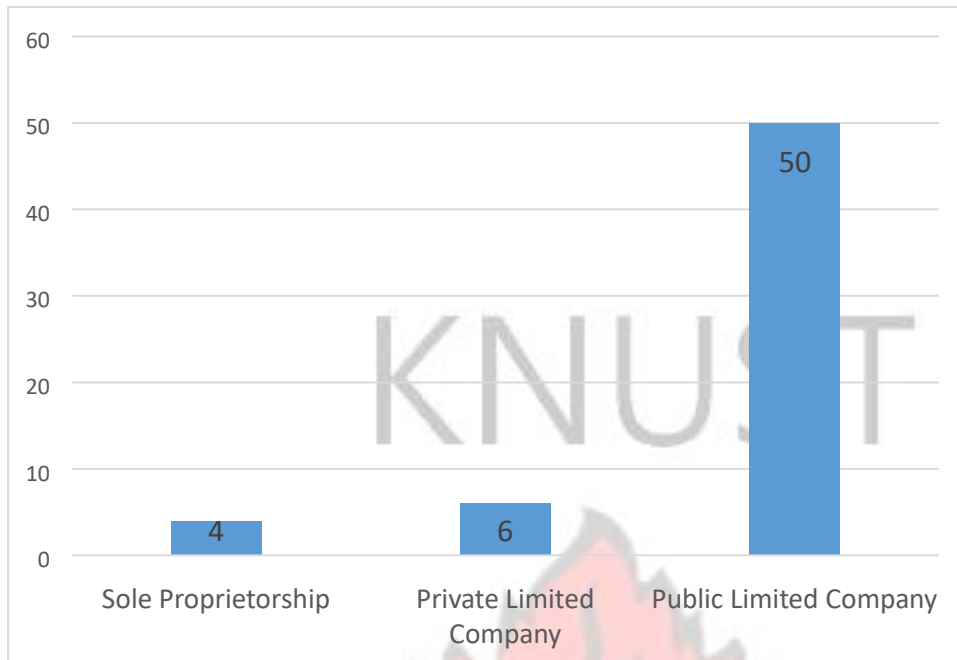
Figure 4.4: Legal status of Firm

Source: Survey data, 2015

4.2.5 Years of existence of Firm

The intention of this question was also to identify the level of experience of the respondents in the construction industry because how long their firms have been in the construction industry will affect the quality of responses that will be given. Figure 4.5 indicates the number of years of the respondent‟s firm in the construction industry. Respondents were asked to indicate how long their firms have existed in the construction industry. 7% indicated their firms have existed in the construction industry between 11-15 years, 35% existed between 5-10 years whilst the majority of the respondents constituting 58% indicated their firms have existed in the construction industry above 15 years.
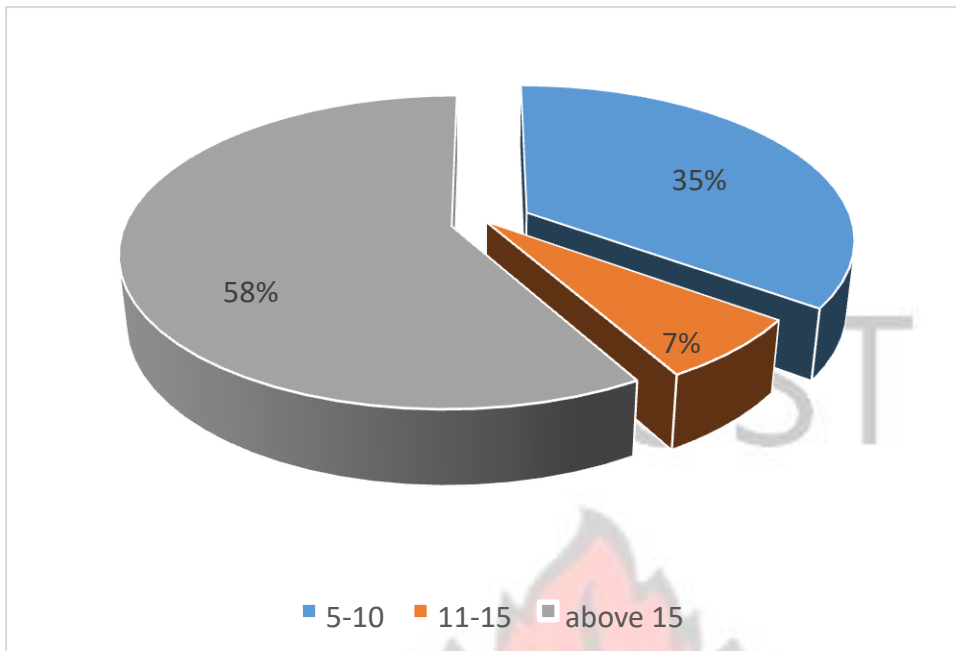
Figure 4.5: Years of existence of firm

