

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,
KUMASI, GHANA**

**THE ROLE OF CLOUD COMPUTING IN IMPROVING SUPPLY CHAIN
MANAGEMENT IN THE GHANAIAAN CONSTRUCTION INDUSTRY.**

By

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**A Thesis submitted to the Department of Construction Technology and
Management, College of Art and Built Environment,
in partial fulfilment of the requirements for the award degree of**

MASTER OF SCIENCE

JUNE, 2019

DECLARATION

I hereby declare that this work is the result of my own original research and has neither in whole nor in part been plagiarised from another degree or diploma at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution except where due acknowledgement is made in the thesis.

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ABSTRACT

The supply chain management in Ghana has not been very effective in meeting the demands of the construction industry. Hence, the trite use of quondam means to deliver goods from one end to the other have not improve over the years. Cloud computing, a module that helps stakeholders to access information from the internet ubiquitously is an emerging approach in supply chain management. Thus, the need to conduct this study which was formulated to explicate the role of cloud computing in improving supply chain management in the Ghanaian Construction Industry. Adopting quantitative research approach and using the snowball sampling technique, top construction firms which were seen to be adopting cloud computing in Ghana were conducted and used for this study. After sending 60 questionnaires out, 42 of them were retrieved. The obtained data was analysed using Relative Importance Index (RII) and Descriptive Statistics. After analysis, it was identified that effective decision making, construction as an information intensive industry and collaboration guaranteeing higher chance of success of projects were identified as the topmost awareness of Cloud Computing in the Ghanaian Construction Industry. Also, some of the benefits of Cloud Computing to the Ghanaian Construction Industry were that the resource usage can be monitored, Cloud Computing present financial benefit to a project and Cloud Solution will enable multiple project management. More so, strategies for implementing Cloud Computing were identified as Education on the cost benefit cloud solution presents on projects, Enable the organization to be able to benchmark its performance, and Enable early supplier involvement in any project. The study recommends amidst others that Cloud Computing should be promoted within the supply chain area to ensure that stakeholders can easily access information and speed up productivity in the industry.

Keywords: Awareness, Cloud Computing, Supply Chain Management, Ghana

ACKNOWLEDGEMENT

All praise to the God, for granting me the strength and grace to embark on this academic journey. It was neither by might nor power, but his endless blessings and mercies saw me through to a successful end. A special thanks to Professor Badu for his guidance in selecting a suitable topic as well as his sternness and keen supervision to ensure that the project met the required standard and was completed in due time.

I would take the opportunity to extend my sincerest appreciation to my parents, who supported me with their prayers, words of encouragement and financially throughout this journey. I owe a special thanks to a special group of people who I have learnt a lot from, they did a marvellous job with the assistance they readily provided contribute to the success of this project. Finally, I would like to say thank you to all who helped in various other ways, such as the respondents. May Abba Father bless you all!

DEDICATION

To my parents for their infinite support and encouragement.

CHAPTER ONE

GENERAL INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Intensive competition in the market place has forced companies to respond more quickly to customer needs through faster product development and shorter delivery time. Increasing customer awareness and preferences have led to an unprecedented explosion in product variety. End customers give credit only to companies that are able to deliver products with excellent quality, and on time. However, the demand of customers for product variety, especially in the case of short life-cycle products such as food, apparel, toys, and computers, makes it difficult for manufacturers and retailers to predict which particular variety of the products the markets will accept. To be effective in matching demand with supply, manufacturers and retailers need to collaborate in the supply chain (Simatupang and Sridharan, 2002). This report throws light on one of the fastest emerging and very useful collaborative tool which has come to change the game in the supply chain management system.

Cloud computing in conceptual terms refers to a series of processes to be undertaken in the act of providing Information Technology (IT) solutions to problems faced in organization through the internet. It exempts the organization off the costs of having to purchase hardware and software as well as hiring human resources to operate and maintain them which may have seemed inevitable by employing the use of the internet solutions. The word “Cloud” in this instance, is used as a metaphor, and is represented by the cloud drawing in computer network diagrams as an abstraction of the underlying technology infrastructure. The Construction industry balances back office functions; billing, payment of invoices, planning payrolls, logistics, as well as running financial reports, with the physical presence needed in the client’s office or on the job site at least.

This should not be the case. Today's technological solutions should be able to serve users in both settings. Cloud computing allows staff to work from various locations without being tied to a specific physical location. With the amount of consolidation, decentralization of offices, travel-based positions, and projects being undertaken in different regions of the country or even internationally, being able to have solid remote access technology to employees is critical for the success of the organization. Unfortunately, in Ghana the benefits of CC have not been realized yet by all in the construction industry. This research is directed towards the identification of the benefits of CC and the general processes involved with CC. It is aimed at creating awareness of the benefits of employing CC as a collaborative tool in Construction supply chain management to broaden the interpretation of Cloud and encourage built professional to make good use of it on construction projects, especially larger and more complex ones.

1.2 PROBLEM STATEMENT

Construction technology has experienced rapid changes in recent years associated with the growing use of computers, software development, automation and offsite construction (Eastman et al, 2011). These advances are helping to address two common problems associated with the industry, namely project delay and safety. A lack of communication between stakeholders and the uncertainties associated with construction sites and processes have been identified as the main causes of construction delays for a number of years (Solis and O'Brien, 2012).

Interest in supply chain management has steadily increased since the 1980s when firms saw the benefits of collaborative relationships within and beyond their own organization. Firms are finding that they can no longer compete effectively in isolation of their suppliers or other entities in the supply chain. A number of definitions of supply chain

management have been proposed in the literature and in practice. (Lummus and Vokurka, 1999). Same or similar information are manipulated and exchanged at a point during the construction process. Drawings are redrawn and lists are re-entered. This similar information being duplicated or slightly manipulated tend to be a waste of precious time and resources which can end up in unproductivity of construction projects. Hence, all effort is made to improve the coordination, collaboration and communication medium/channel within the construction project at the early stages (Delgado, 2005).

The primary goal should be setting up building or raising projects through the most efficient means through which both human and natural resources can be preserved. Cloud computing provides an opportunity to manage these resources and exploit them in the most efficient way to produce top class results. Maximum consideration should be given to the fact that clients in today's construction industry have positioned themselves, given due priority to lower cost of projects without sacrificing quality, shorter durations, and up-to-date information at every stage of the supply chain in a project (Solis and O'Brien, 2012 and Aziz et al., 2006). The competitive importance of linking a firm's supply chain strategy to its overall business strategy and some practical guidelines are offered for successful supply chain management. (Lummus and Vokurka, 1999).

1.3 RESEARCH AIM AND OBJECTIVES.

This section addresses the aim and the various objectives of the research.

1.3.1 Aim of the Research.

The aim of this study is to explore the role of cloud computing in improving supply chain management in the Ghanaian Construction Industry.

1.3.2 Objectives of the Research.

In order to achieve this aim, the following objectives were set:

1. To identify awareness factors of cloud computing practices in the Ghanaian Construction Industry
2. To highlight the competitive advantage adopting CC presents to future construction projects; and
3. To determine strategies for implementing CC within the construction supply chain in Ghana.

1.4 SCOPE OF THE STUDY.

Geographically, the extent of the study will consider both the consultancy and construction firms within the Greater Accra region. This region was chosen because of the numerous construction projects being undertaken and also due to the fact that this research considers modern technology which are more likely to be used by the big time construction firms in the region as compared to the other regions in Ghana.

1.5 RESEARCH METHODOLOGY

A qualitative as well as quantitative approach of enquiry was adopted for this study. To uncover the theoretical paradigms supporting this subject and to identify existing strategies for the successful implementation of CC on construction projects a thorough review of relevant literature was conducted. The review sourced credible and scientific data from the existent literature through journals, unpublished projects, books and publications of corporate bodies. The information that is gathered from the Literature review, as well as the preliminary fact-finding phase was used to develop questionnaires. The questionnaires were used to bring out the perceptions of the respondents on CC application to projects in Ghana. The data from the retrieved questionnaires included a

scale rating of strategies of implementing CC in supply chain management to projects which granted for a pleasant classification and deduction. The selection of the respondents was based on snowball sampling, as this helped locate information-rich key informants who made better inputs with regard to the existing CC implementation strategies on projects. Purposive sampling was used subsequently to draw sample from the population for the determination of proper CC implementation strategies on construction projects.

1.6 JUSTIFICATION OF THE STUDY.

Cloud computing implementation in supply chain management for construction projects in Ghana will assist individuals and organizations to access the resources and services within the information technology domain. It is a combination of hardware and software which the individual can use from any part of the world through the internet.

The Ghanaian society is still behind times with regards to its inclination toward CC even in the construction industry (William and Lansky, 2013). What this study will accomplish is to present evidence to the benefits hidden in CC in aiding maximum and effective coordination in managing projects. The swift transformation in technology taking place worldwide makes it imperative that professionals in the construction industry acclimatize themselves CC operations in order to maximize their activities. Developed countries like, Australia, Germany, Singapore, and the United States are where they are because of the decision to take steps towards such innovative directions. Ghana is behind in such radical leaps. The country needs to follow the direction of these pacesetters.

The limelight of this study will be on CC in Ghana, but more specifically directed towards the built professionals, whom after taking a read of this script's thoughts will

be tingled as well as interests surged in order that they may go back to dig into this area of study and hopefully execute it to enable collaborative management of the supply chains on construction projects. Optimistically, upon digesting this project study, the reader will be persuaded that employing CC as a collaborative tool in managing the supply chain on a project is a feasible alternative with benefits in cost reduction and efficiency, and ultimately giving clients the much need value for money.

1.7 ORGANISATION OF THE STUDY

The thesis is divided into five (5) chapters, which are arranged in chronological order. Chapter 1 is made up of the "General Introduction" presents a background to the research and the problem requiring research efforts. The research aims, objectives, and scope are all included in this chapter. Chapter 2 reviews literature; the review expounds on an extensive coverage of earlier works. These existent literatures reviewed and linked together. It discusses strategies of CC implementation in supply chain management, the awareness of CC practices on construction projects as well as the benefits of adopting CC on construction projects. Chapter 3, aims at expounding on the research methodology and explores the profound approach to the research and situates it within its appropriate jurisdiction. Detailed discussions are provided on the data collection and analytical tools which were employed. The empirical analysis of data and discussions from the field survey that answered all the research objectives is presented in Chapter 4. The summary of the entire research endeavour and reviews of the main contributions of the research to knowledge is presented in Chapter 5 which is titled "Conclusions and Recommendations". Policy recommendations, limitations and pointers for future research attempts were also defined clearly.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter looks to introduce the concept of CC as an emerging IT solution for collaborative supply chain management to the general public in such a way that the lay man may have a fair idea of the architecture behind it and the value it brings to projects after having a read. It will look at the various definitions, perceptions and misconceptions of CC and the implications on construction supply management.

