

UNIVERSITY OF EDUCATION, WINNEBA
COLLEGE OF TECHNOLOGY EDUCATION, KUMASI

**THE IMPACT OF E-BUSINESS ON PERFORMANCE OF CONSTRUCTION
FIRMS IN THE KUMASI METROPOLIS**

FRANK KORMLA SESI

AUGUST, 2018

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**A Dissertation in the Department of CONSTRUCTION AND WOOD TECHNOLOGY
EDUCATION, Faculty of TECHNICAL EDUCATION, submitted to the School of
Graduate Studies, University of Education, Winneba in partial fulfillment of the
requirements for the award of Master of Technology (Construction) degree.**

AUGUST, 2018

DECLARATION

STUDENT'S DECLARATION

I, Frank Kormla Sesi, declare that, this Project, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE:

DATE:

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Project as laid down by the University of Education, Winneba.

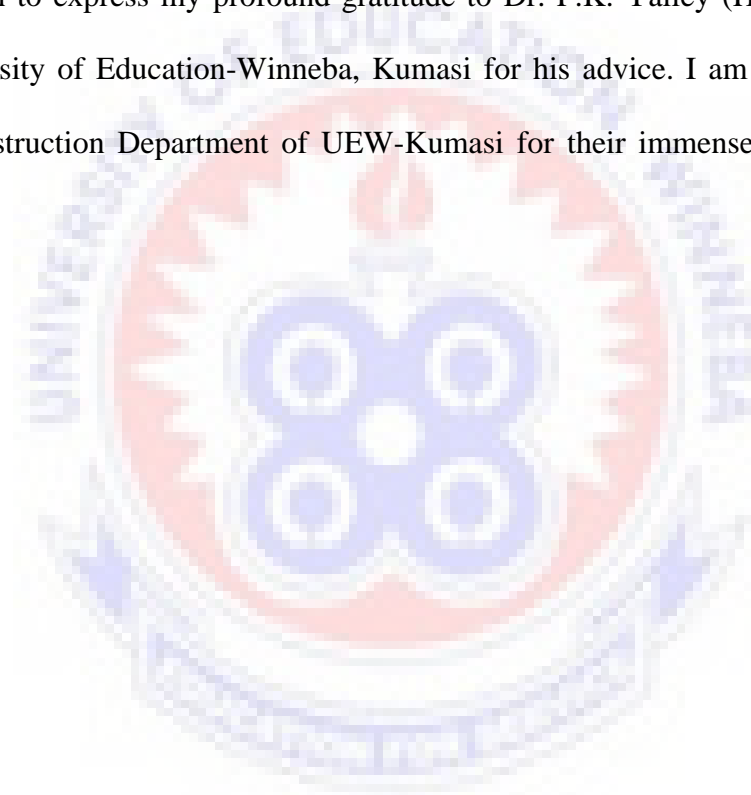
NAME OF SUPERVISOR: PROF. ING. NICHOLAS KYEI-BAFFOUR

SIGNATURE

DATE:

ACKNOWLEDGEMENT

I am highly indebted to my supervisor, Prof. Ing. Nicholas Kyei-Baffour for his patience during the study. I equally wish to express my profound gratitude to Dr. P.K. Yalley (Head of Construction Department), University of Education-Winneba, Kumasi for his advice. I am most grateful to all lecturers at the Construction Department of UEW-Kumasi for their immense contribution to my academic life.



DEDICATION

This work is dedicated to my wife, Mrs. Rosemary Sesi, my son, Benedict Fafali Sesi and daughter, Franklina Seyram Sesi for their love and support.

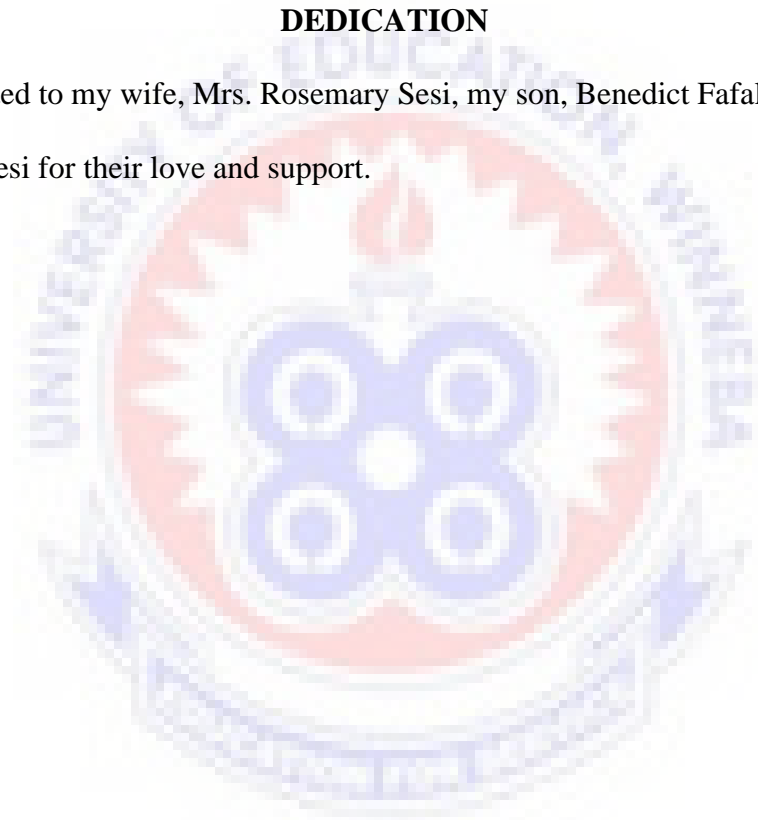




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ABSTRACT

The use of Information Communication Technology on construction activities has gained prominence in recent times due to the rise in innovative ways to execute task electronically which e-business is no exception. This study sought to examine the impact of e-business on performance of construction firms using Kumasi Metropolis as the case study. Purposive and stratified sampling techniques were adopted for selecting the sample size of 268 (employees and contractors) out of which 204 responded. Questionnaire and interview guide served as the

main data collection instruments for the study and results were analysed using descriptive and inferential statistics. The study found that e-business was not effectively accepted and utilized by most construction firms though there some little patronage of the system for performing transactions. It was established that e-business has led to saving of time and collaboration with stakeholders through effective communication and cost saving approach in construction activities. Some challenges enumerated by most respondents were lack of security and trust in transacting business online, lack of technological expertise and inadequate training organized for employees. Despite these challenges, careful and effective e-business systems were found to have led to construction firms gaining competitive advantage, increased transactional speed and eliminates many manual activities and enhance efficiency in conducting construction business processes. It is appropriate for construction industry of Ghana to promote and create adequate awareness on e-business and its related significance. This will help inspire confidence in construction firms' owners and management to adopt e-business practices.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Technological issues within construction have become ever more critical and ranging debates among researchers and construction industry professionals are still underway at different levels within the construction sector. For example, Smyth (2010) pointed out that, there have been several innovative initiatives within construction in many countries in the last two decades to introduce technological reforms to improve industry performance. Bhutto, Thorpe

and Stephenson (2005) emphasized that e-business has become a household name over the past few years, partly due to the phenomenal growth of the internet and advanced electronic communications. Various new business models and approaches for e-business have appeared and are now being embraced, representing a digital economy to replace the industrial economy of the last century.

For traditional business around the world, e-business has sometimes been perceived as an opportunity or a threat. The rapid emergence of dot com culture has forced traditional big businesses, including construction organisations, to seriously consider e-business solutions as part of their business operations. While the construction industry plays an important role in the well being of the economy, the traditional image of the construction industry has often been one of an under-developed industrial sector. The emergence of e-business may therefore have the potential of bringing construction on par with other developed industries (Bhutto et al., 2005). Business embraced ICT provides an edge in competition and time to market, where business transactions can be carried out on a global basis. This is possible in the field of construction industries also which paves way for the economic growth of the country (Cherian & Kumaran, 2016).

E-business adoption by the construction industry has been of particular interest given the potential for technology to increase efficiency and competitiveness in such a traditional sector. However, the analysis of the opinions collected across project owners, designers, engineers, contractors, and suppliers has shown that the adoption rate of ICT in the construction often lags behind other sectors such as advanced manufacturing and commerce. In addition,

previous research indicates that the use and application of information and communications technology (ICT) provides a better understanding of technological development and innovation in the industry (Bowmaster, Rankin & Perera, 2017). It is widely recognised that business and social trends are driving the construction industry through a period of radical change. Indeed in the face of increasing challenges to reduce project cost coupled with the increasing technical complexity of projects; all create a demand for the integration of construction project information (Sekou, 2012).

E-business involves the fundamental reengineering of the business model into an Internet based networked enterprise. The difference in the two terms is the degree to which an organization transforms its business operations and practices through the use of the Internet. It is well known that computers increasingly and successfully support design and construction. From this seems logical to support their communication with computers also. With the introduction of computers and computer applications, a big quantity of information has been generated, related to projects, company, and in general with all of the construction process. Unfortunately, the communication between project participants has not been developed at the same trend. For this to be possible, it is imperative to have hardware and software implementations conforming a body of standards that permit free and easy access to multiple vendor solutions. This means, to make use of open systems (Addo, 2012; Cabellero, 2003).

1.2 Statement of the Problem

Through successful e-business application, business is simplified to provide better, faster services to the customers as well as suppliers. It also would lead to less corruption, increased transparency, greater convenience, revenue growth, and operational cost reduction. These are

only few of the advantages that e-business might bring if it is implemented. E-business offers such great benefits that will totally change the way business is handled. However, even though e-business has been known to result in wealth of benefits, the user's adoption of it is still not at a promising level due to the lack of proper knowledge, education and skilled owner managers and employees within the industry or termed as “skills access” barrier. This is the realistic view in some settings and what factors could eclipse this level of e-business adoption in some particular settings?