Source: Survey data, 2015

4.2.6 Modes of Learning

The intention of this question was to identify how lessons are learnt from projects within respondents" firm. This would give an idea as to how relevant respondents" firms value knowledge management. Figure 4.6 indicates the respondent"s modes of learning from executed projects within the firm. Respondents were asked to indicate how lessons are learnt from projects within their firms. 5 respondents indicated lessons are learnt through interviews whilst the majority of the respondents constituting 32 respondents indicated through the use of observation and simulation. However, the remaining 23 respondents indicated lessons are learnt through the use of questionnaire and surveys.
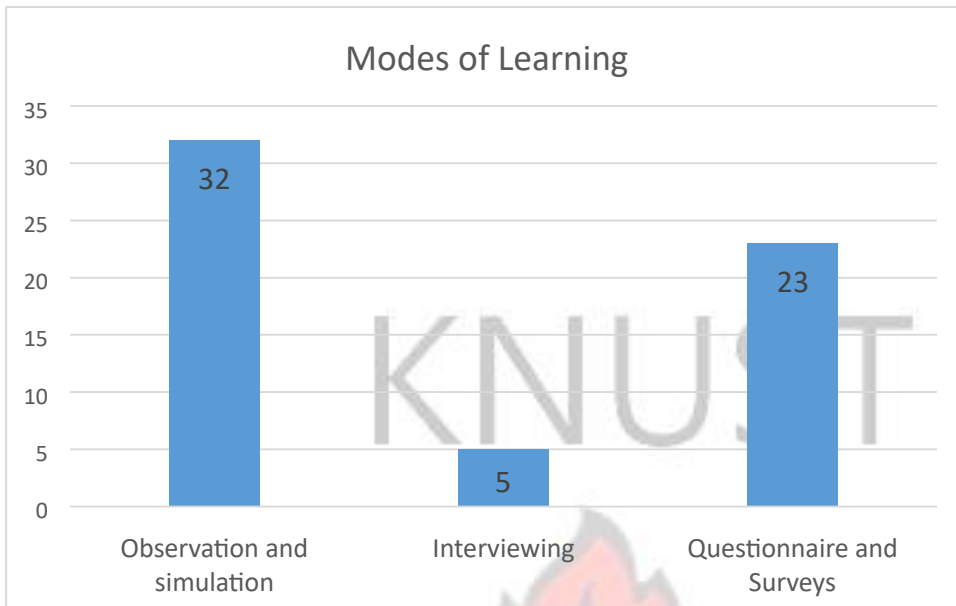
Figure 4.6: Modes of learning

Source: Survey data, 2015

4.2.7 Knowledge Transfer Modes

Respondents were asked to indicate the various modes of transfer of knowledge or learnt experiences within their firms and it posits itself to the following interpretation;

3% of the respondents indicated through database, 12% of the respondents also indicated through expert systems and 35% of the respondents highlighted through meetings. However, the majority of respondents representing 50% indicated through tutoring/ mentoring.
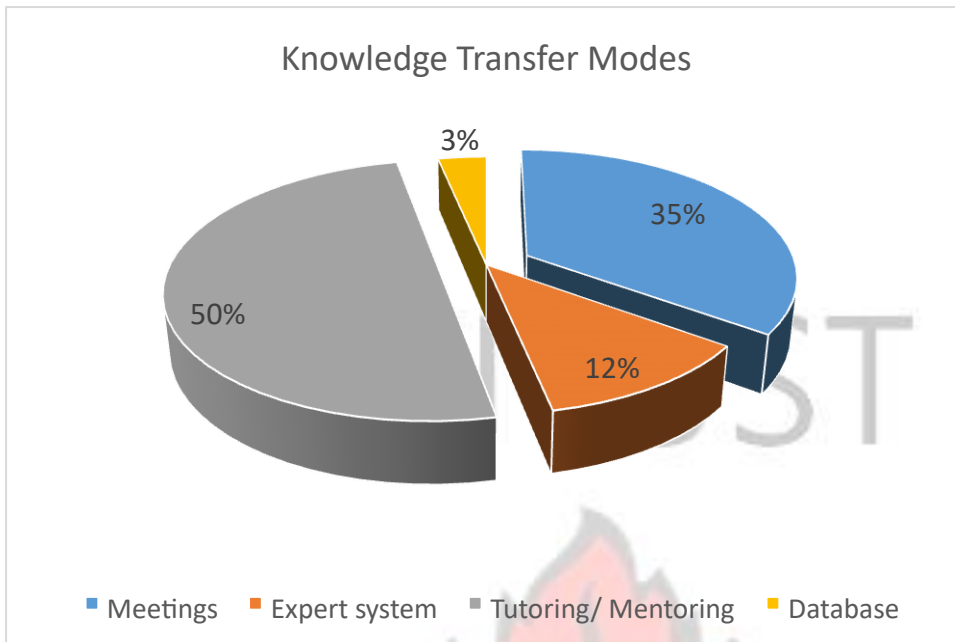
Figure 4.7: Knowledge transfer modes