2.2 INTRODUCTION TO CLOUD COMPUTING

Enough evidence from adequate research has brought to bear that the construction industry lags behind with regards to its readiness and ability to assimilate IT innovative changes in its operations. The industry trails most others in this regard. One name influencing factor that has brought about this state of events is the inadequate quantity and quality of IT resources (infrastructure) amongst the SMEs given their small size and extent of operation. Adopting IT therefore becomes an additional expense to them they cannot afford. A greater majority, over 90% of companies into construction fall in category in developed countries which Ghana is included. However, the cloud computing innovation holds within it the potential to solve to some of the ailing problems in the industry, especially the usage based price model. Hore (2009) in his paper proposed a radical idea of having all SMEs adopt a software approach to their operations utilizing the cloud computing model.

Quite recently, (Shoshanna Leventhal, July 2018) also said that, based on their estimate, Jeff Bezos is literally the richest man in history, beating the likes of Bill Gates and Warren Buffet to the title. Forbes estimate his wealth to be a staggering \$151.7 billion.

His company accounted for 4% of retail sales in the United States as in the year 2017 and another 44% proportion of all digital spending. Our businesses will change in response to this. And it is all accredited to the cloud computing wave that it taking place. The true leaders in business are those who exploit this system and Amazon are masters in this. Estimated forecasts only project more fortunes for Amazon and Jeff Bezos.

Jeff Bezos was considered a fool by well-meaning family and friends for his wonderful idea (Sosik 2015). They tried taking him out of it. His determination and sold-out belief in being radical has resulted in him changing the way business is conducted today. “We can agree; that cloud computing is a lucrative field which we cannot afford to continue to sleep on! (Hugos & Hulitzky) A key point’s made mention was how cloud computing revolution will reshape enterprise like digitization is doing humans. Digitization has brought endless benefits to man. Technology has created easier and faster means of doing things which has relieved man off a lot of stress. It is through technology that cloud computing is made possible.

In an age where the world has become so digital with technology taking over it would be unwise not to adopt the most useful tools to enhance our productivity. Cloud computing stands as one of the most useful tools if applied in construction management and awareness should be created so that we can explore its full benefits.

Cloud computing is a concept which minimizes the cost and efforts required to manage project data; resources, schedule and progress of work, payroll among others. Adopting this tool in the supply chain management will go a long way to improve and ease the management of the supply chain on construction projects in Ghana. Cloud computing enhances the project in many other ways not forgetting financially. Larger and more complex projects are more likely to make optimal benefit of this tool.

2.3 DEFINITION OF CLOUD, CC AND BREAKDOWN OF CLOUD

COMPUTING DEFINITIONS

2.3.1 Cloud.

“The term “Cloud” is used as a metaphor for the internet, and it is represented by the cloud drawing in computer network diagrams as an abstraction of the underlying technology infrastructure.” (Brandt & Moyers, 2013).

2.3.2 Cloud Computing

“Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction”. (NIST, 2009).

Table 2.2 Other definitions for cloud computing in existent literature.

Author(s)	Definitions
Voorsluys et al., (2011)	A new computing paradigm which offers a huge amount of compute and storage resources to the masses.
Mell and Grance (2011) and Cloud Computing (2010)	Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources.
Sultan (2010)	The IT capabilities that are requested, provisioned, delivered and consumed in real time over the internet.
Goscinski and Brock, 2010	A new business model wrapped around new technologies, such as virtualisation, applications (Software as a Service (SaaS)), platform (Platform as a Service (PaaS)) and hardware (Infrastructure as a Service (IaaS)).
Sharif, 2010)	As a technology that has the potential of changing how the internet and the information systems are presently operated and used
Misra et al., 2010; Sultan, 2010; Erdogmus, 2009 and Bittman, T.J., 2009	A collection of disembodied services accessible from anywhere using any mobile device with an internet-based connection.
Armbrust et al., (2009)	Delivering both the required service through the internet and the hardware together with its system software in datacentres the services provide.
Erdogmus (2009)	A pool of highly scalable, abstracted infrastructure which is capable of hosting end-customer applications that are billed by consumption.

In their conclusion, Zhang et al (2011) asserted that the use of smartphones in the traditional setting is hindered by factors such as inadequate memory, low CPU frequency, and the use of batteries. In that regard, cloud computing proves a solution to these prevalent difficulties. These technological innovations I the use of the tablets, and smartphones when applied are the panacea to these aforementioned problems (Zhang et al., 2011).

2.4 ESSENTIAL CHARACTERISTICS

The National Institute of Standards and Technology further explicated the essential Characteristics of CC as follows; (Raizen, 1998)

2.4.1 On-Demand Self Service

Cloud computing ensures fewer human contact and interactions since the consumer is already equipped with adequate computing capacity, good network, and good server time available when needed.

2.4.2 Broad Network Access

Cloud computing is available through a wide range of networks and allows swift access to a variety of clients.

2.4.3 Resource Pooling

This allows for the integration and assembling of computing resources accessible by several consumers using a multi-tenant model. It allows for the allocating and reallocating of both physical and virtual resources in response to the demands of consumers. Cloud computing hides the exact location of the source of resources from consumers but still gives them a general idea of its location. Some resources considered here include memory, storage processing, and network bandwidth.

2.4.4 Rapid Elasticity

Cloud computing is highly flexible and elastic. Resources and capabilities are quickly made available, either increasing or decreasing, corresponding with demand. The

capabilities made available to consumers can seem unlimited and can be accessed at any time.

2.4.5 Measured Service

Cloud computing allows transparency. It is a system that controls and maximizes resources measuring by creating way of measuring capability at various levels with regards to the unique services provided. This allows for thorough monitoring, regulating of this system.

2.5 METHODS OF IMPLEMENTING CLOUD COMPUTING

There are acknowledged 4 delivery models of cloud computing. They are public cloud, private cloud, community cloud and hybrid clouds.

Ashraf, (2009) gave a working definition of cloud as constituting a pay-as-you-go to both the public (open system) and private cloud (closed system) especially when the datacentres are unavailable to the public. The hybrid and community cloud computing models are regulated and used by a select group of organisations with a common interest shared interests. It is worthy of note that the hybrid model integrates the private and public cloud computing model (Mell and Grance, 2011)

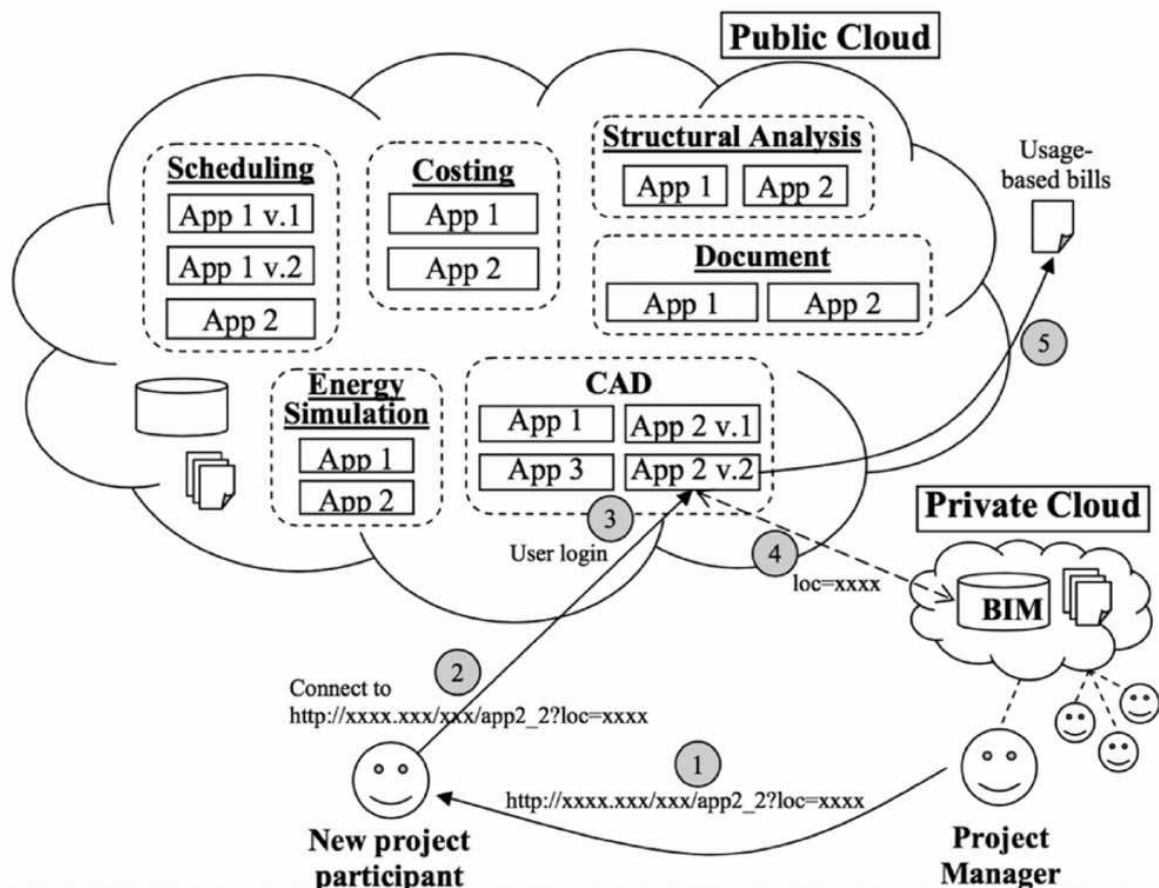


Figure 2.1 Illustration of the 2 main types of cloud computing.

2.6 Types of cloud computing

The following authors have all agreed on the proceeding types of cloud computing: Foley (2008), Reeves (2009), Kim (2009), Cloud computing (2010), P.Y. Thomas (2011) and lastly, Mell and Grance (2011).

2.6.1 Infrastructure as a Service (IaaS): The cloud computing systems makes available certain basic resources, some of which includes storage, network components, processing power amongst others. In this regard, an ready leaders in this area would be Amazon web services.

2.6.2 Platform as a Service (PaaS)

A hosting environment is required and used by the consumer for their applications. The applications that run in the environment are controlled by the consumers, but they however aren't equipped to regulate its operating system and hardware. Iconic examples here would be Microsoft Azure and Google AppEngine.