Evidence from literature suggest that despite the novelty and the little use of e-business application within the construction industry in developed economies, there is a strong link to substantial research in the sector (Aranda-Mena & Stewart, 2004; Chen *et al.*, 2011). On the other hand, empirical evidence on e-Business in construction in developing countries is scanty. Therefore, there is the need for developing countries construction industries like Ghana to reform technologically and take advantage of the opportunities offered by e-business in order to attract the needed investment from their counterparts from developed countries. It against these arguments that the study seeks to assess the impact of e-business on construction firms in the Kumasi Metropolis.

1.3 Purpose of the Study

The purpose of this study was to examine the extent to which construction firms adopt e-business in their operations, challenges confronting the firms and its impact.

1.4 Objectives of the Study

The study seeks to achieve the following objectives:

1. To identify the extent to which construction firms in Kumasi Metropolis adopt e-business in their operations.
2. To examine challenges confronting construction firms in adopting e-business in their operations.
3. To assess the impact of e-business on operations of construction firms in the Kumasi Metropolis.

1.5 Research Questions

The study seeks to answer the following research questions:

1. What is the extent to which construction firms in the Kumasi Metropolis adopt e-business in their operations?
2. What challenges confront construction firms in adopting e-business in their operations?
3. What are the impact of e-business on operations of construction firms in the Kumasi Metropolis?

1.6 Scope of the Study

The study focused on only construction firms within Kumasi Metropolis. Some core issues raised in this study comprised of e-business adoption in construction activities, reasons for the adoption, challenges and impact that it has on the firms.

1.7 Significance of the Study

The study is expected to add knowledge to existing literature on e-business adoption in the construction industry. Recommendations from the study will enhance stakeholders understanding of measures that can be undertaken to promote effective utilisation of e-business systems in construction firms. The study will help policy makers in taking good

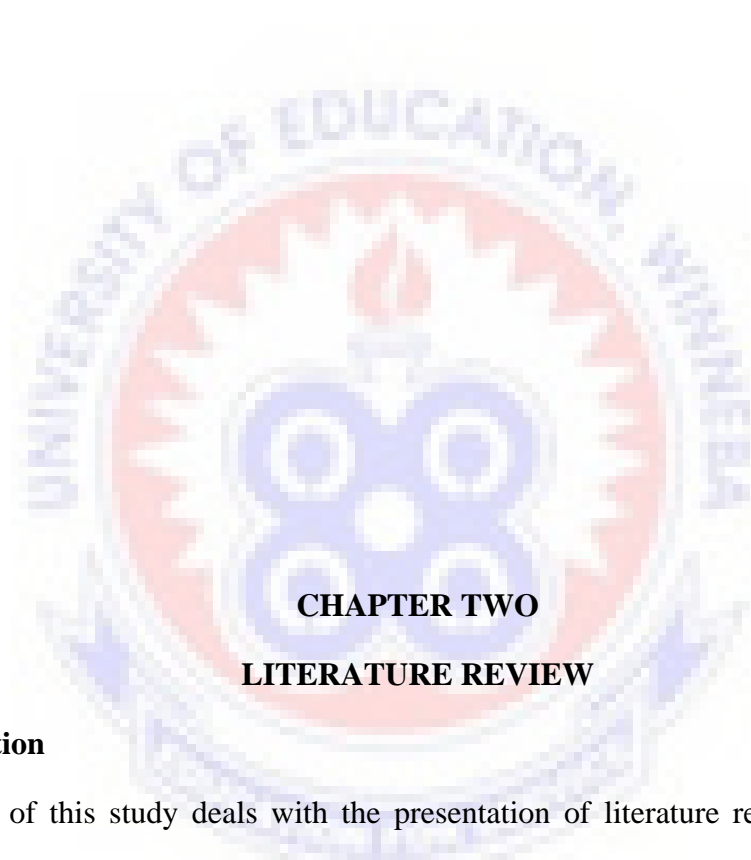
decisions on e-business in construction firms. It is also expected to serve as a reference material for interested people in the academia and beyond. The findings are expected to inform stakeholders and create awareness on significance attached to adoption of e-business on construction activities.

1.8 Limitations of the Study

The study was constrained by time and attitudinal factors. It was difficult in getting necessary cooperation from some employees of construction firms especially supervisors. The study did not deal thoroughly with issues such as factors affecting adoption of e-business in the construction industry. Since the study was concentrated at only within the Kumasi Metropolis, it will be difficult in generalising its findings to cover Ghana as a whole.

1.9 Organisation of the Study

The study is structured into five chapters. Chapter One comprised the introductory chapter, the background of the study, problem statement, objectives of the study, key research questions, scope and limitations of the study. The Second Chapter describes the theoretical and empirical frame work of the study. The chapter was used for a detailed review of existing work on the subject matter. The Third Chapter looks at the methodology of the study. The Chapter comprises data sources, research variable definition and data analysis model. Chapter Four presents the analyses and discussed the result. The last Chapter, Five presents the summary of findings, recommendations and conclusions.



2.1 Introduction

Chapter Two of this study deals with the presentation of literature review on e-business adoption in the construction industry. It focuses on concepts, theories, models and empirical studies on e-business.

2.2 The Construction Industry in Ghana

Ahmed et al. (2014) indicated that the construction industry in Ghana is aware of the many challenges facing the country and the industry in particular. The industry, in collaboration with government, academia and the public sector, is working towards a process that will both

meet their own business interests while simultaneously protecting the environment. The issue is less one of awareness of the challenges than of formulating a strategy to move towards sustainability in the industry. The challenges are complex, involving a multitude of causes, impacts and diverse stakeholders, all with their own vision of what 'successful' development can and should look like. In short, the industry is searching for a vision of a sustainable future, and a process to arrive there.

Ayarkwa et al. (2010) argued that construction activity is increasingly becoming highly technical and sophisticated with high standards of quality and specification arising from the development of new technologies. The growing sophistication of employers or clients and increasing competition across the industry. Issues of technological know-how and personnel development are concerns engaging industry practitioners and government discussions in recent time. The construction industry produces long-term, unique, and complex building projects and infrastructure (Levy, 2007). This covers the provision of new structures as well as additions, alterations, and repairs to existing ones. Major services such as provision of houses, factories, offices, schools, roads, and bridges are only a few of the products of the construction industry. These facilities are necessary for the other sectors of the economy such as education, health, commercial and business activities, housing needs and so on to thrive. Hence, the sector is often regarded as an essential and highly visible contributor to the process of growth in any country (Sekou, 2012).

2.3 Concept of E-Business

European Union (2000) states e-business as, one of those rare cases where changing needs and new technologies come together to revolutionise the way in which business is conducted.

The internet is rapidly becoming the technology of choice for E-business, and it offers business an easier way to link with other business and individuals at very low cost. E-business involves many issues such as trust, security, privacy, accessibility, familiarity, awareness, and quality of public services (Jaeger, 2003). E-business encompasses more than ecommerce transactions, as it demands a review and redefinition of business models and a greater use of IT to maximise the value delivered to customers. This would normally require that an organization review existing processes, develop new skill sets, modify corporate culture, accept a new level of risk taking, acquire new technologies and build new customer and business relationships (Stewart, 2003).

For instance, the rapid growth of e-business initiatives in the MENA (Middle East and North Africa) region reflects its compelling advantages, such as enhanced governmental performance, lower cost structure, greater flexibility, broader scale and scope of services, greater transparency, accountability, and faster transactions. However, getting people to be continually engaged in e-business services is a challenge since only with a few mouse clicks they will be moved away. An agreement seems to enhance better customer service and its consequent effect on online satisfaction and reuse. Especially, online satisfaction is not the only primary driver of online customers' continuous behaviour, but also the key to building and retaining a loyal base of long-term customers.

There are two areas in which ecommerce systems are being utilised, firstly in the business to consumer (B2C) marketplace and secondly with business to business (B2B) transactions. The value of Business to Business activities exceeds Business to Consumer transactions by a ratio of 5:1, and this hints at the potential for B2B ecommerce transactions in the construction

industry. These ecommerce systems require reengineered processes, revised work practices, a re-skilling of staff, computer hardware and software and finally a connection to the Internet. A company also needs a clear strategy and marketing approach to ensure that the systems deliver the desired level of returns (Stewart, 2003).

This trend in the utilization of ICT is said to have been on the increase, especially in the execution of construction projects, and has also gained academic and professional attention globally. The construction industry has largely been described as information-intensive (Brewer & Gajendran, 2009) and among one of the most important industries in the developed world (Ashworth & Perera, 2015). Yet, this sector suffers from challenges, ranging from meeting customer demands, and construction market globalization, to knowledge sharing, and skill sets. This is coupled with extreme industry fragmentation arising from variations in demand and lengthy supply chains (being that it involves a variety of organizations, processes and technologies), all while enduring low profit margins and fierce competition (Sun et al., 2015; Ashworth & Perera, 2015; Alashwal & Fong, 2015). Currently, both public and private construction sectors are looking towards integrating e-business enabling technologies into traditional business methods and processes, paving the way for more innovative methods of doing business (Love et al., 2015). This trend has also resulted in the creation of new opportunities for business. There is a continuing shift seen in many aspects of business including moving from paper to electronic media, network to cloud, local to international commerce, reactive to proactive change, and management to leadership focus (Perera et al., 2011; Almaatouk, 2016).