Source: Survey data, 2015

4.2.8 Expectations of Knowledge Management Practices

The intention of this question was to identify the various expectations of respondents from the implementation of knowledge management practices within their firms because respondents" expectations would determine how frequent respondents would want to implement knowledge management practices within their firms. Figure 4.8 indicates the various expectations of respondents from the implementation of knowledge management practices. Respondents were asked to indicate their expectation of knowledge management practices. 7 of the respondents indicated they expect their firms to possess an advance documentation by implementing KM practices, 12 respondents indicated competitive advantage, 19 respondents also indicated improved productivity whilst the majority of the respondents constituting 22 respondents highlighted that by implementing KM practices within their firms, they expect to achieve service quality.
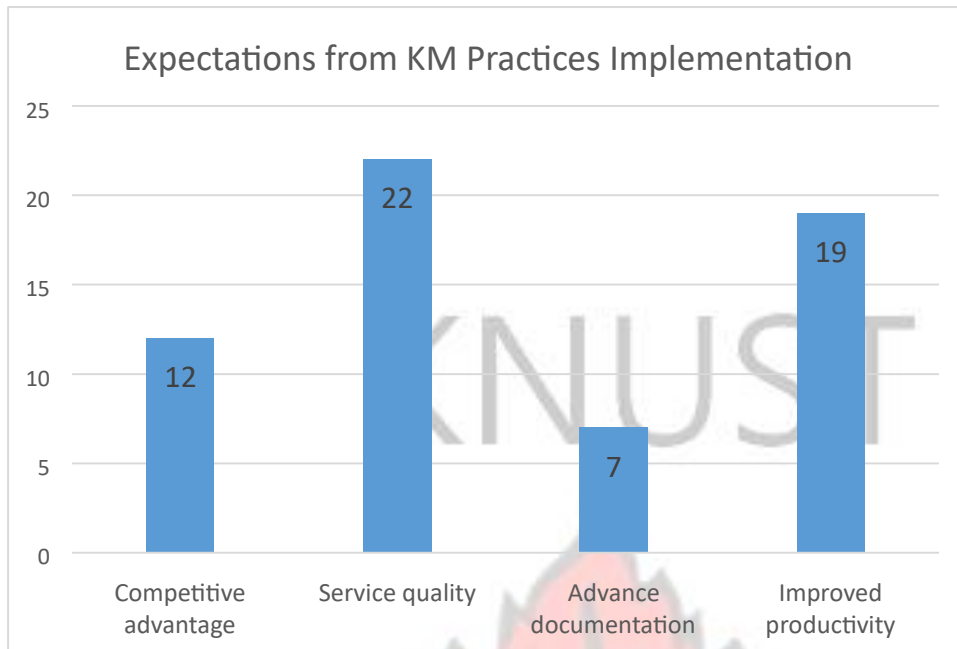
Figure 4.8: Expectations from KM practices implementation

Source: Survey data, 2015

4.3 RELATIVE IMPORTANCE INDEX (RII) FOR CHALLENGES ASSOCIATED WITH ADOPTION OF KNOWLEDGE MANAGEMENT

This section of the questionnaire seek to provide respondents the opportunity to indicate on a five point Likert scale their level of agreement to the challenges associated with adoption of knowledge management within an organisation.