2.6.3 Software as a Service (SaaS)

With this type, the consumer is only allowed to use the application in question and similarly is not equipped to regulate its operating system and hardware. With SaaS, a license is provided which gives access to consumers when demanded. Consumers will have to subscribe to a "pay-as-you-go" model. Iconic examples include Facebook, Microsoft Windows Live, Google Calendar, Gmail, Google Talk, Flickr, Dropbox, YouTube, Amazon, and Twitter.

2.7 CONTEXT AWARE CONSTRUCTION COLLABORATIVE TOOLS

The objective of advancing Information communication technologies globally is gradually being realized as more and more people are able to gain swift access to information, anytime, anywhere. This is what cloud computing is all about. This easy and inexpensive access has drawn an overwhelming amount of information, some of which are useful and other which are useless. It becomes essential to necessary information available to individuals at specific times under specific context (context-awareness). However, the assimilation of information communication technology into the mainstream of construction is dragging its legs in contrast with other industries. The application of context-aware technologies are inadequate in this industry. However, the opportunities it presents are significant through technologies such as Context-Aware Information Delivery (CAID) (Aziz et al., 2006). There are five categories of CAID and

they comprise of Radio Frequency Identification, profiling technologies, sensor networks, location-based services, and ubiquitous computing (Aziz et al., 2009).

2.8 CONTEXT-AWARE COMPUTING AND CLOUD COMPUTING

Being mindful of the user's task, role, location, preferences among others enhances project (Adomavicius et al, 2011). Context-awareness is one of the core elements of cloud computing system, thus should be considered. What it does is to make available quality information, services and enhanced communication throughout the supply chain in order to make improvements to projects.

In this context, cloud computing is emerging as the new innovative wave in the IT industry purposed to enhance effectiveness and efficiency, among other benefits such as enhancing operating systems etc. Conceptually, cloud computing involves sharing and utilizing resources and applications to start a business endeavour disregarding issues such as ownership, management and maintenance of the network applications, resources, and services (Chen et al., 2012).

2.9 ARCHITECTURAL SYSTEM OF CONTEXT-AWARE CLOUD COMPUTING INFORMATION SYSTEM. (CACCIS)

Beyond its unique quality of disintegration, still similar information is transferred, processed and distributed in the construction industry. This leads to redrawing, re-entry, re-counting, and replacing. These are all contributions to poor productivity in the workplace. Therefore, the best objective here is to enhance proper communication, coordination, and collaboration amongst the parties in the supply chain (Fathi et al., 2012). This system trumps others in that it is more effective and more efficient. This, according to Roco and Bainbridge (2003), will improve the two qualities of effectiveness and efficiency)

The design and architecture of cloud computing is in two divisions, namely the front end and the back end. The computer user is only seeing the front end comprising of laptops, tablets, desktop, mobiles, smartphones and others together with a web-based application that enable access to the cloud computing services. This is known as the cloud computing interface, according to Buyya et al (2009). The back end is really the cloud aspect of the entire system. Web-based e-mail service programs such as Yahoo, g-mail, Hotmail amongst others are an example of cloud computing interface (Gong et al., 2010)

2.10 CONTEXT AWARENESS

Context awareness points to the extent of awareness of the consumer or user within a context of a specific environment. The context considered here include aspects like task, quality of services, bandwidth, responsibility, location, time, identity and role, weather, activity, preferences, noise, type of network, site conditions, calendar, interests, network type etc.). The implementation of context awareness in brief will enhance the level of effectiveness the construction industry currently operates with. And it does this by quickly and readily making all pertinent information available, including relevant service germane to the unique context. The underlying basics of this is what is called cloud computing (Mahmud, 2012). What cloud computing does to employ the internet in its operations together with a central remote server in maintaining its applications and data. An added benefit is that cloud computing eliminates the need for installation but granting convenient access for consumers and businesses to their personal files on any computer available connected to the system (Buyya et al, 2009). This system, being highly efficient, reduces cost and its scalable. It does this by centralizing memory, bandwidth, storage and processing (Buyya et al, 2009).

2.11 SUPPLY CHAIN MANAGEMENT

Today global markets have become a cut-throat competitive arena. The influx of commodities with shorter life's span and consumer's increase expectation have forced the hand of businesses. They have now become focused their supply chain, investing heavily in it. The progressive advancement in transportation system and communication have compounded the situation and necessitated the continuous growth of the supply chain amongst organizations in their bid to get ahead of their competitors (Sell, 1999). Usually, the supply chain follows the sequence of first producing the commodity in question, already processed in one or several factories, then shipped for temporary storage in warehouses. Lastly, they are shipped off to retailers and consumers. Consequently, to reduce cost and improve service levels, effective supply chain strategies must take into account the interactions at the various levels in the supply chain. The supply chain, which is also referred to as the logistics network, consists of suppliers, manufacturing centres, warehouses, distribution centres, and retail outlets, as well as raw materials, work-in-process inventory, and finished products that flow between the facilities. (Melo et al, 2009)

2.11.1 What exactly is supply chain management?

Thomas and Griffin (1996) explained the meaning of this concept as follows, the term Supply Chain Management (SCM) is defined as managing the flow of materials and information in facilities and between them. Such facilities can include assembly plants, vendors, manufacturing plants, and distribution centres. Also, Christopher (2011) purported that supply chain is “that network of organizations that are involved, through upstream and downstream linkages in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer.

It has also been defined by Peter Bailey as follows,” the supply chain includes all those involved in organizing and converting materials through the input stages (raw materials), conversion phase (work in progress) and outputs (finished products or services). The cycle is often repeated several times in the journey from individual producer to the ultimate customer, as one Organization’s finished goods is another’s input”.

The chartered institute of purchasing and supply (CIPS) course book with the title improving competitiveness of supply chains, also notes that it is also important for supply chain officials to realize that the supply chain concept can be applied within organizations as well as between them. The internal supply chain or value chain describes a similar flow of information and other resources within –into and through- a given organization: from inbound activities (procuring and receiving inputs), to conversion activities (transforming inputs into outputs) to outbound activities (moving outputs onwards to customers).

Significant attention has been shifted to SCM by businesses in recent years. The United States alone spends \$670 million on non-military logistics. Logistics costs alone constitutes 30% of cost of goods sold in the United States’ manufacturing firms. The savings in this regard that can be had is too significant to neglect. Competition always has its way of pulling down profits and overall costs of production without sacrificing quality customer service (Thomas and Griffin, 1996).

2.11.2 Why is supply chain management necessary?

The adoption of SCM is due to the volatility of the markets in our global economy, the competitive nature of businesses in the 21st century has forced companies to look for a way to increase profit margins and also trying to reduce production cost so as to get

ahead of the competition in the industry. These are some of the main issues why organizations have started to adopt the supply chain and its management techniques.

As we review literature by other individuals in this area of study, we would come to understand the benefits and demerits of using the SCM approach which answers the question why supply chain is necessary (Keller et al, 2011).

What the SCM targets is the supply chain. How? It does this by creating a network of organizations that are involved in various activities and processes leading to value creation for consumers in the form of quality goods and services (Christopher, 2011). In a broad sense, the supply chain comprises of at least two or several organizations legally separated but interlinked through the flow of information, financial and material flows. They come in different forms, these organizations. They can be those into producing parts, end products and components; they can also be into providing logistic services or they could be the end users themselves (Stadtler, 2008). In that regard, this definition stated above subsumes the consumer. The focus of this network usually isn't on only single chain. It also gives attention to diverging and converging flows within a complex network as a result of great demand to be met concurrently. To reduce the complex nature that this presents, organizations only focus on a specific aspect of the supply chain. To illustrate this, organizations are restricted by the customers of its customers downstream. Similarly, when looking upstream, it ends up with the suppliers of its suppliers.

Some of the benefits that organizations realize from using the SCM approach are;

Vision alignment – SCM allows the accomplishment of strategic business plans by enabling dynamism in swift assessment, evaluation, quantification, and implementation.

Segmentation and market offering alignment – SCM ensures the alignment of customer's values with supply chain offerings. This will also increase profits and customers service levels.

Risk and resiliency – Pin-pointing weaknesses in the supply chain and strategizing ways of overcoming those weaknesses.

Mergers and acquisitions – SCM allows organizations to settle on a common operating model which will enable organizations to control their collaborative acts and to cut down cost.

Operating model redesign – Linking organizations operating models with its supply chain strategy in order to enhance efficiency throughout the value chain.

Analytics and performance management – SCM increases understanding of cost. This understanding will provide information for making effective decision concerning the supply chain.

Global footprint strategy and network design – Interconnecting the customer footprint, supply chain, and the supply chain to match up to growth requirements.

Supply chain management is becoming fundamental to most businesses in today and a crucial element in their success and that of customers achieving. It enhances customer service provision by:

Right Delivery Time – SCM ensure in-time and on-time delivery of services.

Right After Sale Support – There are provisions for swift rendering of services.

SCM again aids in reducing operating cost in an organization by:

Decreases Purchasing Cost – SCM cuts down cost by preventing the accumulation of cost in the form of inventories in stores for an extensive period of time than required.

Decreases Production Cost – SCM also cuts down manufacturing cost. Manufacturers depend on the supply chain for materials, plants and equipment to function. With SCM, cost requirements on manufacturers are greatly reduced.

Decreases Total Supply Chain Cost – Considering Dell Computers for instance, this company manages the supply chain in order to stay in competition. It does this by producing on demand or by order. This eliminates waste and reduces cost of storage, waste, damage of good in warehouses etc.

The supply chain helps improve the financial position of an organisation:

Increases Profit Leverage – Management of the supply chain is a valuable activity to all firms given the cost reduction advantages involved. This leads to incredible increases profits. managers are valued by firms because of the supply chain cost they help control and reduce. This was the case with cereal production in the United States.

Decreases Fixed Assets – SCM reduce or sometimes eliminate the cost of large fixed assets, transportation, and warehousing.

Increases Cash Flow – SCM also expedites the flow of products to customers. This level of speed enables organizations to invoice customer sooner. For instance, delivering in 7 days instead of 30 allows you to invoice customers 23 days earlier

Some of the societal roles of SCM are outlined below:

SCM Helps Sustains Human Life – It is the supply chain that makes available fundamental necessities such as food and water. It was the effectiveness of the supply chain that made such dramatic rescue during Hurricane Katrina, supplying food and water to the inhabitants of New Orleans.

Human Healthcare – The supply chain also delivers healthcare and medical supplies.

Without the supply chain, it is clear that the human race will suffer. Fast moving vehicles and choppers have enabled quick response to emergency situation which often saves lives.