2.4 Adoption of E-business in the Construction Industry

Typically, e-business is anchored on the capabilities of ICT facilities to thrive and this has been demonstrated in many economic sectors (Li, 2007). E-business essentially has the potential to streamline organisations processes through integration thereby enhancing the traditional processes (Ruikar & Anumba, 2008). E-business aims at ensuring optimisation of communication and sharing information without making any reservation of the traditional barriers that exist between design, engineering and construction within the construction industry (Worst, 2009). It is obvious that e-business has a solution to fragmented and geographical barriers within construction industries (Oyediran & Odusami, 2005).

Iddris (2012) recently examined the need to identify and measure the perceived significance of driving forces and barriers in the adoption of e-business solutions in small and medium-sized enterprises in Ghana. Although, there is an acknowledgement that some amount of work has been done on e-business technology transfer to the construction industries in developing countries as indicated previously, and some different sector(s) within the economy of Ghana, the body of knowledge did not appear to have supported the fundamental necessities of e-business technology transfer within industries in developing countries particularly the Ghanaian construction industry. The construction sector Small and Medium Enterprises (SMEs) contribute significantly for the development of the economy. The use of Information and Communication Technology (ICT) in this sector is low even though it has got the greatest potential to increase productivity and efficiency. The four most important internal processes of ICT are e-tendering, e-site, e-procurement and e-quality (Vitkauskait & Gatautis, 2008).

E-business is defined as the way of doing business in construction using internet. Adoption of ICT in construction industry has made effective changes in the construction site to track progress in different projects at greater speed. Implementation of e-business has created high significance and improved performance of the organization and also encourages the employees and traders to utilize it with proper communication, training and infrastructure (Cherian & Kamaran, 2016).

As technologies evolve fundamental changes in the methods of practice of all businesses and industries including construction have also change. The construction industry has been one of the most impacted by these radical changes. According to Wong and Sloan (2004), most construction processes have been automated resulting into higher efficiency and accuracy in production. However, Oyediran (2011) asserts that construction procurement system is still largely traditional despite the expanding capabilities of the information communication technology (ICT). He further observe that before the advent of the internet, procurement functions were perceived by many to be routine and repetitive processes. Most organizations used to have separate procurement offices laden with responsibilities of performing definite and specific tasks. These tasks are usually labour intensive, dominated by paper, thereby making them costly, ineffective and inefficient. In view of this, various business concerns have found it both appropriate and inevitable to embrace the use of internet facilities to enhance the performance of their tasks. Connection to the internet is an indispensable requirement. It provides the platform for the operation of the e-procurement web portal, the tool that enables collaboration. It is important to note that the internet connection used for electronic procurement is fast, secure, and reliable.

2.5 Theories on E-business

Rogers Model of Innovation Diffusion (1983) states that the four main parts of diffusion of a new idea are innovation, channels, time and the members of a social system (Rogers, 1983).

Innovation is an idea, practice or an object that is perceived as new by an individual for adoption. Before an innovation is selected, its attributes are studied in detail. There are five attributes of innovation. These are perceived by the members of the social system and include (Yang & Leskovec, 2010):

1. Relative advantage: The relative advantage for innovation diffusion can be measured in different ways, including economic advantage, social prestige, convenience and satisfaction.
2. Compatibility: An innovation is considered compatible if it is consistent with the existing values, past experiences, and needs of potential adopters.
3. Complexity: Complexity refers to the degree to which an innovation is perceived as difficult to understand and use. The complexity of innovation is directly proportional to the time undertaken to adopt it.
4. Trialability: This refers to the experimentation of innovation with a limited bias. The innovations that can be tried out are more likely to be adopted.
5. Observability: This particular attribute measures the extent to which the results of innovation are visible to others. The easier it is for an individual to see the results, for example, benefits of adopting an innovation, the more likely they are to adopt it.

The literature of e-business acceptance has acknowledged that e-readiness perspective is a good foundation to study on the adoption and diffusion of the technology. E-readiness is considered as one of dominant factors to the success of the e-commerce implementation by individual enterprises (Aibinu & Al-Lawati, 2010; Lou, 2010). Therefore, assessing the state

of e-readiness has become very important to enterprises that seek to adopt and implement e-commerce technologies. This provides an enterprise the basic upon which to build a planning process which in itself is an integral step in making sound policy and investment decisions (CID, 2006). Generally, definition of e-readiness is varied in different contexts, different users and for different purposes. Lou (2010) defined e-readiness as “a measure to which an organization or business may be ready, prepared or willing to adopt, use and benefits arise from the digital economy such as e-procurement.

While Ruikar et al. (2006) defined e-readiness as the ability of an organization, department or workgroup to successfully adopt, use and benefit from information and communication technologies, such as e-commerce. Therefore, to make the aim of the study tractable, it was instructive to have an e-readiness definition for this present study. Here, they define that e-readiness for entry-level adoption (or initial adoption) of Internet-based B2B e-commerce as a measure of the extent of a construction enterprise’s internal resources and external resources to which the enterprise should make an adoption decision and the enterprise will more likely use and gain basic benefits from the technology.

There have been many efforts to develop the models and the measurement instruments which assist e-readiness assessment for the adoption/implementation of e-commerce at the firm level. However, the most of them have not paid enough attention on the impact role of contextual characteristics, industrial specific issues and the demands for planned applications (Janom & Zakaria, 2008). Related literature of e-commerce consistently demonstrates the important role of external factors on the adoption decisions and the success of the implementation of the technologies. In addition, studies on e-commerce sophistication also

considered the high integration level among the technology, the organization and the interorganizational environment as a critical condition for success of e-commerce (Raymond *et al.*, 2012). It can be said that the environmental factors identified are generally associated to government commitments, legal issues, ICTs infrastructure, supporting industries and business channels. As it is known, the nature of the construction industry is project-based; construction trading relationships are, traditionally, temporary; and construction collaboration are very fragmentary, especially in developing countries (Ruikar *et al.*, 2008). Moreover, the construction supply chains include many different actors, such as clients, architects, engineers, project managers, contractors, supplier, etc. Therefore, within the industry, e-commerce practices are commonly diffused through various operational clusters because of their business linkages and interdependence (London & Bavinton, 2006). Consequently, the adoption decision as well as the success of the implementation of e-commerce in individual enterprises will depend much on the e-commerce state of their partners.

In addition, the construction industry is very knowledge-intensive. However, it has a high level of fragmentation and an innate conservatism as well as lacks channels that support sharing and transferring information and knowledge of innovation. This makes key knowledge assets are often looked-up in each enterprise or even in each department of firm (Egbu, 2008). Therefore, for construction-oriented studies on the Web-based B2B e-commerce adoption they need to place the adoption process into a wider socio-economic communication system (London & Bavinton, 2006). Besides aspects mentioned above, industrial cultural issues and IT knowledge infrastructure should be also paid especially attention with such the studies.

According to Mutula and van Brakel (2006), the importance of information to individuals and organizations is growing rapidly when it drives our communication, decision-making and reactions to the entire environment. The way information was structured, stored, retrieved and manipulated through the formalism of information modeling was of critical importance in e-readiness assessments (Mutula & van Brakel, 2006). Given skilled human resource, appropriate technology infrastructure, good management and integrated process; however, if it lacks information resource the system would not operate in an efficient manner. Thus, information infrastructure issues at both the industrial and organizational levels should be considered appropriately when assessing enterprises' e-readiness to adopt e-commerce.

2.6 E- business and Procurement System in Construction Industry

E-procurement (or Business-to-Business networks) is an online system by which companies can be connected directly to suppliers for the purpose of buying products and services at the lowest cost possible. E-procurement essentially replaces its offline version, called tender. The advantages and disadvantages of e-procurement mostly parallel the universal benefits and disadvantages of the internet. According to Mastor (2010), e-procurement is done with a software application that includes features for supplier management and complex auctions. The new generation of e-procurement is currently on demand or software as a service (SaaS). The e-procurement value chain comprises indent management, e-tendering, e-auctioning, vendor management, catalogue management and contract management. Indent management is the workflow involved in the preparation of tenders (Abubakar, Yunusa & Babayo, 2015).

E-procurement has been widely adopted by both customers and suppliers for long relationships and sustainability. Organizations have to implement E-business for further

development and business success and also overcome constraint factors such as technology, environment and organizational characteristics (Morais, Pires & Goncalves, 2012). Procurement systems and project organisations provide the framework for implementation and development of projects. Procurement systems and project organisations are well studied and established for major developments and in developed countries in particular. When these systems are used in developing countries for major commercial, social and infrastructure developments, appropriate results are seldom achieved. This may be due to a variety of factors, which include systemic, environmental, cultural, economic, legal, political and socio-cultural amongst other things. Therefore, in order to take advantage of collaboration, a procurement procedure is one key improvement area and can contribute substantially to project success (Khanapuri, Nayak, Soni, Sharma & Soni, 2011).

A change of procurement procedures is, however, impeded by clients' habitual behaviour. Although procurement procedures need to be tailored to enhance the fulfilment of different project objectives, clients tend to choose those procurement procedures they have a habit of using, regardless of any differences between projects. In order to enhance change, an increased understanding of how electronic procurement affects project performance and delivery is vital. In order to achieve successful governance of construction projects a holistic and systemic approach to procurement procedures is crucial (Mastor, 2010).

2.7 Challenges confronting the Construction Industry in adopting E-business

A business is successful when challenges are overcome. Most of the construction industries are still adopting the brick and mortar system for the purchase of resources. The major barriers faced by Indian construction industries for instance are poor ICT infrastructure, lack of

familiarity with ICT system, need ICT training in small construction sites, lack of feeling of transfer in some electronic communication tools, inapplicable software outputs, and complicated administrative process for ICT development and poor backup system (Mohamed, 2010). The challenges for the adoption of e-business in construction industry are low awareness of customers and suppliers, huge implementation cost, lack of expert professionals, reluctance from management and hesitant to change the way of working, management's fear about security, insufficient interest of suppliers and business partners to partake in e-business initiatives (Cherian & Kamaran, 2016).