4.3.1 Challenges associated with adoption of KM

From Table 4.1, Lack of available KM systems is the most ranked challenge associated with adoption of KM by respondents, evident with an RII of 0.79 and mean value 3.93. This is closely followed by Lack of leadership support and ranked 2ⁿᵈ by respondents with RII of 0.72 and mean value of 3.62. This affirms Davenport et al., (1998) assertion that management support is vital in the implementation knowledge management initiatives and should be represented in both word and action. Lack of awareness of KM practices is ranked 3ʳᵈ by respondents with an RII and mean value of 0.72, 3.60 respectively. These affirm Hari et al., (2005) assertion that the lack of awareness of the

importance and future benefits of knowledge management causes the need for a more coherent and structured approach for managing and utilizing the diverse types of knowledge within an organisation. However, Lack of understanding knowledge management is ranked 4th by respondents with an RII and mean values of 0.71, 3.55 respectively. If employees understand how knowledge management initiatives directly impact their routine activities, they would be more willing to play active role in knowledge management. Furthermore, any activity that deviates from ones actual business is considered not relevant. Employee resistance is ranked 5th by respondents with an RII of 0.71 and a mean value of 3.53. However, Poor organisation of internal business is ranked 6th with an RII and mean values of (0.70, 3.48) respectively whereas Lack of adequate technology is also ranked 7th by respondents evident with an RII of 0.70 and a mean value of 3.48. This is in confirmation to Gann (2001) argument that organisations may have strong capabilities in project management but are often much vulnerable in organizing their internal business in relation to knowledge management.

Furthermore, Lack of project documentation also ranked 12th with an RII of 0.66 and mean value of 3.30. Nature of project is ranked 13th with an RII of 0.65 and a mean value of 3.27. Lack of training and support is the least ranked challenge associated with adoption of knowledge management by respondents with an RII of 0.61 and a mean value of 3.55. This indicates that employees do not recognize lack of training and support as a very relevant challenge with the adoption of knowledge management.

Table 4.1: Challenges associated with adoption of Knowledge Management

	RATING									
CHALLENGES	**1**	**2**	**3**	**4**	**5**	**Total**	**∑W**	**Mean**	**RII**	**Rank**

Lack of organizational culture	2	15	21	20	2	60	185	3.08	0.62	14th
Diverse individual cultures	6	8	12	28	6	60	201	3.35	0.67	11th
Lack of standard work processes	2	12	15	21	10	60	205	3.42	0.68	10th
Lack of awareness of KM practices	2	8	13	26	11	60	216	3.60	0.72	3rd
Time constraint	4	12	14	13	17	60	207	3.45	0.69	9th
Poor organisation of internal business	4	4	19	23	10	60	211	3.52	0.70	6th
Employee resistance	4	7	12	27	10	60	212	3.53	0.71	5th
Lack of available KM systems	2	0	14	28	16	60	236	3.93	0.79	1st
Lack of understanding knowledge management	2	8	13	29	8	60	213	3.55	0.71	4th
Lack of leadership support	4	5	17	18	16	60	217	3.62	0.72	2nd
Lack of training and support	4	6	11	31	8	60	213	3.55	0.61	15th
Lack of project documentation	4	9	18	23	6	60	198	3.30	0.66	12th
Nature of projects	2	10	24	18	6	60	196	3.27	0.65	13th
Lack of adequate technology	2	8	18	23	9	60	209	3.48	0.70	7th
Lack of structured procedures	4	10	7	33	6	60	207	3.45	0.69	8th

Source: Survey data, 2015

4.4 RELATIVE IMPORTANCE INDEX (RII) FOR MEASURES TO

IMPROVE KNOWLEDGE MANAGEMENT

This section of the questionnaire seek to provide respondents the opportunity to indicate on a five point Likert scale their level of agreement to identified measures to improve knowledge management in civil engineering construction firms in Ghana.

4.4.1 Measures to improve Knowledge Management

From Table 4.2, Innovation is the most ranked measure to improve knowledge management, evident with an RII of 0.81 and mean value of 4.03. This confirms Katzenback and Smith (1993) assertion that innovation occurs when individuals exchange knowledge and believe that a greater opportunity exists to improve performance than what is currently being achieved. This is closely followed by Awareness creation with an RII of 0.78 and a mean value of 3.90, which is also very high indicating that if individuals are fully aware of the benefits derived from knowledge management practices, there is the likelihood for them to fully participate. Use of knowledge storage is third ranked with an RII value of 0.75 and mean value of 3.77. Knowledge storage includes a series of items used for gathering knowledge and can be adopted to improve knowledge management practices in an organisation (Alavi and Leidner, 2001). Use of knowledge management models is fourth ranked measure with an RII value of 0.74 and mean value of 3.72 whilst adequate funding is fifth ranked by respondents with an RII value of 0.74 and a mean value of 3.72. These affirm Abdullah et al., (2002) argument that knowledge management models can be adopted to enable people understand the complexity of real systems by representing the main features and dividing the large systems into its parts which would simplify understanding and management.