SCM Protects Humans from Climate Extremes – SCM is also responsible for the supply of electricity and other forms of energy into our various establishments. Electrical energy is converted into heat, light, refrigeration, etc. In this modern era, losing one of these elements can be catastrophic.

Foundation for Economic Growth – Economic growth is highly contingent of the effectiveness of the supply chain. The various infrastructure that aid the supply chain are the very contributors to economic advancement. Our transportation systems are enable the transfer of goods and services.

Improves Standard of Living – Reduced cost of products due to the effectiveness of the supply chain leads to a relative increase in the incomes of people thereby increasing their standard of living.

Job Creation – All professionals in the supply chain are in employment in this field. In the United States, 10 million people are employed in this sector as at the year 2006.

Opportunity to Decrease Pollution – The activities of the supply chain leads to waste production including some pollutants. However, these professionals are continuous looking into ways of ensuring sustainability.

Opportunity to Decrease Energy Use – The operations of the supply chain comprise of transporting human beings as well as materials. This leads to the exploitation and depletion of scarce energy. Professionals in the supply chain are continuous looking for more energy-efficient ways that require less resources

Defending Human Freedom – SCM supplies all military logistics necessary for defending the territories of a nation against potential threats.

Protects Delivery of Necessities – All necessities of the citizens of any country are supplied by this chain. The SCM therefore becomes highly integral to this end.

2.11.3 Brief history of supply chain management

SCM maybe a fresh concept; however, coordinated planning is an ancient one. Clark and Scarf, way back in the year 1960, began the exploration of multi-echelon distribution system. Research into coordinating production and distribution scheduling have been inadequate albeit recent efforts. Data available is not enough to form the basis for making innovative changes to the supply chain. This can be attributed to the research study that has been secluded on energy modelling of smaller sections instead of the larger sections.

2.12 SUPPLY CHAIN

In another sense, using the term supply chain can also be considered in light of large companies who have many branches in various countries. Coordinating material, information and financial flows for such a multinational company in an efficient manner is still a formidable task. Decision-making, however, should be easier, since these sites are part of one large organization with a single top management level. A supply chain in the broad sense is also called an inter-organizational supply chain, while the term intra-organizational relates to a supply chain in the narrow sense. Irrespective of this distinction, a close cooperation between the different functional units like marketing, production, procurement, logistics and finance is mandatory – a prerequisite being no matter of course in today's firms.

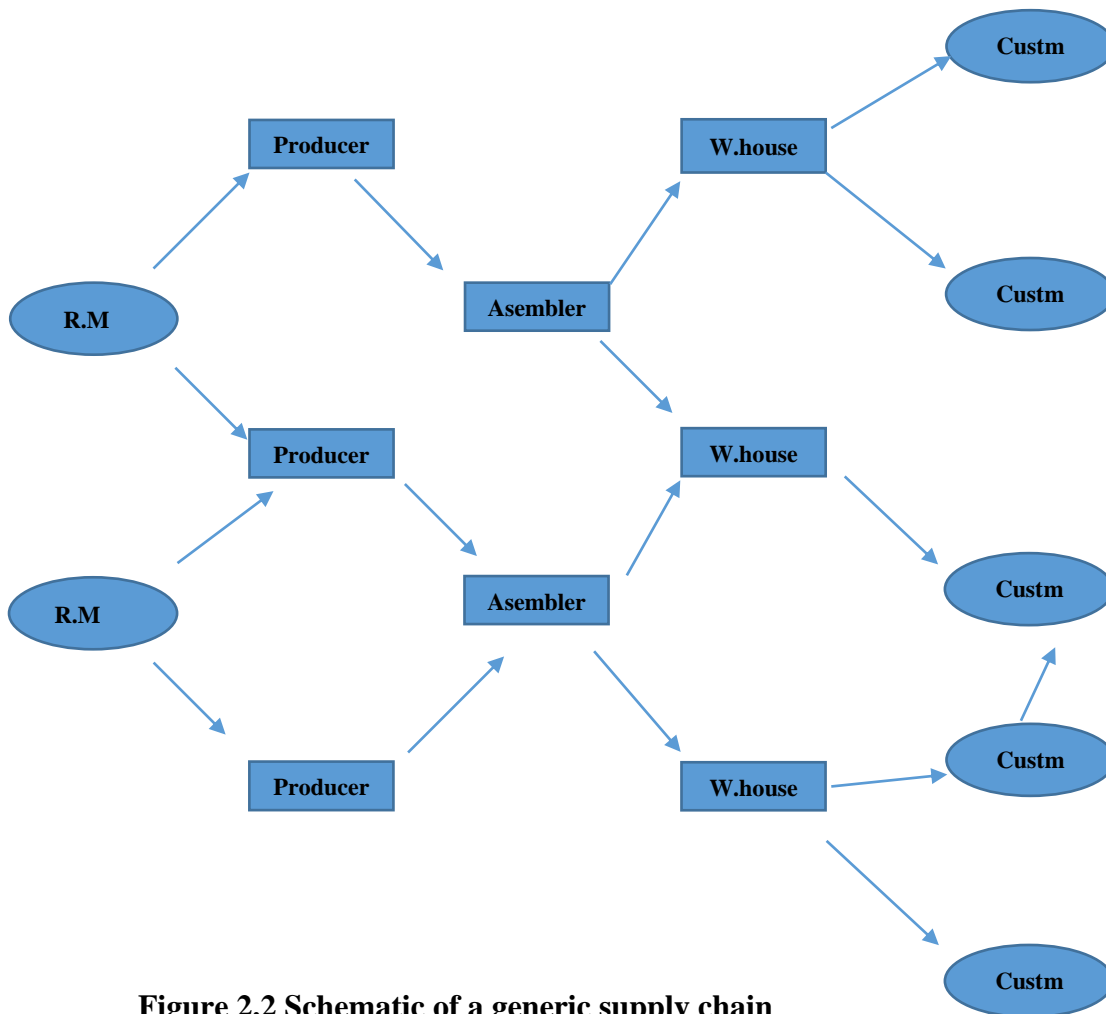


Figure 2.2 Schematic of a generic supply chain

Thomas,D.J and Griffin. Pm. (1996)

2.13 COLLABORATION RELATION WITH SUPPLY CHAIN MANAGEMENT.

Many key operations and supply chain activities require close collaboration with participants from other areas, such as marketing, engineering, and finance. Throughout this book (strategic supply chain management) it was emphasized the importance of cross-functional collaboration as well as collaboration with outside supply chain partners. Forecasting (Chapter 9) and inventory management (Chapter 11) are just two areas in which collaboration is essential for the process to work. Chapter 10, in fact, is devoted to sales and operations planning, an approach to planning that depends entirely

on collaboration and negotiation between operations, marketing, finance, and human resources in order to succeed. (Bozarth and Handfield, 2013). Improving collaboration among parties in the construction supply chain will enable easy management to prevent delays in construction of models of complex and large architecture and at the lowest cost eliminating majority of risks and wastage in order to provide value for money which in turn increases profits.

2.13.1 Construction Collaboration Tools

Many researchers seek to implement techniques, technologies and tools which reduce project duration and cost whilst improving quality, productivity, efficiency and effectiveness since the early 2000's., clients, a significant part of the construction supply chain, are requesting better value for money, higher-quality products, shorter construction periods and access to valid and up-to-date information at any time in the project life cycle within the dynamic construction industry. As asserted by, the partnership in a project requires those involved to interconnect in order to be aware of each other's activities. Successful and efficient sharing of knowledge, negotiation, coordination and management of activities is required when partnership exists. However, the construction industry is associated with the unstructured, dynamic and complicated nature of projects, their difficulties, threats and risks. Hence, the use of creative and intelligent ways for collaboration will be necessary to effectively overcome the mobile and information-intensive nature of construction projects. The significant potential tool to support the construction industry and its currently available collaboration tools such as desktops, internet networks, tablets, smartphones and laptops is the cloud computing tool. This research will therefore propose the implementation of cloud computing as a collaborative tool in the construction industry that could be utilized

by the supply chain parties and their project stakeholders. The next part of this research will present The concept cloud computing is present in the next part of this study.

2.13.2 Cloud computing as a collaborative tool in construction supply chain management

The significant elements in construction projects which can either obstruct or support the successful consequences on project objectives are quality, quantity and timing of information (Garza et al., 1998). Whereas, information delivery is the key to better management within the construction supply chain including the implementation of construction projects Construction is an information intensive industry (Anumba et al., 2008). It is also vital, for cost savings, efficient and effective decision making and a key for success. In order to overcome problems in construction management, modern project management approaches and tools have been evolved. Project management tools utilization in construction management has been widely known (Milosevic, 2003). All of these techniques and tools are a contributory factor for efficient and effective collaboration among parties in the construction industry parties.

The unstructured and dynamic nature of the construction projects, difficulties and hazards existed within the construction industry will necessitate the use of intelligent ways such as adapting the cloud computing to support the construction industry will go a long way to overcome the mobile and information and intense nature of construction projects. As opined by (Sosinsky, 2010), the new business model wrapped around new technologies, such as virtualisation, applications (Software as a Service (SaaS)), platform (Platform as a Service (PaaS)), and hardware (Infrastructure as a Service (IaaS)) is known cloud technologies. Therefore, the purpose of this research is to unravel the concepts and merits of the cloud computing application within the construction industry

and the merits of its application as a cooperative tool in supply chain management.

2.13.3 Building Information Modelling (A form of cloud computing)

The use of Building Information Modelling (BIM) in the last few years has been a particularly striking innovation. BIM has been shown to be useful in visualising construction processes and has helped risk managers foresee potential hazards to inform risk assessment and mitigation measures, reducing construction accidents and improving the safety of working environments. The literature reviewed on BIM reveals growing interest in developing countries (e.g. Adzroe, 2015; Monko and Roider, 2014), highlighting potential benefits that include reducing environmental impacts (Marzouk et al., 2017), providing a sharing information platform and accelerating the use of ICT (Chileshe and Kikwasi, 2014), and cost savings (Benrós et al., 2011).

In the time available for this review, we found few studies demonstrating the use of BIM in low- income countries, suggesting that there has been limited uptake of this technology. This conclusion is supported by other studies (Kuittinen and Kaipainen, 2011; Monko and Roider, 2014). However, it has been suggested by Aboushady and Elbarkouky (2015) and Monko and Roider (2014) that capacity building and training to introduce BIM technology to staff and provide the necessary facilities (i.e. software) may help increase its utilisation.