Keeping in mind the benefits that ICT implementation will render to construction firms, there are certain constraints and barriers that have been realized in the actual implementation of ICT in a company. These factors are identified as lack of ICT investment decisions, lack of organizational adoption and loss of business outcome in the construction industry (Lenny, 2009). According to Rogers (2003), some socio-economic perspectives including industry characteristics, market situation, managerial perspective and psychological perspective can serve as barriers to innovation diffusion in firms. Although Rogers did not talk about construction sector specifically, these socio-economic perspectives can be generalized to the construction industry.

Similarly, barriers to technology include cultural, organizational and institutional barriers. These include clients who undervalue and discourage innovation, the dynamic and unpredictable production environment in which buildings are constructed, general industry resistance to change and anti-intellectual culture. The barriers also include poor training and skills development and traditional and professional trade practices that are threatened by the

introduction of new technologies (Brandon & Lu, 2008). Construction firms also lack investment in research and development processes (Sexton & Barrett, 2003). Moreover, factors that hinder the development of ICT include lack of uniformity of decision makers, the complexity of new projects and the variety of differentiated activities involved in any construction project (Lenny, 2009).

Financial constraint is one of the restraining factors that can inhibit the growth of e-business in the construction industry. Research indicates that administrative bodies in the construction industry are unaware about the potential gains of e-business. Owing to their lack of awareness, they may not invest in ICT. Another plausible reason of financial constraint is that executives focus mainly on traditional methods of construction. For instance, they are at home in estimating costs manually. Therefore, they are reluctant to adopt new methods and to invest in technology (Hosseini et al., 2013). Reluctance in investment can also occur due to the uncertainty about positive outcomes of employing ICT. Managers may be hesitant to invest in technology if they are unconfident whether technology can garner fruitful results for their construction business or not (Bee, 2013). Organizational barriers include the culture of the organization, top executives' attitude, business processes and company size. Culture is by far the strongest component of an organization. It is intangible in nature but has a strong impact on an organization. Culture helps to foster a positive attitude and seriousness towards technology adoption. If the culture of a construction company is inclined towards continuous improvement, then technology diffusion in the organization takes place easily (Onyegiri & Nwachukwu, 2011). However, if the organization is not open to innovation, the technology diffusion is complex and time-consuming.

2.8 Concept of Technology

Ofori (1994a) defined technology as the application of the existing body of knowledge (science) to the production of goods and services. Further to earlier definition, Streeten (1991), defines technology as ‘the relationship between inputs of all conditions and factors of production,, including skills, attitudes, organisation and investment, and outputs. Moreover, it covers specification and designs of products’. Technology in this context encompasses equipment, tools, techniques, materials, system processes, information, the goods and services produced and their use (Streeten, 1991). The focus on technology is a major factor behind raising organisational e-readiness; specifically: managing, operating, standardising, maintaining, forecasting and investing technology is therefore seen as a core function.

The management of ICT is therefore critical in order to ensure that new technologies and emergent economies are successfully leveraged. Therefore, any investment in technology must be aligned with the organisational strategic plan and corporate strategy. In this respect, this alignment can help secure competitive advantage, using ICT a core competency enabler (Construct IT, 2008). Thus, the ability of the organisation to securely store and disseminate information; encourage users to contribute and participate in sharing information; and the ability of the organization re-use information and reward users; represents the highest stage of information infrastructure and management readiness (Boomer, 2006).

2.8.1 Information and Communication Technology

According to Cherian and Kamaran (2016), the world has become a small village due to the growth of Internet. Internet has changed the way we interact and communicate. Further ICT which is a subset of Information technology has revolutionized the process of information creation, exchange, storage, access and the ability to view. Internet, computer, telephone and

wireless signals, multimedia are the commonly used tools of ICT. Perera et al. (2012) discussed the importance of enabling technologies for the conduct of e-business activities within construction. They identified two main technologies namely: cloud computing and BIM as recent e-business technologies, in complement with web-based project management software provided a platform from which e-business activities within the construction industry can be utilised, maximised and maintained. It is important to know also that technologies such as the Internet and CAD are identified alongside cloud computing and BIM as e-business enabling technologies within construction.

Bhutto et al. (2005) opined that the last decade of the twentieth century will leave tremendous and long lasting impact on the technological developments. The rapid advancements in computer and telecommunication technologies have revolutionised the way we communicated. The emergence of the internet enabled by the merger of these technologies is changing the way the business used to be conducted. The internet has become a household commodity. It has enabled any individual to have access to the information never imagined of before. It is an economical real-time communication channel which has previously not been affordable. The changes from internet usage have forced businesses to improvise traditional trading processes, continuously improve the products and services, and create new business strategies. The result is a new business medium known as e-business, and businesses on a worldwide scale are keen to make most from this innovative medium.

Admittedly, effective collaboration between all the role players during construction is not only important but also necessary for the successful completion of a construction project. With so many interested parties, effective communication and information sharing among them is vital. Not only must the formal structures and networks be examined to understand the level

of information sharing that is happening on a formal basis, but the informal relationships among parties will depend on how and when information is shared and how and when information is flowing (Perreira & Soares, 2007).

Kabango and Asa (2015) emphasised that due to technological advances economic transactions have become much easier and faster and this is mainly because of the development of e-business. Real engine of the new economy, e-business is a remarkable source of competitive advantage for businesses and a new space for consumers. In the coming years, growth and profitability will depend most likely the ability to introduce these new emerging technologies and adopt new methods of business transactions. Since many years ago computers, appliances, plane tickets and many other items are available for purchase on the Internet using cards issued by local banks. Although this technological trend could significantly strengthen the national economic structure, its role and place in developing countries economic structure remains unclear and leaves many questions to ask. Information and communication technology (ICT) is radically transforming the way individuals, organizations, and governments work. The internet in today's information societies has become an essential channel that is used for dissemination of information, products, and services. People prefer to use the internet as a transaction tool in different areas, such as, learning, shopping, marketing, travel, trading, etc.

Carter and Belanger (2003) emphasized the use of ICT to improve efficiency and access to government services across all stakeholders in G2C, G2E, G2G and G2B services. Additionally, governments have realized the importance of the internet and have undertaken critical transformations to use it to deliver public services, so that citizens can always access

them regardless of their location (Abdulkarim, 2008). Fang (2002) has described e-government (part of e-business) as a method for governments to use the most innovative ICT services, particularly web-based internet applications. These applications are able to provide citizens and businesses with more convenient access to government information and services, to improve the quality of services and provide more opportunities for democratic institutions and processes.

2.8.2 Importance of ICT in the Construction Sector

Onyegiri and Nwachukwu (2011) studied the importance, requirements, and obstacles for effective use of ICT in the construction industry. The authors conducted an in-depth analysis of relevant literature. The research mentioned that the major benefit of using ICT in the construction sector was that employees do not necessarily need to be present at the same venue; computer and internet allow them to coordinate from different locations. Moreover, the requirements mentioned in the study include having basic knowledge of communication technology and establishing a proper code of conduct and regulations by private boards. These factors facilitate efficient and effective implementation of ICT in the construction sector.

Atalah and Seymour (2013) analyzed the use of wireless technology in the construction industry. A web-based survey was used to collect data. Quantitative analysis of data showed that participant's level of interest in wireless technology was much greater than their level of use. The results of their survey showed that new technology allows construction managers to improve their skills, productivity and customer service. However, it failed to improve their ability to bargain and supervise project costs. On the other hand, implementation of wireless technology was hindered by slow download speed. Klinc et al. (2016) explored the use of

information and communication technology in construction projects. The paper highlighted that for successful project delivery, a collaborative engineering environment for information sharing is required. Furthermore, it exposed that collaborative information sharing has resulted in two diverse communication typologies. Firstly, since information can be accessed anywhere in the world, the model of communication has become standardized. Secondly, the users of information sharing application could communicate with each other whenever they found it necessary. The benefits offered by ICT on construction project are well documented in literature. This include among others improved access to richer information to aid decision making, quicker information, improved information flow, greater management control and getting geographically dispersed group to work together (Peansupap, 2004).

According to Peansupap (2004), ICT can be used to:

- Improve productivity in construction through improved operational efficiency, reduce cost and project cost.
- Support information integration and this in turn can help to reduce the volume of information processed and reduce data re-entry by transferring information through internet/Intranet protocols. This can provide benefits throughout project phases such as design, construction, and operation.
- Enhance collaboration by supporting communication among project members and sharing of information and documents, especially when team members are located in different geographical areas.

2.9 Impact of E-business on Construction Industry

Bayo-Moriones, Billon and Lera-Lopez (2013) noted that the perceived benefits of ICT for project management are related to projects, team management, technology and organization

are interrelated, needs more attention. Piotrowicz and Irani (2010) emphasised that new technology in construction industry has made many benefits such as strategic and e-procurement to make operations and decisions much easier and smooth. E-business enhances the back office value chain activities such as accounting, distribution, procurement and manufacturing. E-business initiatives help in the growth of the company. Some of the initiatives and tools are e-procurement, Customer Relationship Management (CRM), Supply Chain Management (SCM), Internet infrastructure, Extranet and Intranet (Cherian & Kamaran, 2016). The use of Information technology in the construction industry can possess a multitude of benefits, in the long-run as well as in the short run. Kodama (2012) and Kocarev (2012) have stated that if a construction firm can strategically invest in ICT, it will enable the company to reduce both costs and time in the capital works process. Furthermore, it will assist the firm in fulfilling the needs of its clients and improving the delivery of services.