However, New process implementation is ranked eighth with an RII value of 0.71 and mean value of 3.55. It is followed by establishing a learning organisation with an RII value of 0.67 and mean value of 3.33. However, Clear KM strategic goals is the least ranked measure with an RII value of 0.65 and mean value of 3.25 indicating that respondents do not recognize clear KM strategic goals as an important measure to improve knowledge management.

Table 4.2: Measures to improve Knowledge Management

MEASURES	RATING					Total	∑W	Mean	RII	Rank
	1	2	3	4	5					
Use of knowledge storage	4	6	4	32	14	60	226	3.77	0.75	3rd
Use of knowledge management models	0	6	21	18	15	60	223	3.72	0.74	4th
Awareness creation	0	6	12	24	18	60	234	3.90	0.78	2nd
Employees update on KM systems	2	10	11	25	12	60	215	3.58	0.72	7th
Support for knowledge creation and sharing	4	6	12	22	16	60	220	3.67	0.73	6th
Adequate funding	4	8	7	23	18	60	223	3.72	0.74	5th
Clear KM strategic goals	6	6	21	21	6	60	195	3.25	0.65	10th
Establishing a learning organisation	0	15	16	23	6	60	200	3.33	0.67	9th
New process implementation	2	6	15	31	6	60	213	3.55	0.71	8th
Innovation	0	6	4	32	18	60	242	4.03	0.81	1st

Source: Survey data, 2015

4.5 CHAPTER SUMMARY

This chapter focuses on the analysis of data gathered and discusses the results of the research work. Relative importance index is the main technique used to analyze data collected.

CHAPTER FIVE SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This dissertation which essentially explored the significance of knowledge management practices in civil engineering construction firms in Ghana is divided into five (5) independent but interrelated chapters. The main introduction to the research covered in Chapter One. The review of literature on the topic which covered background discussions and overview on knowledge management was captured in Chapter two. In Chapter three, the methodology adopted for the study including the philosophical considerations, research design, and research strategy were discussed. The research process was in one main phase; survey questionnaires. Chapter four presented the empirical analysis and provided detailed discussions on the survey results. This chapter (Chapter five) summarizes the issues addressed throughout the study. It begins with a summary of how the research objectives were achieved, followed by contributions of this research to knowledge. The chapter concludes with recommendations for further research that can be conducted based on the conclusion of the study.

5.2 SUMMARY OF FINDINGS

5.2.1 Achieving Research Objectives

This research was initiated with the aim of exploring the significance of knowledge management practices in civil engineering construction firms in Ghana. In an attempt to accomplish the stated aim, three research objectives were set in Section 1.3.

Objective 1 was achieved through existing literature whilst objectives 2 and 3 were achieved through the literature reviews and the survey questionnaires which were administered. Subsequently discussions on how the objectives were achieved follows:

5.2.1.1 The First Objective; To explore knowledge management strategies in civil engineering construction firms in Ghana

Through available literature, background knowledge on knowledge management was discovered. Furthermore, the strategies adopted in knowledge management were also ascertained. Literature also gave an overview of the classification of knowledge, knowledge management processes and also highlighted on the benefits derived from proper knowledge management in organisations. Literature brought to light knowledge management in construction and its associated challenges.

5.2.1.2 The Second Objective; To analyse the challenges associated with the adoption of knowledge management in civil engineering construction firms in Ghana

With the background knowledge on the challenges associated with the adoption of knowledge management in civil engineering construction firms in Ghana gained from literature, a questionnaire was designed to address the second objective, of which fifteen variables were identified which was then tested on a number of civil engineering construction firms in the Kumasi metropolis and other selected municipalities in the Ashanti region. The questions highlighted on challenges such as lack of organizational

culture, diverse individual cultures, lack of standard work processes, lack of awareness of KM practices, time constraint, poor organisation of internal business, employee resistance, lack of available KM systems, lack of available KM systems, lack of understanding knowledge management, lack of leadership support, lack of training and support, lack of project documentation, nature of projects, lack of adequate technology and lack of stru ctured procedures. It was realized that the variables (i.e. 15 challenges) could be measured using the same underlying effect. Relative Importance Index (RII) was used to rank the challenges and then subsequently discussed. From the study, the most significant challenges were identified as lack of available KM systems (0.79, 3.93), lack of leadership support (0.72, 3.62), lack of awareness of KM practices (0.72, 3.60), lack of understanding of knowledge management (0.71, 3.55) and employee resistance (0.71, 3.93). This affirms available literature by Hari et al., (2005) and Gann (2001) that lack of available KM systems, leadership support and awareness hinders the successful implementation of knowledge management.