Modern methods of construction (MMC) and in particular offsite construction (the process of manufacturing a structure offsite in a factory under controlled conditions and thereafter transporting it to be assembled onsite) have the potential to transform the construction industry in LICs. Offsite construction provides a quality-assured process that can be completed quickly and safely and to budget to meet tight deadlines. The installation process presents less risk than traditional onsite approaches, is safer, has less environmental impact and reduces disruption on the site and can be subject to less

corruption. The literature on offsite construction, albeit from a relatively small number of studies identified in this review demonstrates potential benefits including the rapid provision of affordable mass housing (Cherian et al., 2017), time saving (Gunawardena et al., 2014), quality control, and advantage of manufacture and transition to a country under trauma (e.g. post-earthquake) Benrós et al. (2011). There is a perception that mass production ignores individual needs, but when used in conjunction with BIM, offsite construction can help to overcome this issue by engaging end users in the design phase to include individual and cultural needs (Vieira et al. (2017); Pour Rahimian et al., 2017).

How cloud computing improves supply chain

Analytics Capabilities Advancement-Previously, analysis of data gathering required both a data entry clerk and a person to conduct data analysis. The cloud, in concurrence with the Internet of Things, has enabled rapid collection of data from various resources and analysis of this data. As a result, businesses can eradicate these former “human” positions in favour of any service that achieves the same results on an exponentially faster scale. This ultimately allows the business to make better decisions for how daily activities perform.

Multiple Platform Integration- As companies began accessing SCM providers, many platforms were created in enabling changes. The unfortunate situation is that, most of the platforms failed to get united. Cloud technology on the other hand enables multiple platforms to co-exist through a series of standardized protocols. Old digital conflicts which prevented rapid order fulfilment and communications are now non-existent.

Geographic and Political Boundaries Removed-Physical and political boundaries in close relation to integration of systems are removed from the supply chain management viewpoint. Since many cloud hosts rely on common practices for accessing, storage, and

retrieval of cloud data, the same information may be altered from any place on the globe. The dissolution of political debates between business practices; although, the rules of governing entities may have the capacity to limit Internet access, such as was seen in Egypt in past years is allowed by cloud technology.

Security Measure Enhancement- Cloud hosts must abide by strict public perception and government privacy standards (financial and medical information), so the state-of-the-art security practices and measures offered by the cloud are useful and brought to the forefront for SCM. Interconnectedness allows for massive security monitoring and execution across all cloud-based digital planes while still maintaining communication and improving the flow of business practices.

Add IT Capabilities- Cloud provider agreements with supply chain management providers cut company needs for a full-fledged in-house IT department. Minimal in-house IT departments are still employed for physical in-house IT needs however. Most cloud hosts offer 24/7 business support for digital needs like e-commerce, companies must cover issues for buyers within the system day and night. By preference, service users can also redirect the necessary corrections of end-user problems without having to personally manage the process.

Making Market Volatility Adjustments-Damaging volatility is not new to US plants – SCM providers should stay conscientious of how to use resources in case of another economic collapse because, 10 years ago the worst market collapse since the Great Depression happened. An effective shield and hedge against instable markets is cloud technology. Partnerships are can also be negotiated again between cloud hosts and SCM providers. They can even be cancelled should sudden declines in the markets occur. Also, cost can be minimized in case of the collapse and maintenance of service at a competitive rate as a result.

Add Scalability-Cloud technology cushions owners from volatility in the markets as well as achieving a quick scalability. SCM provider may suddenly face upping production by factors of 5, ten, and beyond as success hits for a business and a higher demand arises. The strain each added order places for extra bandwidth and processing could be rectified by the cloud technology within a blink of an eye. Services or Terms can quickly extend SCM providers within their corresponding cloud hosting and cover instant demand growth with full capability. Beyond this, using cloud-based analytics, companies are able to separate crucial inefficiencies in their order fulfilment processes, which may result in growing the respective company even more.

Cost Reductions- The top cloud technology benefit for SCM providers is the operational expense reduction. Worker numbers and task hours can be diminished by cloud technology all through in supply chain. A report can be generated automatically of a specific warehouse's needed units, trigger a delivery of said units and log the units once received to utilize cloud. Minimizing order-processing man-hours allows workers to instead handle other physical supply chain areas. The benefits of lower security, IT, data analysis, and beyond is reaped by SCM providers.

How cloud computing can improve construction supply chain management

To trace and achieve inventory in real time, cloud computing has suggestively improved the supply chain to make provision for a real-time access to data from any location at all. An ERP (Enterprise Resource Planning) system is a cloud solution that will allow you to track inventory and demand changes in real-time and helps you to balance your stock levels to meet demands. In addition to this, one can automatically order equipment and materials needed to complete a project and this would go a long way to reduce waste and minimise errors, keeping the user both on budget and on schedule, thus is it cost and time effective.

Gain data insight- Businesses face a challenge of maintaining an effective collaboration between supply chain elements because information is usually held in silos. To solve this by facilitating forecasting and planning an intelligent supply chain software could be employed. Historical data can be used to enable accurate projections and account for resource fluctuations and labour shortages to be forecasted. Subsequently, with accurate inventory, purchasing and production planning, delays and waste which results in what matters most in any business revenue could be avoided.

Automate processes- According to Chris Mills, Smart systems are gradually infiltrating the supply chain and performing tasks previously carried out by humans. For instance, an ERP system can remove the need for laborious administration tasks, streamlining order processes and automating your purchasing. Through automation, one can free up time to focus on core business activities resulting in increased profits and efficiency, as well as reducing costs and waste.

Improve cash flow-An issue which keeps arising in the construction industry is late payments and the general lack of working capital and this poses a threat on the ability to deliver projects successfully. According to Suzanne Nichol MBE, Chief Executive of Build UK, stated that, a lack of cash flow influences behaviour and compromises performance all the way along. With ERP system such as NAV contracts you can accurately monitor committed, accrued and actual costs against budgets to identify possible slip-ups and ultimately improve cash flow.

Establish long-term relationships with all the members of your supply chain- A good relationships with suppliers, contractors and sub-contractors are fostered because it is crucial to the project success and client satisfaction. However, a lack of mutual trust and the subsequent lack of information sharing can go a long way to jeopardise and ultimately affect revenue and growth of a project. It is however prudent to outline the

potential risks involved in supply chain activities. This will enable individuals to prepare for different scenarios and build resiliency as well as minimising impact on their customers.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

This research looks at exploring how cloud computing can be used in improving supply chain management Ghanaian construction industry. In chapter two a critical review of previous literature on the subject with aim getting an insight in it. This chapter delves into the available choices in research methodology which can help give correct answers to the objectives. It starts with an overview of research paradigms and the various philosophical considerations as fundamental beliefs that affect the ways of conducting a research. The chapter will then look into the research approach and the various elements included in it. Such elements, includes, research method and technique, study setting, units of analysis, sampling techniques, and many others. The different methods and techniques used in data collection are also outlined. These include questionnaire survey.

3.2 RESEARCH PARADIGM/PHILOSOPHY

Research philosophy refers to epistemological, ontological and axiological assumptions and activities that provide a guide for an inquiry in a research study, obliquely or clearly. However, the failure to think through philosophical issues, which are not necessarily fatal, can seriously affect the quality of a research, which is central to the notion of research design (Easterby-Smith et al., 2003). Ontology and Epistemology are the two core philosophical dimensions that helps to determines the existing research paradigms (Saunders et al. 2009). Thurairajah et al. (2006) also explained that the research philosophy is mainly concerned with the premise that a researcher makes available in an investigation while positivist argue that the world exists externally and its properties should be measured through objective methods. Ontology relates to our idea and

understanding on the nature and what can be known about it (Guba and Lincoln, 1994). In other words, it can be explained as one's enquiry about nature and what he can know about. According to Crotty (1998), Ontology is the study of existence. From the statement of the above researchers, it can be deduced that, this type of the research philosophy talks about 'reality'. Things that known as real and in existence in the world. For instance, resources used in construction are known as real, which can be seen, touch and used.

Epistemology deals with the theory of knowledge, how it is achieved, understood and its use (Wahyuni, 2012; Grix, 2004). Researchers are of the view that by adopting a scientific approach, it will be possible to gather data and analyse them free from any unfairness to address the issues of the subject matter of this research (Yavuz, 2012). Epistemological deals with the production and development of knowledge through scientific approach. Guba and Lincon (1994) describe that epistemology position deals with asking question and establishing the relationship between the aspiring knower and what can be known?

From the above, this research will follow the positivist style where scientific approach will be use to collect and analyze data.

3.3 RESEARCH DESIGNS/STRATEGY

Research design are mainly to help the researcher recover significant suggestion with less effort, time and money (Kothari, 2004). Again, it is defined as a plan for a study which make available the overall framework for the collection of data (Leedy,1997). It is the measures used in collecting data for research. Research problems helps to determines the type of research design to be adopted, and for each research design, there are several

research methods that can be applied in collecting and analyzing the generated data from the investigations (Walliman, 2011).

These designs have been grouped into three types namely, Quantitative, Qualitative and mixed methods. However, the Qualitative and quantitative approaches should not be seen as polar opposites but instead, they show diverse ends on a continuum (Newman & Benz, 1998).

Quantitative approach uses scientific method with the initial study of theory and literature producing specific aim and objectives with proposition(s) and hypotheses to be tested and then verified or modified on the basis of the research findings (Phillimore and Goodson, 2004 cited by Paintsil, 2015). It is again explained by Weinreich, 2009, as methods from natural sciences that are designed to ensure objectivity, generalizability and reliability. This phenomenon is simply subject to mathematical logic. Quantitative is objective in nature. The objective of quantitative research is to develop and engage mathematical models, theories, hypotheses regarding the natural phenomena (Sarandakos, 2005). Accordingly, quantitative researchers have frequently sought to abstract the phenomenon which is being studied from the rest of the social world and to fix meaning within what might be described as a contextual vacuum (Phillimore and Goodson, 2004). Generally, quantitative approaches are used to address questions such as what, how much, how many? Quantitative approach will be used under this study. Data will be collected through self-administered questionnaires to research participant.

Qualitative approach is subjective in nature which aim at increasing the general understanding of situation. Research in situation such as this, is a function of researcher's insights and impressions (Kothari, 2004). They are social phenomenon that cannot be subject to mathematical logic. Knowledge in this approach are gain from the perspective of those involved. Qualitative data sources include observation and

participant observation, case studies, interviews and questionnaires, documents and texts, and the researcher's impressions and reactions (Bryman, 2004).

3.4 SOURCES OF DATA

There are two types of data collection namely the primary source of data collection and the secondary source of data collection. According to Walliman, (2011), Data comprises of information that serves as raw material for researchers to come to an end in the event being studied. They are collected from the original source by the researcher. They are mainly gathered to provide answers to research question or to meet the research objectives (Saunders et al., 2007).