A study by Gajendran and Perera (2017) in Australia emphasized that e-business brings competitive advantage on one hand while increasingly customers (construction clients) and supply chain partners expect engagement with e-business tools. Firms surveyed also believe that e-business adoption can contribute to enhanced efficiency in business process, increased productivity, better management control and time/cost savings. Firms also indicated that the most identified e-business barriers do not hinder adoption in Australia in a significant way. The barriers associated with legal, cultural, and competencies-related aspects are now seen as low-level barriers for e-business adoption

Implementation of the technology in an organisation and in business processes requires the assessment of issues in a broader context. Technologies are often assumed as “plug and play”

entities, while studies have shown that introducing them without addressing their social-economics dimensions (e.g. business needs, culture, learning requirement, and incentives) can cause problems (Sloan & Low 2000). E-business or any other IT system implementation brings organisational changes and this is unfortunately a neglected area resulting in the cultural resistance. Bhutto et al. (2005) explains that the implementation of information technology leads to changes in the structure of jobs and other organisational practices. Frequently these matters are dealt with in an ad hoc way as a problem arise and constitutes a piecemeal and unsystematic way of changing from one form of organisation to another. The result is often tension and conflict in the social structure and an under-utilised technical system. Successful e-business implementation necessitate a supportive and effective organizational structure.

Moreover, CICA (2000b) reports the following advantages from e-business suggested by construction organisations:

- Faster transaction times
- Reduced costs
- More up-to-date information
- Less paperwork
- Wider market
- More information

However, organisations also pointed to initial set-up cost, loss of personal contact, the need to re-train staff, security issues and increased internal cost, as some of the disadvantages from e-business. Stewart (2003) also forecast that the greatest usage of the internet by business will be between businesses, since e-business offers savings in inventories, shipping, reporting,

sales transaction and customer support. It has been also forecast that the number of companies in Australia who are active in e-business will increase up to five times and this will result in more than 40,000 companies using e-business by 2005 (NOIE, 2000). Howarth and Skotniki (2000) also suggest that e-business alters business value since it offers increased transactional speed and eliminates many manual activities.

2.10 Models of E-business in the Construction industry

At present the majority of large construction companies maintain their web sites, though mainly for information and contacting, and as an advertising medium. Some of the sites also provide recruitment facilities. The major initiatives in construction now are the creation of construction electronic market places. Companies from within the industry and from outside are striving to tap into this potential market (Bhutto et al., 2005). To thrive in the internet economy, businesses need a new model for commerce that addresses requirements maximising the life time value of a business relationship. Business activities that used to be well defined and structured will defuse across the enterprise and among partners and customers.

McCarthy and John (1999) agree that, as the internet channel becomes the reality for world commerce, companies that provide non-stop electronic commerce for their partners and internal and external customers will be successful and at the top of their sector. It is also emphasized (Andersen Consulting, 2000) that, if e-business were only about technology, it would be the 'next big thing', but nothing more. The potential of e-business points to a fundamental economic change that is much more pervasive. Moreover, this requires strategic and organisational change that is also pervasive and fundamental. As a direct result of the

requirement of new business models and strategies, individuals and organisations have come up with novel and completely unexplored ideas to reap the early fruits of the e-business. Virtual Storefront, marketplace concentrator, information broker, transaction brokers, electronic clearing houses, reverse auctions, digital product delivery, content provider, and on-line service provider are some examples of innovative business models.



CHAPTER THREE

METHODOLOGY

3.1 Introduction

Chapter three presents methods adopted for the study. These include strategies adopted to conduct the study. Chapter three consist of research design, population, sampling techniques and sample size, data collection tools and procedure, pilot test, in addition to data analysis techniques employed.

3.2 Research Design

Research design deals with set out plan upon which a research is conducted. The researcher employed descriptive survey approach to achieve objectives of the study. Both quantitative and qualitative techniques were adopted for the study. The nature of research questions made it imperative for adopting both techniques in dealing with issues in the study. The qualitative technique enhanced direct contact with participants through interviews to gather data on their perceptions, views and comments on issues raised in the study. In quantitative research, scores are assigned to achieve meaningful outcomes on data collected for making comparisons and drawing of meaningful conclusions. In this study, quantitative part used questionnaire and its results were presented using statistical tools such as descriptive and inference statistics. Questionnaires were administered to employees of construction firms and afterwards, statistical analyses were carried out to get a meaningful outcome. In this sense, a case study approach was adopted to gather large quantum of information about few participants

(employees and contractors) to ascertain in-depth understanding of e-business adoption in construction firms.

3.3 Population

The target population comprised of contractors within Kumasi Metropolis and their employees. A population can be defined as total number of individuals, groups, object or animals of interest to a study. The contractors and their firms were identified from respective sites where construction works were actively ongoing. Details of the population are presented in Table 3.1 as well as the sample size.

3.4 Sampling Technique and Sample Size

In order to select the sample size for the study, purposive sampling technique was adopted. For the sake of anonymity, the names of the construction firms used for the study were represented with A-Z. This was meant to ensure confidentiality of firms used for the study eventhough the study is an academic one. The purposive technique ensured that only key individuals of interest to the study were chosen. This made it possible to select only contractors and employees of construction firms to arrive at the sample. After the purposive sampling was used to deal with only contractors and employees, the study employed stratified sampling approach to ascertain the total number of employees and contractors. This was done to ensure that accurate representation of the sample size was achieved without bias. After getting the total number of employees within each construction firm, the sample size was determined using a formula developed by Brewer and Miller (2003) given as;

$$n = \frac{N}{1 + N(\&)^2}$$

Where N = Sample frame

& = margin of error (10%)

Details of sample size are presented in Table 3.1

Table 3.1 Population and sample size determination

Construction Firm	Employees	Sample	Contractors	Sample	Total
AA	46	31	1	1	32
BB	62	38	1	1	39
CC	31	23	1	1	24
DD	54	35	1	1	36
EE	26	20	1	1	21
FF	64	39	1	1	40
GG	18	15	1	1	16
HH	36	26	1	1	27
II	15	13	1	1	14
JJ	23	18	1	1	19
Total	375	258	10	10	268

Source: Field data, 2018

3.5 Sources of Data

Data for this study were sourced from primary data. With the primary data, responses from the questionnaire delivered by respondents coupled with interviews conducted provided the basis for it.

3.6 Data Collection Instruments and Procedure

The collection of data in this study comprised of questionnaire administering to employees and structured interviews conducted through face to face medium with contractors. The questionnaire on the other hand was meant for the employees. The questionnaire consisted of both closed and open-ended questions. The questionnaire were grouped into sections with Section A dealing with biographic characteristics of respondents; Section B presents adoption of e-business in construction firms; Section C provides general statements on impact of e-business on construction firms in general and specifically towards performance and productivity. Some of the closed ended items were framed in general statements where respondents were asked to choose options from a 5-point Likert scale (strongly agree – strongly disagree) and to provide answers to a large extent or to no extent with some statements in the questionnaire. The questionnaires were distributed to employees for a period of one week to be completed. It should be emphasised that to ensure adequate uphold of ethical issues in the study, rapport was built with employees of selected firms and the academic intention of the study explained to them. To ensure anonymity and confidentiality, names of employees were not needed in the questionnaire (see Appendix A).

The interviews were conducted to contractors only. The interviews were conducted to ascertain whether contractors adopt e-business activities in their operations, challenges facing such activities and the impact of e-business on their performance (see Appendix B).

3.7 Pilot study

A pilot study was conducted at Gyanfosu Construction Limited to obtain a reliable feedback on questionnaire and interview guide developed for the research. During the exercise, errors were detected as well as ambiguities and vague sentences were reframed to clarify issues in

the questionnaire and interview guide. The corrected errors and ambiguities in the questions led to high level of accuracy. To achieve reliable and consistent outcomes, the questionnaires and interview guide were given to professionals to scrutinise its content and their suggestions were taken on board and addressed accordingly.

3.8 Data Analysis

The researcher after gathering the data, sorted and cleaned it thoroughly to ensure accuracy and validity. All errors and ambiguities were corrected after which variables were grouped in their respective categories. Descriptive and inferential statistics were employed for analysing results of the study. The results were presented in the form of mean scores, percentages, Standard deviation and Pearson correlation matrix. Content analysis was used in dealing with reports and interviews conducted.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

The Chapter Four of the study presents the results and discussions. This includes the demographic characteristics of respondents, reasons for adopting e-business in construction activities, challenges confronting construction firms with e-business adoption, the effects of e-business on construction firms. Out of the 268 selected sample size, 204 responded. This gives 76% of response rate.

4.2 Demographic Characteristics of Respondents

The demographic characteristics of respondents in this study include their gender, age and educational background.