5.2.1.3 The Third Objective; To propose measures to improve knowledge management practices in civil engineering construction firms in Ghana

The background knowledge of the measures to improve knowledge management practices gained from literature helped to design a questionnaire to address the third objective, of which 10 variables were identified and then tested on a number of civil engineering construction firms in the Kumasi metropolis and other selected municipalities in the Ashanti region. The questions highlighted on measures such as use of knowledge storage, use of knowledge management models, awareness creation, employees update on KM systems, support for knowledge creation and sharing, adequate financial resources, clear KM strategic goals, establishing a learning organisation, new process implementation and innovation. However, it was realized that

the variables (i.e. 10 measures) could be measured using the same underlying effect. Relative Importance Index (RII) was used to rank the factors and then subsequently discussed. According to the study, several measures could be adopted to improve knowledge management in organisations. However, it was identified from the study that the most significant measures for improving knowledge management in organisations are innovation (0.81, 4.03), awareness creation (0.78, 3.90), use of knowledge storage (0.75, 3.77), use of knowledge management models (0.74, 3.72) and adequate financial resources (0.74, 3.72). These findings affirm Katzenback and Smith (1993) assertion that innovation, adoption of knowledge storage and knowledge management awareness can be used to effectively implement knowledge management in any organization.

5.3 CONCLUSION

Knowledge Management is very vital in the growth of every organisation and helps to increase useful knowledge within the organisation. However, the findings of the study show that knowledge management in organisations face numerous challenges which adversely affect its incorporation in organisations. Notwithstanding these challenges, various strategic measures could be adopted to improve its incorporation within organisations. Furthermore, adequate KM practices within an organisation would provide a competitive advantage, ensure growth and increase the organization"s productivity.

From the study, it was revealed that, knowledge management is very critical for sustainability of firms. However, the findings also revealed that most civil engineering firms lack;

- available knowledge management systems

- leadership support

- awareness of knowledge management practices which will enable them to properly manage knowledge within the firms.

Notwithstanding, most respondents indicated that they adopted observation and simulation in learning from previous projects undertaken. Furthermore, most respondents highlighted that knowledge was transferred within their firms through tutoring and mentoring and expect to achieve service quality.

Respondents confirmed that in spite of the challenges encountered in the implementation of knowledge management in civil engineering construction firms, measures such as innovation, awareness creation, knowledge storage and use of knowledge management models could be employed to improve knowledge management in their firms.

5.4 RECOMMENDATIONS

To assist in incorporating knowledge management in civil engineering construction firms, the following recommendations are therefore prescribed:

- Management should ensure adequate platform for exchange of knowledge, forums and regular meetings and also strive to introduce innovation in the management of knowledge within the organisation.
- Management should employ the use of knowledge management models and develop adequate knowledge storage systems.
- There should be an awareness creation and advocacy on the benefits of Knowledge Management to firms by management so as to remain competitive in the global market.

5.5 LIMITATIONS OF THE RESEARCH

The core limitations of this study which ought to be acknowledged have to do with the scope and research process. These deficits which provide the basis for further studies are as follows:

- The limitation of the survey to civil engineering construction firms in the Ashanti region alone may affect the generalizations of the findings.
- The possibility of sampling as well as measurement errors and their effects on the data collected and analysis undertaken and the conclusion drawn.

5.6 DIRECTION FOR FUTURE RESEARCH

The research results have recognized a few areas that need further research efforts. The following are therefore recommended for future research:

- Further research on the impact of Knowledge Management practices on the productivity of civil engineering construction firms in Ghana.
- Further research on measures to ensure adequate Knowledge Management in civil engineering construction firms in Ghana.