Secondary data on the other hand are already collected and published data by someone else. They are in the form of journal, books of fact and figures from graduate personnel's. However, this research is going to use both primary data and secondary data. The primary data for the study will be the issue of questionnaires to obtain data on cloud computing from targeted respondents.

3.5 POPULATION AND SAMPLE FRAME

They are the larger group of people from which the research draws his sample. Population is described as the composition of all individuals of whom measurement is taken (Heckathorn, 1997). Again, Walliman (2011) is of the view that, a population does not state any number of people, units or elements but instead a total number of a particular type of people, units or cases relevant to the subject of a researcher. In this regard, the population for this study will be professional in the construction industry specifically the project managers, contractors and quantity surveyors. That is

stakeholders who are directly affected with cloud computing. In this study, construction firms in both Kumasi and Accra were regarded as the sample frame.

3.6 SAMPLE SIZE

Sample means taking a part of the population. Hence sampling can simply be defined as a portion of the actual population drawn to represent the remaining. It must however be noted that, sample size depends on the size of the population. It is generally stated that the larger the population, the smaller the percentage of that population the sample needs to be and vice versa (Naoum, 1998). If the population itself is relatively small, the sample should comprise a reasonably larger percentage of the population (Polit & Hungler, 1999). However, Taylor-Powel (1998) stated that sampling may not be necessary if the population under study is small. In this study, the population are large construction firms in Ghana. In Ghana, the large construction firms are known to be fewer compared to the small medium firms. These construction firms are scattered in these two capital cities, hence finding their actual total population was difficult. For that reason, purposive and snowball sampling technique was used to select construction firms who are working at these two cities. The snowball sampling was used for identifying respondents with rich information that are relevant to the study. In using this approach, the researcher contacted the most visible and easy to reach contractors operating in the metropolis for questionnaire administration. Response were taken from contractors, quantity surveyors and project managers who have been involved in infrastructural projects of each firm for about three years.

3.7 SAMPLE TECHNIQUE

The two main kinds of sampling technique identified and used by researchers are: Probability ‘sampling and Non-probability ‘sampling. Probability samples are used to simplify conclusions, as contrasting to, producing ideas, as with non-probability samples (Page and Meyer, 2000). Based on the design and practical nature of the research, probability sampling will be used to collect information relevant to the study. This technique allows the researcher to collect information randomly from it sample frame.

3.8 DATA COLLECTION

In view of the nature of the research, questionnaire will be more appropriate to collect information from respondent. Walliman, (2011) is of the view that, the most suitable instrument or tool to be used to collect quantitative data is a questionnaire (Walliman, 2011). Questionnaires are an inexpensive way to gather data from a potentially large number of respondents (Polgar & Thomas, 2005; Saunders *et. al.*, 2000; Oppenheim, 1996; Fellows & Liu, 2003). A questionnaire consists of a number of questions printed or typed in a definite order on a form or set of forms (Kothari, 2004). It is a popular method of collecting data adopted by research workers. In this study, the format adopted for the questionnaire are both closed ended and open-ended question. Closed ended questions restrict the respondent to select from stipulated alternative. On the other hand, the open ended allows the respondent to provide answers on their own. These questionnaires are formulated to provide answer to the aims, objectives and research question of the study. A good questionnaire consists of questions that elicit different types of information from respondents (Gall et al., 2003).

3.9 DATA ANALYSIS AND ANALYTICAL TOOL

Analysis as defined by the Cambridge advance learner's dictionary as the act of studying and examining something into details in order to discover more about it. Data analysis according to Strydom *et al* (2005), is explained as the process of searching for answers by means of interpreting collected data and results. The reason for data analysis is to breakdown raw data into a clear, simple and easy to understand form for the interpretation of result. Strydom *et al*, further explained that, raw data are difficult to explain hence it must first be described, analyzed and then results of analysis interpreted. This section will help find answers to research questions by the analysis of the quantitative data collected and the interpretation of result to help allow conclusion to be drawn.

For this study, information from respondent were gathered, grouped and enter into an analytical software called, Statistical Packages for Social Sciences (SPSS version 21). Analytical tool used for the analysis were Descriptive statistics, where the mean and medians of the various variables were determined and data presented on graph, charts and tables using MS excel.

3.10 CHAPTER SUMMARY

The main purpose of this chapter was to describe the research methodology involved in the gathering and collection of data for analysis. This chapter gives detailed information on the type of research strategy chosen and a description of the type of questionnaire which were used for the data collection. Analytical software used is the SPSS for data analysis with descriptive statistics as the analytical tool where emphasis was on the measure of central tendency.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS DISCUSSION

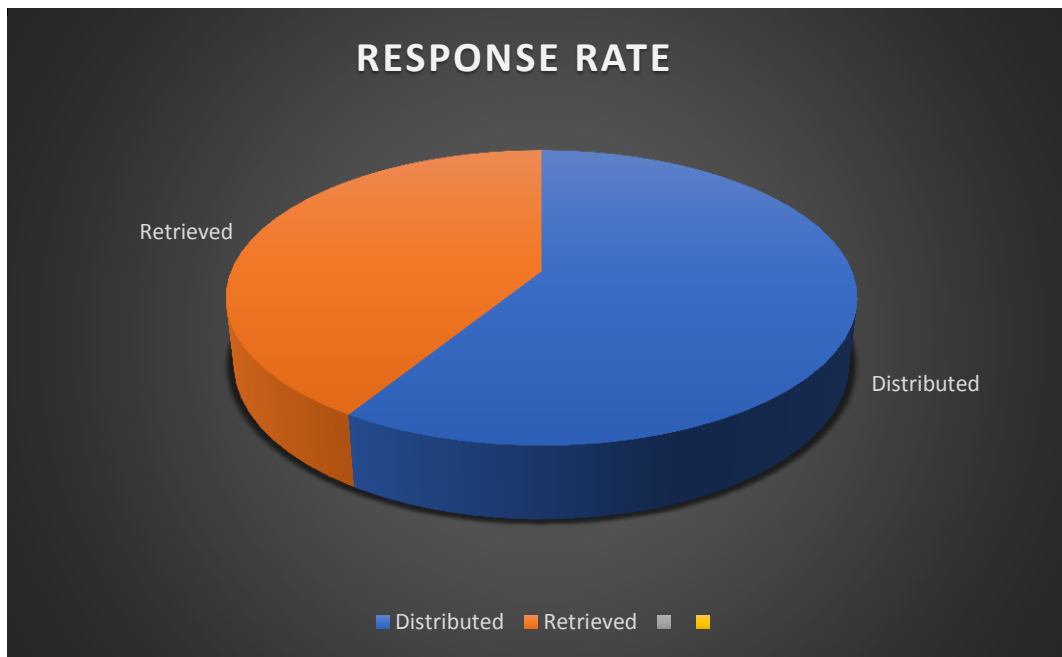
4.1 INTRODUCTION

This chapter shows the results and discussion of the field survey after the analysis of data retrieved from target respondent. The primary source of data gathered were from the various respondent, made up of the stakeholders involved in a construction project. These data were collected using closed and open-ended questionnaire. However, this section has been grouped into two main sections namely the respondent profile and objectives. The tool adopted for the analysis were the descriptive statistics and Relative Importance Index for ranking both parts. Statistical package for social sciences (SPSS) and Microsoft excel were equally adopted to derive the systematic analysis format. These analytical results are presented on tables and charts and are interpreted accordingly.

4.1.1 SURVEY RESPONSE

A 60-number questionnaire were distributed to the various professionals in construction firms both in Kumasi and Accra. Out of this number, 42 were retrieved indicating a high response rate of 70%. However, most of these questionnaires were self-administered and a few sent through online survey platform such as google document. Below is a graphical representation of the response rate for the survey.

Figure 4.1: Response Rate



Source: Field Survey, 2018

4.2 DEMOGRAPHIC DATA ANALYSIS (RESPONDENT)

This part of the questionnaire seeks to obtain the basic information of the various respondent to help determine the level of knowledge and experience of the respondent and to check also the understanding of the respondent on the research area. This helps the researcher in getting accurate data out of the surveys. It also helps the researcher to assess the credibility and reliability of the source of data gathered.

4.2.1 Respondent Field of Expertise

This is to identify the various professional background of the respondent and to ascertain that the right respondent responds to the questions. A respondent field determines the kind of information they will produce, this however influence the researcher's reliability on the information gathered.

Table: Illustration of the professional background of respondents

Table 4.1 Illustration of the professional background of respondents

Professional background			
		Frequency	Percent
	Architect	8	19.0
	Civil engineer	14	33.3
	Quantity surveyor	8	19.0
	Project manager	6	14.3
	Contract manger	6	14.3
	Total	42	100.0

Source: Field Survey,2018

The above table indicate that, all the 42 respondent who responded to the questionnaires were professionals from the various field in the construction industry. Out of the 42respondent, the highest number recorded was the civil engineer with a frequency of 14 representing a percentage of 33.3% followed by the quantity surveyor with a frequency of 8 representing 19%. Project manager and contract manager recorded the same frequency of 6 representing a 14.3% each.

4.2.2 Familiarity with Cloud Computing

In order ascertain the understanding of the respondent on the research study so as to retrieve accurate information from the respondent. This part of the questionnaire needs to be answered by the various respondent. How familiar the respondent is with cloud

computing will determine their experience and the level of knowledge they have about it.

Thus, making the inclusion of the section in the demographic necessary.

Table 4.2 Familiarity with cloud computing

Familiarity with cloud computing			
		Frequency	Percent
	Fair idea	25	59.5
	slightly familiar	17	40.5
	Total	42	100.0

Source: Field survey 2018

From the above table, the level of familiarity with clouding computing among the respondent were low. The familiarity of respondent with clouding computing from the table shows that, majority of the respondents had a fair idea on the research area with a frequency of 25 representing a percentage of 59.5 and a frequency of 17 representing 40.5% were slightly familiar with it.

4.2.3 Duration in the Professional Practice

This helps to determine the level of experience in the respondent in his/her professional practice. The duration of a respondent in his/her field of practices demonstrate his level of knowledge in the various construction activity.

Table 4.3 Duration in professional practice

Duration in professional practice			
		Frequency	Percent
	less than 6years	27	64.3
	6-10years	10	23.8
	greater than 10	5	11.9
	Total	42	100.0

Source: Field survey,2018

From the above table, it could be deduced that majority of the respondent had practiced their profession for less than 6 years recording a frequency of 27 which represent 64.3% of the total. This was followed by 6-10 years of experience with a frequency of 10 representing a percentage of 23.8. Respondents with 10 years and above experience represented 11.9% of the total with a frequency of 5.