4.2.1 Gender of Respondents

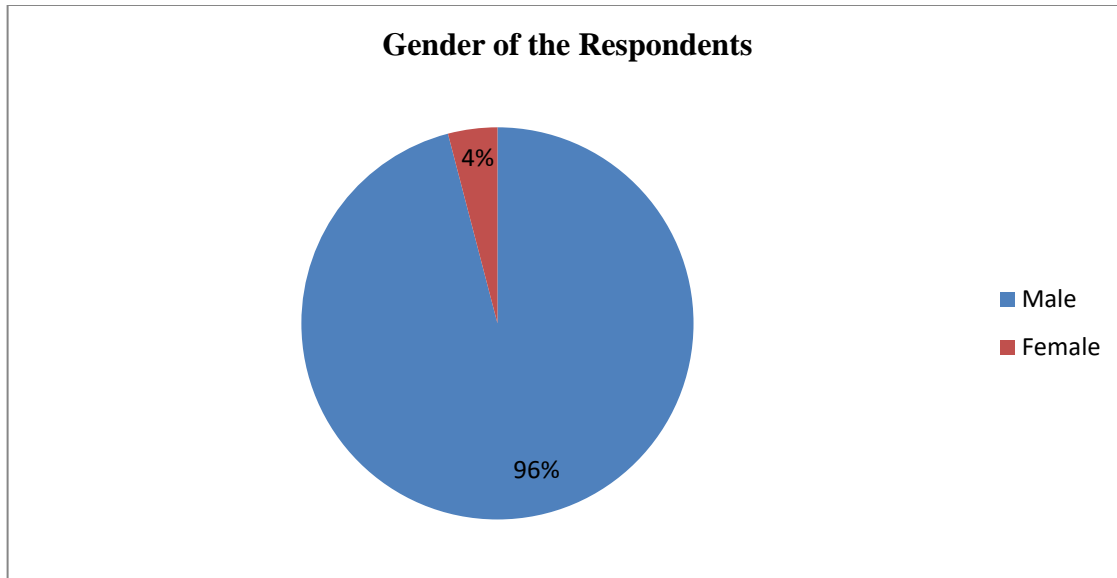


Figure 4.1: Gender of Respondents

Source: Field survey, 2018

From Figure 4.1, it was found that the number of male respondents constituted 96% while females consisted of 4%. This implies that the number of male workers at the various construction firms selected for the study were higher than that of females based on the results. The result suggests that the construction industry in the Kumasi Metropolis has not been attractive to females.

4.2.2 Age interval of Respondents

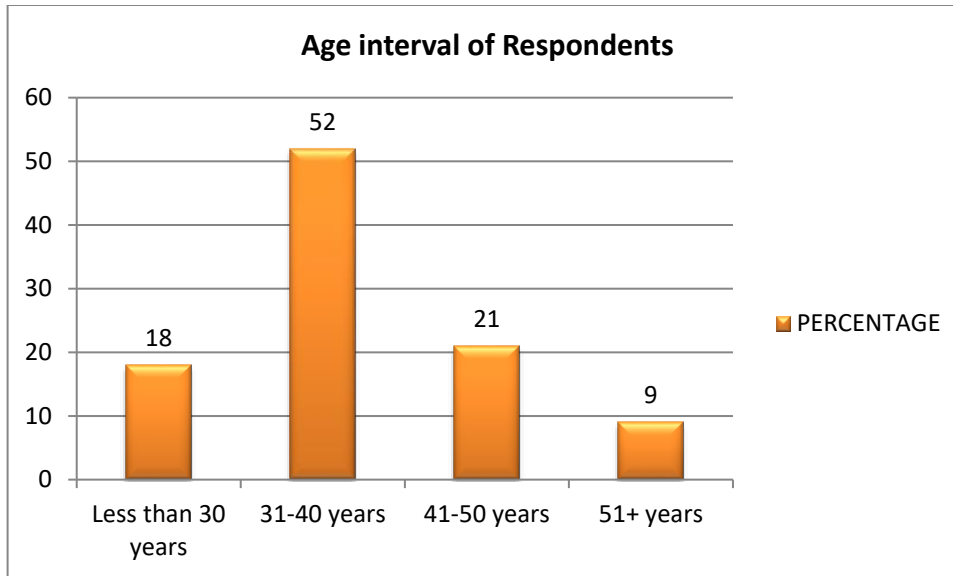


Figure 4.2: Age interval of Respondents

Source: Field survey, 2018

It was realised in Figure 4.2 that majority of the respondents were within the age bracket of 31-40 years (52%), followed by respondents who fell in 41-50 years (21%). In addition to these, 18% of respondents were less than 30 years while 9% of them were 51+ years. The results indicate that majority of respondents were in their youthful ages

4.2.3 Educational background of Respondents

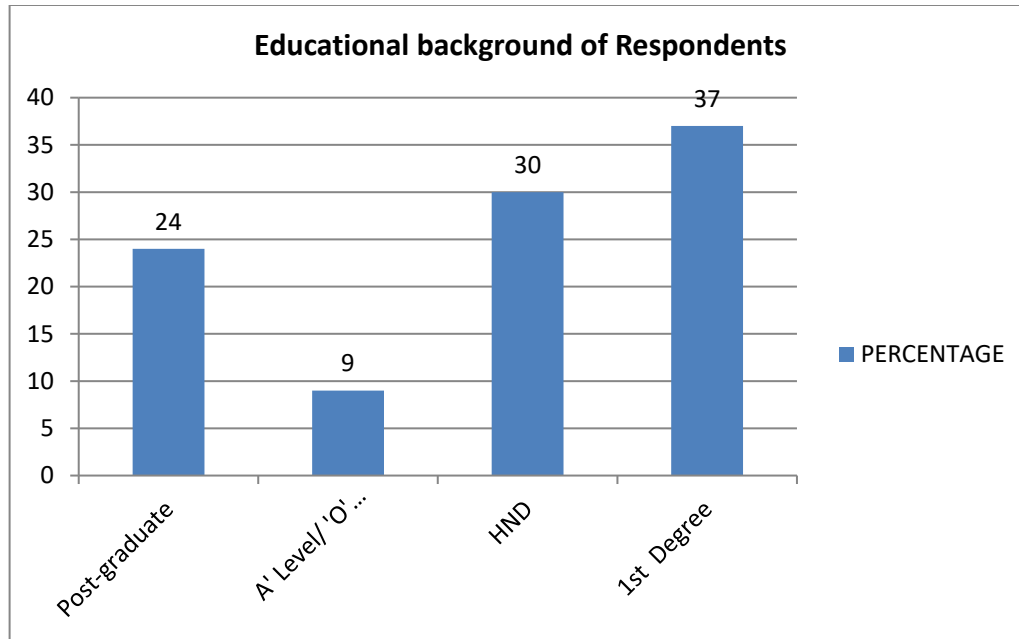


Figure 4.3 Educational background of Respondents

Source: Field survey, 2018

From Figure 4.3, it was realised that majority of the respondents were first degree holders with 37%. This was followed by those with HND who accounted for 30%. It was also found that 24% of respondents were postgraduate degree holders and 9% were with O'level/A'Level qualification. The results show most respondents have had adequate level of formal education. The high literacy rate among respondents give room for better knowledge on e-business activities within the construction and how effective its implementation has been on efficiency and effectiveness of construction project implementations. The high literacy level among respondents gives an indication that they are well conversant with issues pertaining to e-business and therefore were capable of responding to the study appropriately.

4.2.4 Number of years Respondents have worked at the various construction firms

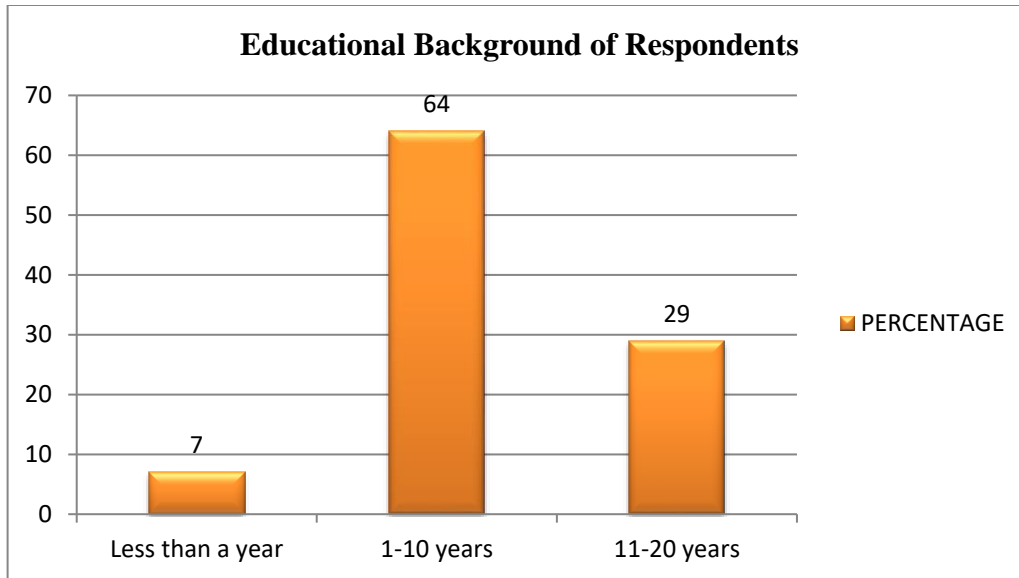


Figure 4.4: Number of years Respondents have worked at the various construction firms

Source: Field survey, 2018

It was evidenced in Figure 4.4 that majority of respondents (64%) had served in the construction industry for 1-10 years. In addition to this, 29% of them have worked for 11-20 years. Moreover, 7% had served for less than a year. This implies that, most respondents have had adequate experience on the job. The experience they have acquired through long service enhance performance and improve productivity of workers when they are given the right conditions of services with right resources and systems such as e-business.