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APPENDIX

SURVEY QUESTIONNAIRE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

COLLEGE OF ART AND BUILT ENVIRONMENT

Department of Building Technology

(MSc. Construction Management)

INCORPORATING KNOWLEDGE MANAGEMENT IN CIVIL ENGINEERING CONSTRUCTION FIRMS IN GHANA

Dear Sir/Madam

This questionnaire forms part of an MSc. Research project which aims to **explore the significance of knowledge management practices in civil engineering construction firms in Ghana.** Knowledge management has become very relevant in the success of contemporary organisations and presents various dimensions for the sustainability of these organisations. The results of this study will identify the various challenges associated with the adoption of knowledge management in civil engineering construction firms and propose measures to improve upon these practices.

I would like to invite you to participate in the above project. Completion of the questionnaire is completely voluntary and returning the completed questionnaire will be considered as your consent to participate in the survey. The questionnaire will take you about 10 minutes to complete.

The data collected will be used purposely for this research and any solutions obtained will be shared for the entire construction indusry and its operatives.

I appreciate that you are already busy and that participating in this survey will be another task to add to your busy schedule, but by contributing you will be providing important information. **All data held are purely for academic purposes and would be treated as strictly confidential.**

In the event of questions or queries, please do not hesitate to contact me. Thank you for your time and valid contribution in advance.

Yours faithfully,

BENJAMIN SMITH

MSc. Researcher

Email: benkwasmith@yahoo.com

Tel: 0244718579

SECTION A: RESPONDENT'S PROFILE

Please, kindly respond to the questions by ticking (√) in the appropriate box(s) for each item.

1. Name………………………………………..(please ignore if you wish to remain anonymous)

2. Please state the number of years you have been in the firm/construction industry

    ☐ Less than 1 year

    ☐ 1 – 2 years

    ☐ 2 – 3 years

    ☐ 3 – 5 years

☐ More than 5 years

3. Please indicate your position in firm.

    ☐ Engineer

    ☐ Quantity Surveyor

    ☐ Project Manager

    ☐ Managing Director

    ☐ Other ………………………………… (please explain further)

4. Please indicate highest qualifications (please do not tick **(√) more than two boxes**)

    ☐ PhD

    ☐ MSc

    ☐ BSc

    ☐ HND

    ☐ Professional qualification………………………… (please indicate)

    ☐ Other…………………………………………… (please indicate)

5. Please indicate the legal status of your firm.

    ☐ Sole Proprietorship

    ☐ Private Limited Company ☐ Joint Venture

    ☐ Public Limited Company

6. How long (years) has the firm been in existence?

    ☐ Less than 5

    ☐ 5 – 10

    ☐ 11 – 15

Above 15

7. Please indicate how lessons are learnt form projects within your firm.

    Observation and simulation

    Interviewing

    Questionnaire and Surveys

    Other …………………………….

8. How do you transfer knowledge or learnt experiences to others within your firm?

    Meetings

    Expert system

    Tutoring/Mentoring

    Database

    Other …………………………….