4.2.4 PUBLIC PROJECT UNDERTAKEN

The number of public project undertaken with the last year will help the research to understand and note the frequency with which the respondents firm execute public project.

Table 4.4 Public project undertaken with the last year

Public project undertaken with the last year			
		Frequency	Percent
	1-5 project	42	100.0

Source: Field survey,2018

All the respondent from the survey according to the study undertook public project between 1-5 the past year.

4.2.5 Usage of Project Management Software

This part of the respondent profiles tries to figure out if cloud computing is being used by any of the firm's project management term. This helps to determine the level of knowledge of the respondent in the research study.

Table 4.3 Usage of project software/tool

Usage of project software/tool				
		Frequency	Percent	
Valid	No	42	100.0	

Source: Field survey,2018

From the above table, it was captured that all the respondents of the survey do not use any project management software/tool during a project.

4.3 AWARENESS OF CC IN THE GHANAIAN CONSTRUCTION INDUSTRY

Cloud computing has been described as a new development in the information technology arena (Yang et al, 2011). From the literature, it could be noted that, cloud computing is at its infancy in the Ghanaian construction industry. Many construction firms are not knowledgeable in cloud computing. (Senyo et al,2015), was equally of the view that, the cloud computing industry is in its infancy in Ghana and the awareness and

adoption of cloud computing is still at a low stage. This part of the section to identify if really cloud computing is known by the Ghanaian construction industry. The Likert scale was ranked as follows: 1-strongly disagree, 2-disaggre, 3-neutral, 4-agree and 5-strongly agree. Descriptive statistics were the analytical tool adopted for this objective. This tool was used to rank the variables on the bases of priority.

Table 4.4 Descriptive Statistics

Descriptive Statistics						
	N	Minimum	Maximum	Mean	Std. Deviation	Ranking
Effective decision making	42	3	5	4.33	.687	1st
Construction is an information intensive industry	42	3	5	4.29	.673	2nd
Collaboration guarantees higher chance of success of projects	42	3	5	4.19	.707	3rd
construction resources are effectively utilized	42	2	5	4.07	.921	4th
Supply chain management must improve productivity	42	3	5	4.00	.855	5th
Frequent fragmentation of construction	42	2	5	3.93	.838	6th
Rise of mobile device usage on site	42	2	5	3.71	.864	7th
Offsite construction is more efficient relative to in situ construction	42	2	5	3.67	1.162	8th
Construction activites are widely dispersed	42	2	5	3.57	.887	9th
site locations are frequently changed	42	1	5	3.40	.989	10th

Source: Field survey,2018

4.3.2 Discussion of Result

From the above display, it is noted that the respondent ranked effective decision making as the first awareness factor with a mean score of 4.33 and a standard deviation of 0.687. The awareness of cloud computing can be made known through effective decision making. According to the views of the respondent displayed above, effective decision making using CC can increase the level CC awareness among the construction firms in Ghana. Construction as an information intensive industry was ranked second with a mean score of 4.29 and a standard deviation of 6.73. Rendering to the views of the respondent, the construction is an information intensive industry hence a system such as CC is needed. The information intensive nature of the industry can contribute to making the cloud computing known in the industry. Collaboration guarantee higher chances of success on a project was the variable ranked as third according to the views of the respondent with a mean score of 4.19 and a standard deviation of 0.707. (Garza et al, 1998) The important elements in construction project are explained to be quality, quantity and timing of information can either hamper or assist the successful consequences on project objective. The construction industry is made up of a number of stakeholders hence an effective collaboration among these stakeholders assisting a successful project can help in creating awareness in the construction industry. Effective utilization of construction resources was also ranked forth with a mean score of 4.07 and a standard deviation of 0.921. Respondent were of the view that the effective utilization of construction resources on a construction project through cloud computing would equally help in the awareness creating among the construction industry. Supply chain management improving productivity, frequent fragmentation of construction, the rise of mobile device usage on site, Offsite construction, the dispersed nature of construction activities and the frequent change of construction site where ranked 5th,6th,7th,8th,9th

and 10th. These according to the respondent will also help in awareness of CC but not as intensive as the first four.

4.4 BENEFIT OF CC TO THE GHANAIAAN CONSTRUCTION INDUSTRY

Cloud computing is a concept which minimizes the cost and efforts required in managing a project data, resources, schedule and work progress. According to Voorsluys et al, (2011), Cloud computing is a new paradigm which offers a huge amount of compute and storage resources to masses. The above explanation outlines some of the benefit of CC to the construction industry. These variables were subjected to Relative Importance Index for the analysis.

Table 4.5 Illustrate the benefits of cloud computing

		Frequency of rank					TOTAL	ΣW	MEAN	RII	RANKING
NO.		1	2	3	4	5					
	RESPONDENTS VIEW										
	Resource usage can be monitored, controlled and reported, creating transparency	0	0	5	13	24	42	187	4.452	0.89	1st
	Cloud computing present financial benefit to a project	0	0	5	13	24	42	187	4.452	0.89	1st
1	cloud solution will enable multiple project management	0	0	8	12	22	42	182	4.33	0.866	2nd
2	Mobile device is offering great value	0	0	3	22	17	42	182	4.33	0.866	2nd
3	Cloud computing would encourage faster flow of information across organization	0	0	11	11	20	42	177	4.21	0.842	3rd
4	Offsite construction reduces time	0	2	6	16	18	42	176	4.19	0.838	4th
5	Collaboration construction	0	0	2	31	9	42	175	4.166	0.833	5th
6	Cloud solution will extend project visibility	0	0	3	30	9	42	174	4.142	0.82	6th
7	Offsite construction a solution to post disaster construction	0	0	6	27	9	42	171	4.071	0.814	7th
8	Cloud provides freedom and ease access	0	0	22	11	9	42	155	3.690	0.738	8th

Source: Field survey,2018

4.4.1 Discussion of result

The above table indicate some of the benefits derived from cloud computing and the ranking of these benefit based on the respondent's view. Resource usage can be monitored, controlled and reported, creating transparency and Financial benefit to project by using cloud computing was ranked as first by the respondent with a mean of 4.45 and a standard deviation of 0.89. According to the respondent the usage of resources can be properly observed, controlled and recorded if CC is used in the construction industry. This in the long run will ensure transparency hence increasing the financial benefit on a project. The variables ranked second are the usage of cloud solution to manage multiple projects and the great value offered by mobile devices with mean score of 4.3 and a standard deviation of 0.87. The respondent was of the view that, cloud solution can be used to manage multiple project when effectively utilized. They were of the view that these systems offer great value on project. The third ranked variable was the encouragement of faster flow of information across organization with a mean score of 4.21 and standard deviation of 0.843. They were also of the view that, cloud solution can encourage the faster flow of information across organization leading to productivity of works. This industry has been established as information intensive area hence well and faster circulation of information will help improve productivity. The 4th, 5th, 6th, 7th and 8th ranked variables are offsite construction reduces the needed time for construction, collaboration construction provides significantly faster construction times, the extending of project visibility through cloud solution, offsite construction a solution to post disaster construction and lastly providing freedom and ease access to information at anytime, anywhere with mean score of 4.19, 4.166, 4.14, 4.07 and 3.69.

4.5 STRATEGIES FOR IMPLEMENTING CC IN THE GHANAIAN CONSTRUCTION

Due to the low usage of cloud computing in the construction industry, some strategies implementation can foster its growth in the various construction firms in Ghana. Some strategies were identified in literature. Respondents were asked to rank the ten variables that can assist in implementing cloud computing in the Ghanaian construction industry according to the level of severity. This was done on a Likert scale of 1-5 where 1-strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-strongly agree.

4.5.1 Relative Importance Index

The variables relating to the strategies collected from the field were subjected to Relative Importance Index for analysis. The mean score and the RII values were all computed and results presented in a table below.

Table 4.6 Illustration of mean score and RII ranking of strategies

		Frequency of rank					TOTAL	ΣW	MEAN	RII	RANKING
NO.		1	2	3	4	5					
	RESPONDENTS VIEW										
1	Education on the cost benefit cloud solution presents to projects	0	0	10	10	22	42	180	4.28	0.85	1st
2	Enable the organization to be able to benchmark its performance	0	0	9	13	20	42	179	4.26	0.85	2nd
3	Enable early supplier involvement in any project	0	0	4	25	13	42	177	4.21	0.84	3rd
4	Creating awareness of the impact cloud solution present to suppliers in the competitive market	0	0	7	25	10	42	171	4.07	0.81	4th
5	Train staff and supplier on how to use the cloud	0	0	5	30	7	42	170	4.04	0.80	5th

6	Status report given at every stage of the project	0	0	9	23	10	42	169	4.02	0.80	6th
7	Enable the organization develop suppliers	0	0	16	15	11	42	163	3.88	0.77	7th
8	Policies should be made for the use of cloud computing since its usefulness has been realized	0	7	2	23	10	42	162	3.85	0.77	8th
9	Easily find and access information when needed	0	4	7	25	6	42	159	3.78	0.75	9th
10	Ultimate control over information	0	2	16	22	2	42	150	3.57	0.71	10th

Source: Field survey,2018

4.5.2 Discussion of results

From the table above, the strategy ranked first by the respondent was the cost benefit cloud solution present to the project with a mean of 4.28 and a standard deviation of 0.85. According to them, if more benefit is reaped from a project using cloud solution, it can easily convince the industry of its usage hence promoting it. Enable the organization to be able to benchmark its performance was ranked as second with a mean of 4.26 and a standard deviation of 0.85. When cloud computing is used and productivity increases, a firm is able establish a benchmark for its performance to detect when productivity is low.

This according to the target respondent, one effective strategy of implementing cloud computing is the ability to establish a benchmark for performance. The early involvement of suppliers in any project was ranked third with a mean score of 4.21 and a standard deviation of 0.843. Again, respondents are of the view that the usage of clouding solution will help engage suppliers at the inception of the project hence ensuring efficiency and timely delivery. This can motivate stakeholders in using this system, therefore has been recognized as one of the strategies in aiding the implementation of cloud solution. Creating awareness of the impact cloud solution present to suppliers in the competitive market, companies must train staff and suppliers on how to use the cloud, enable organization to develop suppliers, policies should be made for the use of cloud computing since its usefulness has been realized, ensures that team members can easily access information when needed and lastly ultimate control over information are equally variable identified as strategies for implementing cloud solution and ranked according to the respondents as 4th, 5th, 6th, 7th, 8th, 9th and 10th respectively with mean scores of 4.07, 4.04, 4.02, 3.88, 3.85, 3.78, and 3.57.