4.3 Existence of E-business in construction firms

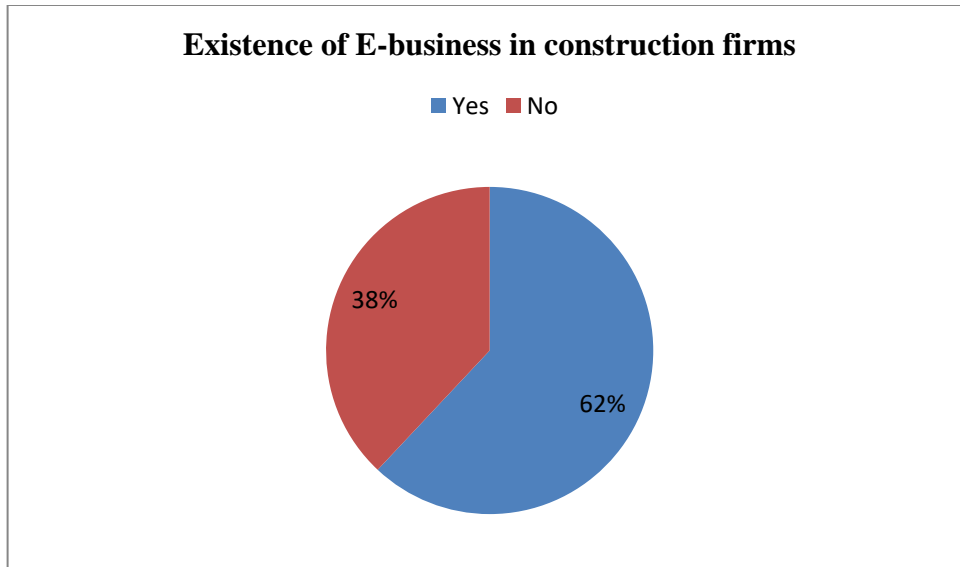


Figure 4.5: Existence of E-business in construction firms

Source: Field survey, 2018

Figure 4.5 presents the views of respondents in reference to existence of e-business in their construction firms. As captured in Figure 4.5, it was realised that most of the firms had some form of e-business in their activities. This position was upheld by 62% of respondents. However, 38% held the view that there were no such systems in place in their firm. The results suggest a lot of construction firms selected for the study have e-business systems in place but its usage is a bone of contention to be made. Iddris (2012) observed that most construction firms in Ghana have made the move to adopt e-business in their activities especially when it comes to e-procurement practices and exchange of information among stakeholders on construction contract administration processes. From the interview, one contractor stated that:

“ Indeed my firm adopts e-business in our operations especially during the pre-award contract stages. The use of email has been an instrumental tool that facilitates effective communication through information sharing and utilisation ”

4.4 Utilisation of E-business in construction firms activities

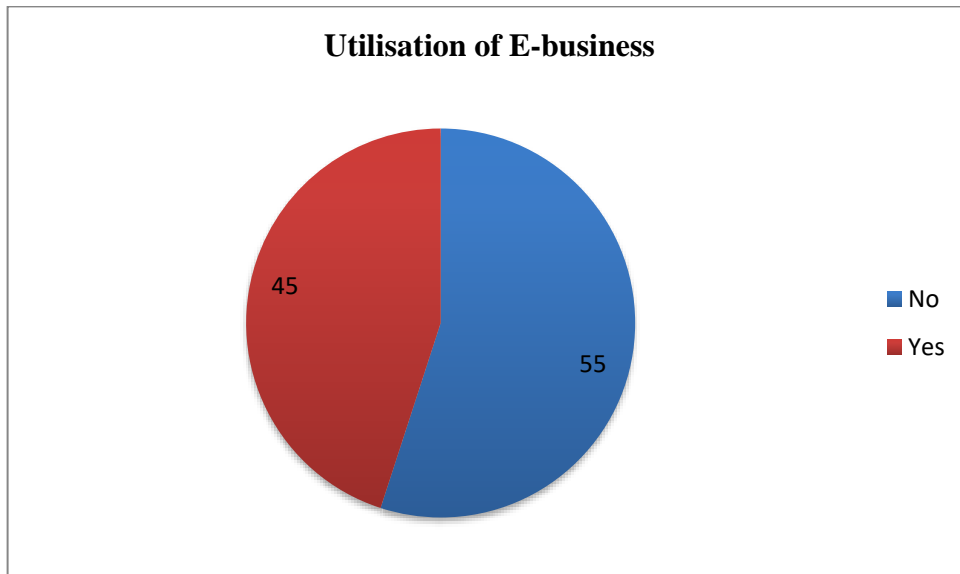


Figure 4.6 Utilisation of E-business in construction firms

Source: Field Survey, 2018

The researcher after ascertaining as to whether there exist e-business in construction firms selected for the survey sort to identify the extent to which it was utilised . As captured in Figure 4.6, it was emphasised by majority of respondents that it was not widely used in though the systems are in place (55%). This was attributed to challenges inherent in the adoption of e-business in the firms which most have not been able to address effectively. On the contrary, 45% were of the view that there have been active utilisation of e-business system in conducting construction related transactions and other any other activity that demands its usage. The overall implication suggests e-business utilisation has not been effectively utilised by most construction firms selected for the survey though they exist. From the interview, a contractor indicated that:

“ though there are many e-business mechanisms in place which can be used but I often do not undertake such steps since I am not highly good in computing and moreover, most of the employees are not highly skilled with IT systems ”

This result is in line with submissions by Oyediran (2011) that despite the introduction of ICT in the construction sector a lot of activities such as procurement are still done using traditional methods.

4.5 Reasons for adopting E-business in construction firms

Table 4.1: Reasons for adopting E-business in construction firms

Reasons	Mean	SD	Rank
Increasing usage of the internet	3.35	.20	7 th
For conducting research	3.38	.24	6 th
Collaborating with business partners	3.50	.22	3 rd
Better channel partnership	2.94	.23	9 th
For the purposes of data capture and management	3.76	.19	1 st
It reduce costs	3.42	.22	5 th
It saves time	3.68	.21	2 nd
Improve services quality	3.32	.21	8 th
Improve advertising in construction firms	3.46	.21	4 th

Source: Field survey, 2018

Form Table 4.1 it was found that one of the main reasons for adoption of e-business in construction firms was for the purpose of data capture and management (Mean=3.76, SD=.19). The use of e-business enhance the possibility of storing large volumes of data on computers without necessary having to keep so many paperworks. Through the adoption of e-

business memos, letters, contractual agreements, invoice, notes to mention a few are stored on computerised systems. This reduces manual way of information processing and storage. It promotes spacious office due to less paperless activities. With proper backup systems e-business ensures that data in construction firms are well captured and stored in more efficient and effective way to enhance easy retrieval and usage. For instance, it is more convenient to retrieve memos stored on computers than to search for piled papers in a cabinet. This makes information storage, preservational and retrieval easy to undertake on construction activities. A contractor stated from the interview that:

“ the use of computer related systems for the firm’s transactions has limited the volume of paper works which occupy much space at the office and it saves operational cost on stationeries. With IT systems more information can be stored on hard disk or pen drives without buying huge cabinets ”

Some authors like Kline et al. (2016) and Peansupap (2004) share similar view that the adoption of e-business in construction firms are done partly for the purpose of data capturing and management to enhance information sharing among stakeholders in the construction industry.

The second most dominated factor enumerated by respondents was the issue of time saving (Mean=3.68, SD=.21). The adoption of e-business is aimed at saving time spent on undertaking business activities within construction firms. The use of ICT ensures that the conduct of activities are done efficiently and effectively to save time. It is easier and quicker to send information across the internet than using any form of transportation or medium. Through the adoption of ICT related tools in emails on business activities can be exchanged

with seconds among parties and stakeholders on construction projects. This is time saving and cost effective compared to manual way of sharing information. Payments done through electronic means are faster than the traditional modes. The use of social media networks such as facebook, twitter, whatsapp and emails makes easier for stakeholders to share and transmit information among themselves to enhance achievement of work goals. Klinc et al. (2016) and Kabango and Asa (2015) shared similar view that e-business saves time through efficient way of sharing information in the form of emails and other related social media tools. From the interview, a contractor emphasised:

“ with emerging technologies, the firm is able to exchange information and make enquiries from vendors and make payments without wasting time and at a very fast rate ”

The third factor rated by respondents towards the reasons for adopting e-business in construction firms was collaborating with business partners (Mean= 3.50, SD=.22). The existence of e-business in construction firms allow for effective collaboration among partners in the industry. Through the use of e-business models, stakeholders within the industry such as contractors, architects, masons, quantity surveyors, clients to mention a few are able to share their views and comments on issues affecting them. It gives opportunity for them to identify certain important activities they can tap on. Peansupap, (2004) and Klinc et al. (2016) emphasized e-business has contributed to enhancing collaboration among construction stakeholders.

4.6 Challenges of E-business confronting construction firms

Table 4.2: Challenges of E-business confronting construction firms

Challenges	Mean	SD	Rank
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Poor ICT infrastructure	3.02	.25	9 th
Lack of familiarity with ICT system	3.24	.23	8 th
Lack of security and trust in transacting business online	3.96	.17	1 st
Lack of technological expertise	3.91	.19	2 nd
Lack of feeling of transfer in some electronic communication tools	3.68	.23	7 th
Poor backup system	2.86	.25	11 th
Low awareness of customers and suppliers	2.81	.26	12 th
Huge implementation cost	3.84	.20	3 rd
Lack of uniformity of decision makers	2.78	.25	13 th
Reluctance from management and hesitant to change the way of working	3.76	.22	5 th
Lack of ICT investment decisions	2.97	.24	10 th
Poor training and skills development	3.82	.20	4 th
Financial constraint is one of the restraining factors	3.73	.21	6 th

Source: Field data, 2018

Respondents were probed to indicate their opinions on challenges of e-business in construction firms operations. As shown in Table 4.2, it was found that lack of trust and security related issues was rated as the highest challenge affecting patronage of e-business by construction firms within Kumasi Metropolis (Mean=3.96, SD=.17). Adoption of e-business in place through internet related activities pose security threats and mistrust in its usage. Transacting business activities on construction related matters can be risky due to activities of hackers and fraudsters. Hackers are able to unlawfully access private information on systems during transacting activities online. There can be breach of confidentiality on exposing vital information to the public and also getting access to unauthorised information which can affect

strategic measures adopted by the firms in executing its task. These security threats are among keen reasons why some firms do not engage the use of e-business approach in their activities. Cherian and Kamaran (2016) emphasised that reluctance in the adoption of e-business by construction firms was partly due to lack of trust and security related issues. From the interview, a contractor stated that:

“ apathy towards the utilisation of e-business as a core tool for our activities stem from the fear of insecurity where there can be breach of confidentiality which may not be in best interest of the firm ”

The second highest ranked challenge by respondents was lack of adequate technological expertise to handle e-business related activities (Mean= 3.91, SD. 19). Inadequate existence of people with good technical know-how on best practices of current ICT related matters make adoption of e-business in construction firms a herculean task. Experts are required to install and manage e-business systems put in place and are required to train users on how to use them for their intended purposes. Efficiency and effectiveness of e-business are questioned when there is lack of people with needed expertise to handle and manage it in the firms. It has been a usual practice of some construction firms engaging in outsourced experts to install their systems. These outsourced experts are not permanent and this sometimes create difficulties in reaching them when there are shortfalls with the system. Cherian and Kamaran (2016), Ashworth and Perera (2015) and Alashwal and Fong (2015) shared similar view that lack of experts to handle e-business systems was a challenging factor to construction firms.