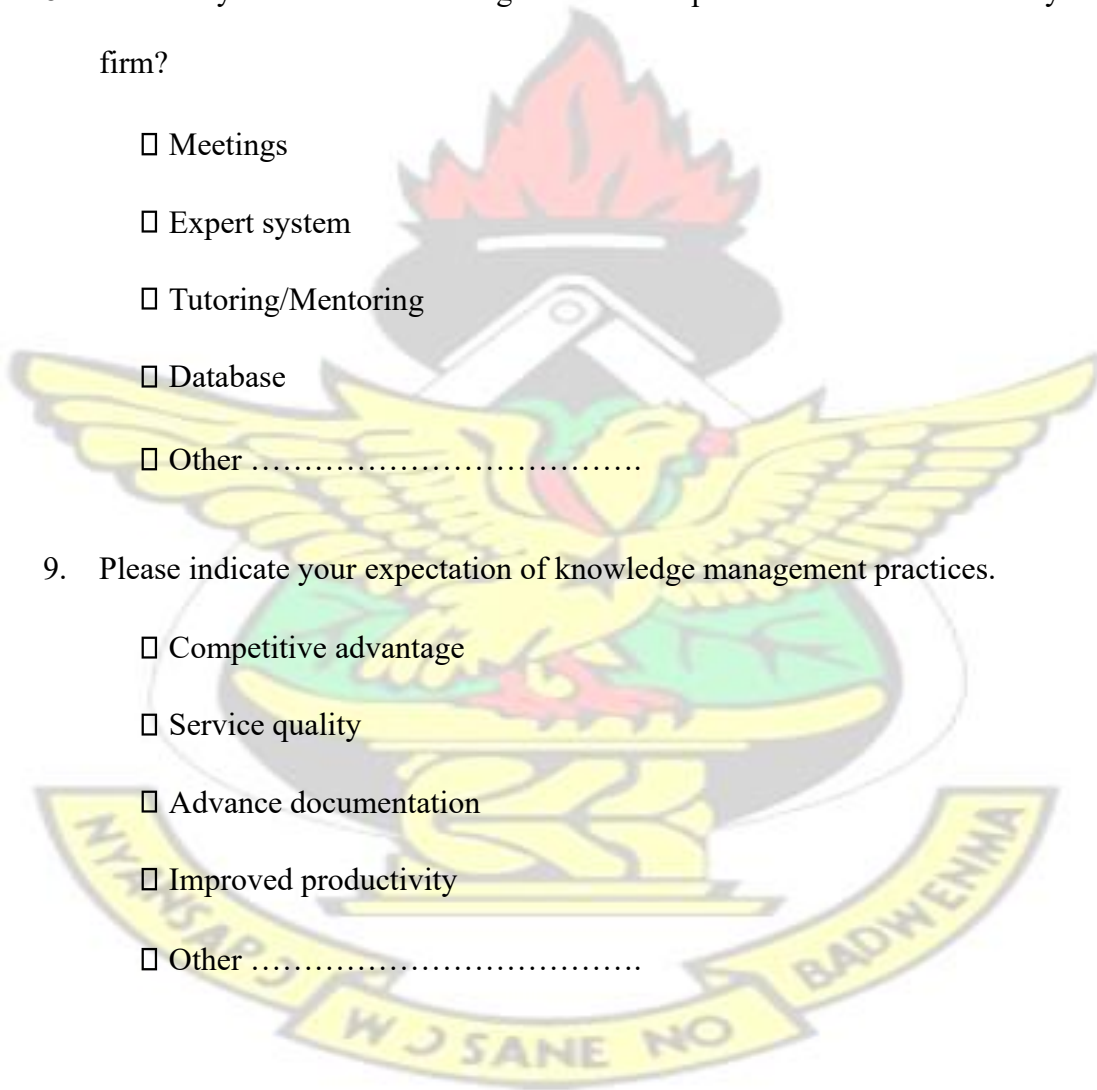9. Please indicate your expectation of knowledge management practices.

    Competitive advantage

    Service quality

    Advance documentation

    Improved productivity

    Other …………………………….

SECTION B: CHALLENGES ASSOCIATED WITH ADOPTION OF

KNOWLEDGE MANAGEMENT

1. Below are potential challenges associated with the adoption of knowledge management practices. From your experience, express your opinion on your level of agreement to the following challenges. . **Use the scale: 1 = Strongly Disagree   2 = Disagree   3 = Neutral   4 = Agree**

5 = Strongly Agree

ITEM	CHALLENGES	1	2	3	4	5
1	Lack of organizational culture					
2	Diverse individual cultures					
3	Lack of standard work processes					
4	Lack of awareness of KM practices					
5	Time constraint					
6	Poor organisation of internal business					
7	Employee resistance					
8	Lack of available KM systems					
9	Lack of understanding knowledge management					
10	Lack of leadership support					
11	Lack of training and support					
12	Lack of project documentation					
13	Nature of projects					
14	Lack of adequate technology					
15	Lack of structured procedures					

Please state below any relevant information which you deem necessary

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………………

SECTION C: MEASURES TO IMPROVE KNOWLEDGE MANAGEMENT

1. Please the following have been identified as having influence on knowledge management in the construction industry. Please indicate your level of agreement to the following measures to improve knowledge management   in civil engineering construction firms in Ghana. . **Use the scale: 1 = Strongly Disagree   2 = Disagree   3 = Neutral   4 = Agree   5 = Strongly Agree**

ITEM	MEASURES	1	2	3	4	5
1	Use of knowledge storage					
2	Use of knowledge management models					
3	Awareness creation					
4	Employees update on KM systems					
5	Support for knowledge creation and sharing					
6	Adequate funding					
7	Clear KM strategic goals					
8	Establishing a learning organisation					
9	New process implementation					
10	Innovation					

Please indicate your views on any critical matter which in your opinion, this questionnaire did not consider.

……………………………………………………………………………………………

……………………………………………………………………………………………

……………………………………………………………………………………………

Thank you.