4.6 CHAPTER SUMMARY

In a nutshell, this chapter basically talked about the results from the survey conducted with little discussion on the respond rate and further proceeded to discuss the actual views of the target respondents on cloud solution. Their knowledge of it, benefits that can be derived from its usage and crowned it with strategies of implementing it in the Ghanaian construction industry due to its limited knowledge on it.

CHAPTER FIVE

RECOMMENDATION AND CONCLUSTION

5.1 INTRODUCTION

This research was carried out to explore how cloud computing can be used in improving supply chain management in the Ghanaian construction industry. The research was grouped into five sections for better understanding. The first chapter talked basically about the background of the research area. With the researcher identified gaps in literature based on it stated his aim and objective followed by scope of his study, identified research methodology, justification of the study and finally the organization of the thesis.

The second part of the research study was the literature review which composed of existing literature aiding the researcher the to know what other researchers, authors and scholars have discussed concerning the research area. A number of articles, books, and journals were read by the researcher to aid him in discussing their views on clouding computing as a mechanism for improving supply chain management in the Ghanaian construction industry.

The third chapter was pointed towards satisfying the objectives of the researcher. It basically explained the selected method for gathering data, how the sample size was derived, a description of the adopted analytical tool and its coding when questionnaires have been received.

The forth chapter discussed the analyzed data into details using the various tools analysis that best fit the listed objectives. The last chapter comprises of the main issues discussed in the study by giving a brief on the various objectives followed by a main conclusion to the research study. It finally ends with a recommendation and future research based on limitations conclusion of the study.

5.2 CONCLUSION

The main aim for the research was to explore how cloud computing can be used in improving supply chain management in Ghanaian construction industry. Three objectives were formulated in order to obtain the main aim of the study. Based on the analysis, the obtained objectives are discussed below.

5.2.1 Objective One

To identify awareness factors of the cloud computing practices in the Ghanaian construction industry.

Extensive literature was pertaining to this objective was reviewed check and understand the views of scholars on this objective. This was done to obtain this objective and in the long run the main aim for this study. Ten variables were identified in all and targeted respondent were asked to rank order of severity. The Likert scale was adopted where 1-strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-strongly agree. Descriptive statistics was used to derive the mean and ranked in order of priority. After the analysis, the three main awareness factors identified was: effective decision making, construction as an information intensive industry and collaboration guarantees higher change of success of projects. From this the respondent were of the view that these variables can help in creating awareness of cloud computing in the Ghanaian construction industry.

5.2.2 Objective Two

To highlight the competitive advantage of adopting CC presents to the future construction project.

For this second objective, several literatures concerning the benefits of cloud computing to future construction project were reviewed and the most pressing ones identified and

taken. Ten variables were taken in all and ranked by the respondent in order of severity. The analytical tool used was the Relative Importance Index to determine the most pressing variables among the ten. After the analysis, it was realized that: resource usage can be monitored, controlled, controlled and reported, creating transparency, cloud computing present financial benefit to a project and lastly cloud solution will enable multiple project management were the three-main listed benefit according to respondents are derived from the use of cloud computing.

5.2.3 Objective Three

To determine strategies for implementing CC within the construction supply chain in Ghana.

With this third objective also, the relevant literature pertaining to it was reviewed thoroughly to identify the various strategies for implementing cloud computing within the construction supply chain in Ghana. Ten variables were identified and ranked by the respondent by the order of severity. Relative importance index was used again for this analysis to determine the level of severity of all the variables. After the analysis, it was noticed that the variables ranked as most strategic were: Companies must be educated with proof of figures the cost benefit cloud solution present to project, cloud computing would enable the organization to be able to benchmark its performance and cloud computing would enable early supplier's involvement in any project. These variables were ranked as the top three strategies in implementing cloud computing.

5.3 CONTRIBUTION TO KNOWLEDGE

The main aim for the was to explore how cloud computing can be used in improving supply chain management in the Ghanaian construction industry. This was due to the gap identified in literature in which several researchers have observed that cloud computing is at its infancy in Ghanaian construction industry especially and this system can help improve the supply chain management of Ghanaian construction industry.

Generally, it has been understood from the analysis that, clouding computing are in their infant stage in Ghanaian construction industry especially. It was deduced that cloud computing is not well known in the local industry but nevertheless its awareness can be enhanced through some factors such as effective decision making and many others. The study went further to identify and explain some benefits to be derived from the use of cloud computing. benefits such as resources monitoring and control hence ensuring transparency in construction activities.

So therefore, the study has brought to light some benefit to be derived from cloud computing in the construction industry when well utilized.

Lastly, the study has helped identify some strategies in aiding the implementation of cloud computing in supply chain management for its improvement.

5.4 RECOMMENDATION

In other improve supply chain management, one system that should be looked at by the construction industry is cloud computing which based on the study has lots of benefits that can be derived by the industry. Due to the information intensive nature of the construction industry, a system such as cloud computing which helps in the faster flow of information should be put be utilized. The awareness factors listed and explained in

the previous chapter should be used to create awareness amongst the various construction firms.

Also in relation with the third objective, the identified strategies such as educating based on proof figures on the cost benefit of using cloud solution and many others. These strategies when properly implemented will contribute tremendously to the productivity of supply chain management in the construction industry.

5.6 RESEARCH LIMITATION

The major limitation encountered in this study was data collection and sample size determination. In this study, the targeted population for the survey was professionals of the various construction companies. However, it was difficult getting them due to the pressure intensive nature of the construction industry. Also locating these firms and construction site was a major due to the dispersed nature of site and the firms. Hence a qualitative method was adopted. Again, the professionals in the industry were my main target respondent and getting them to answer questionnaires was a difficult task. This is as a result of their busy schedule and this resulted in the difficulty of retrieving data from the respondents. But the few who made time to answer the questionnaires were of great help to the study.

Also, some difficulties were encountered in analyzing the collected data as some of the analytical tools were new and complex to understand.

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KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BUILDING TECHNOLOGY

MSc. CONSTRUCTION MANAGEMENT

The role of cloud computing in Improving supply chain management in the

Ghanaian Construction Industry

This study is being organized as part of an academic requirement for the award of MSc in Construction Management. This is also to encourage a successful implementation in the construction industry.

The information obtained from this survey shall be kept anonymous and completely confidential. Only findings in aggregate form will be submitted to the relevant authorities.

Your participation in this survey will be much appreciated.

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QUESTIONNAIRE

CLOUD COMPUTING: “Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction”. (NIST, 2009)

In other words, Cloud computing refers to a series of processes to be undertaken in the act of providing Information Technology (IT) solutions to problems faced in organization through the internet.

BACKGROUND OF RESPONDENTS

Please provide the correct information by ticking (✓) the appropriate box and fill in the blank spaces where necessary.

1) Kindly indicate your professional background.

a.() Architect

b.() Civil engineer

c.() Quantity surveyor

d.() Project manager

e.() Contract manager

If other's), please specify.....

2) Please indicate by ticking (✓) on a scale of 1-5 how familiar you are with cloud computing, 1 being not familiar at all and 5 being very familiar.

1 (No Idea), **2** (Fair Idea), **3** (slightly familiar), **4** (familiar) and **5** (Very familiar)

1	2	3	4	5

3) How long have you been in your professional practice?

- a. () < 6 years
- b. () 6 – 10 years
- c. () > 10 years

4) Kindly indicate the number of public projects you have undertaken within the last year?

- a.() 1 – 5 projects
- b.() 6 – 10 projects
- c.() 11 – 15 projects
- d.() 16 and above.

5) Does your company use any Project management software / tools?

- a.() Yes
- b.() No

If yes, specify

AWARENESS OF CC IN THE GHANAIAN CONSTRUCTION INDUSTRY

In your opinion, please rate (✓) your level of agreement on the Awareness of CC in the construction Industry, with **1** (strongly disagree), **2** (disagree), **3** (neutral), **4** (agree) and **5** (strongly agree)

AWARENESS		1	2	3	4	5
1.	Construction is an information intensive industry					
2.	Decisions critical to management are quickly and effectively made					
3.	Supply chain management must improve productivity					
4.	Collaboration guarantees a higher chance of success of projects.					
5.	Offsite construction is more efficient relative to on site construction.					
6.	Construction activities are widely dispersed					
7.	There is a rise in mobile device usage on site.					
8.	Site locations are frequently changed					
9.	Construction resources are effectively utilized					
10.	There is frequent fragmentation of construction team					

For any further remarks

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BENEFITS OF CC TO THE GHANAIAAN CONSTRUCTION INDUSTRY

In your opinion, please rate (√) the level of Awareness on CC in the construction Industry, with **1** (strongly disagree), **2** (disagree), **3** (neutral), **4** (agree) and **5** (strongly agree)

BENEFITS		1	2	3	4	5
1.	Offsite construction reduces the time needed for construction					
2.	Offsite construction can be a solution to post-disaster construction because of its modular and prefab construction.					
3.	Collaborative construction provides significantly faster construction times.					
4.	Mobile devices are offering great value to construction companies					
5.	The cloud provides freedom and ease to access information anytime, anywhere					
6.	Cloud solutions will extend project visibility.					
7.	Cloud solutions will enable multiple project management from any location.					
8.	Resource usage can be monitored, controlled and reported, creating transparency					
9.	Cloud computing presents financial benefits to a project					
10.	Cloud computing would encourage faster flow of information across the organization.					

For any further remarks

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**STRATEGIES FOR IMPLEMENTING CC IN THE GHANAIAN
CONSTRUCTION INDUSTRY.**

In your opinion, please rate (✓) the level of significance on the strategies for implementing CC, with **1** (strongly disagree), **2** (disagree), **3** (neutral), **4** (agree) and **5** (strongly agree)

STRATEGIES		1	2	3	4	5
1.	Companies must be convinced that cloud providers have ultimate control over who sees their information.					
2.	Cloud solutions should ensure that team members can easily find and access information when they need it the most.					
3.	Companies must be educated with proof of figures the cost benefits cloud solutions present to projects.					
4.	Clients as well as project stakeholders must be given a status report at every stage of a project.					
5.	Companies must train staff and suppliers on how to use the cloud					
6.	Cloud computing would enable early supplier involvement in any project					
7.	Cloud computing would enable the organization develop suppliers					
8.	Cloud computing would enable the organization to be able to benchmark its performance					
9.	Policies should be made for the use of cloud computing since its usefulness has been realized.					
10.	Creating awareness of the impact cloud solutions present to suppliers in the competitive market.					

For any further remarks

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