The cost of installing e-business and its maintenance was rated as the third highest factor which affect construction firms adoption (Mean=3.84, SD=.20). In some cases, the desire to

adopt e-business in construction firms are frustrated by its cost of installation and implementation. When the cost involved in setting up e-business systems are huge, it creates apathy on the part of management of construction firms to stay away. Cherian and Kamaran (2016) and Hosseini et al. (2013) indicated cost was a determinant factor which hinder adoption of e-business among construction firms. These situations were also coupled with lack of adequate training for users of e-business related activities (Mean=3.82, SD= .20). Failure by management of most construction firms to provide training for users of e-business do not promote its efficiency and effectiveness. Skills enhancement that are usually achieved through proper training are lost in a situation where training is not prioritized by management. This influence poor outcomes on e-business delivery services when right methods are not impacted on users with the necessary skills.

4.7 Impact of E-business on construction firms

Table 4.3: Impact of E-business on construction firms

Item	Mean	SD	Rank
Improvement in operational efficiency	3.92	.19	2 nd

It improves profitability	3.54	.22	8 th
Time/cost savings	3.69	.20	7 th
Improved communication	3.88	.21	3 rd
More up-to-date information	3.94	.22	1 st
Increased transactional speed and eliminates many manual activities.	3.81	.21	4 th
Leads to changes in the structure of jobs and other organisational practices	3.18	.23	9 th
Competitive advantage	3.79	.22	5 th
Conflict in the social structure in firms	2.87	.24	11 th
Better management control	3.06	.23	10 th
Enhance collaboration by supporting communication among project members and sharing of information	3.74	.21	6 th

Field survey, 2018

Table 4.3 present opinions of respondents on impact of e-business on construction firms operations (Mean=3.94, SD=.22). Through adoption of e-business in construction activities, efficiency is achieved due to accurate, quality and speed at which online activities operates. When the right input are effected, the outcome is automatically good. Wong and Sloan (2004) and Peansupap (2004) emphasised most construction processes have been automated resulting into higher efficiency and accuracy in production. The adoption of e-business in construction firms have improved communication stakeholders (Mean=3.88, SD=.21). Construction firms which adopt e-business systems have improved communication mechanisms over their counterparts in the industry. Through the use of ICT related activities communication are done easily and smoothly among stakeholders. Adoption of e-business ensures that information are communicated and shared among its stakeholders through stated channels accepted by management of the firms. The use of emails, watsapp, twitter to mention a few have led to

easy sharing of information online among stakeholders within the construction industry. Onyegiri and Nwachukwu (2011), Klinc et al. (2016) and Peansupap (2004) held similar positions that adoption of e-business lead to effective collaboration and communication among actors within the construction industry. The adoption of e-business in construction firms enhance increased transactional speed and eliminates many manual activities. (Mean=3.81, SD=.21). Through e-business, transactions undertaken are completed at greater speed than manual way of executing task. It limits existence of too much paper works. It encourages speedy transmission of information between stakeholders of construction firms.



4.8 Relationship between E-business and Performance of construction firms

Table 4.4: Relationship between E-business and Performance of construction firms

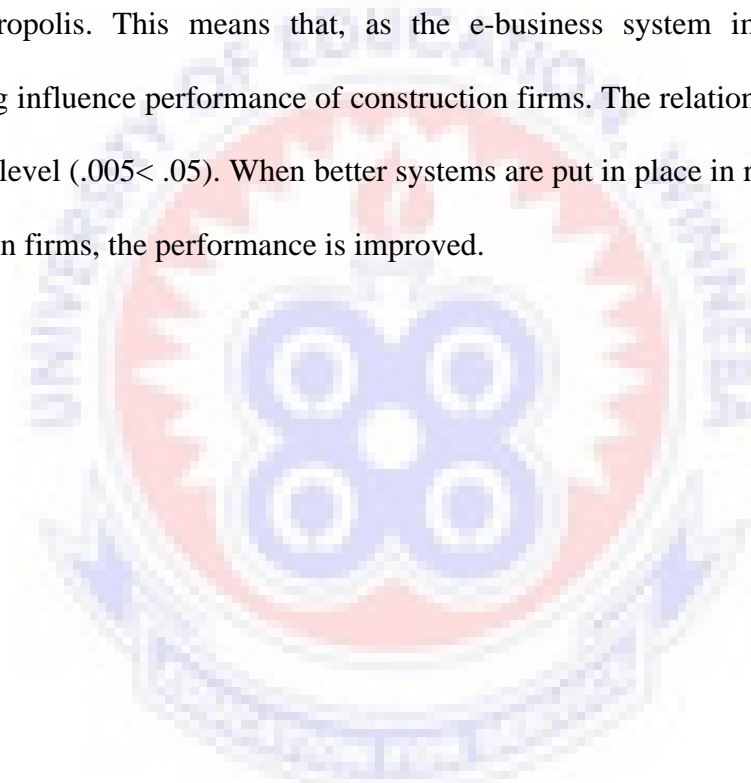
		E-business	Performance
Pearson	E-business		
	Correlation coefficient	1.000	.769
	Sig. (2-tailed)		.005
		N	204

Performance	Correlation coefficient	.769	1.000
	Sig. (2-tailed)	.005	
	N	204	204

Source: Field survey, 2018

Correlation is significant at the .05 level (2-tailed)

From Table 4.4, a Pearson's correlation coefficient of .769 indicates a strong positive relationship between adoption of e-business and performance of construction firms in the Kumasi Metropolis. This means that, as the e-business system improves, there is a corresponding influence performance of construction firms. The relationship is significant at the .05 alpha level ($.005 < .05$). When better systems are put in place in relation to e-business in construction firms, the performance is improved.



4.9 Relationship between E-business and Productivity of construction firms

Table 4.5: Relationship between E-business and Productivity of construction firms

			E-business	Productivity
Pearson	E-business	Correlation coefficient	1.000	.726
		Sig. (2-tailed)		.005

	N	204	204
Productivity	Correlation coefficient	.726	1.000
	Sig. (2-tailed)	.005	
	N	204	204

Source: Field survey, 2018

Correlation is significant at the .05 level (2-tailed)

The results presented in Table 4.5 show a strong positive relationship between E-business and productivity of construction firms. This assertion was backed by a correlation co-efficient of $.726$ which was set at significant level of 0.5. This results indicate that an increase or improvement in E-business will have a significant effect on productivity. On this premise, when there is efficiency and effectiveness in dealing with e-business and its related matters, productivity will increase. Gajendran and Perera (2017) indicated e-business adoption can contribute to enhanced efficiency in business process and increased productivity.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Chapter five of this study presents key summary of the findings. Conclusions arrived based on the findings are as well captured in this section. Recommended measures that can be

adopted to improve e-business activities within construction firms are spelt out in this section. Moreover, it deals with suggestion for future studies.

5.2 Summary of Findings

It was found from the study that most construction firms have in place existing e-business practices. Some of the firms indicated they use e-business to transact activities. These were informed by the growing rate of the need to be innovative and competitive in the business world. Most respondents were of the view that three key reasons for the adoption of e-business in their operations were; it saves time, for the purpose of data capture and management and improve advertising in construction firms. The use of e-business ensures data on contracts administration, performance management and other reports are captured in electronic format to make storage easy and simple to manage. Through e-business, contractors are able to store information on constructional agreement on harddrives without necessary keeping volumes of paperwork in their cabinet. Through e-business, construction firms are able to promote their products and services online through ensuring effective advertisement. Posting of samples of workdone, competencies, innovations, equipment on company's website attract potential customers. Some products and services patronized in e-business during construction operations include email services, e-procurement, online payment, Wifi internet access, software for managing firms database to mention a few.

Some challenges enumerated by most respondents were lack of security and trust in transacting business online. Due to hacking and internet scams, most firms are reluctant to adopt e-business practices especially with online ordering and payments. Some firms are reluctant to use e-business for fear of data compromise from activities of hackers. This leads

to confidentially compromise or breach. Lack of technological expertise is another crucial factor which limits the desire to adopt e-business practices. Lack of technical know-how on effective usage of ICT related tools for business activities is a causal factor curtailing adoption of e-business in construction activities. Some contractors and employees of construction firms are not conversant with technology related matters and this makes it difficult for them to accept and adopt e-business practices. Absence of needed expertise to handle e-business related activities within firms make it extremely difficult for management of construction firms to adopt and invest in it. Moreover, it is sometimes difficult to implement e-business activities due to huge cost involved in its setup.

The cost required to establish e-business related systems in construction firms are sometimes not encouraging and this promote disaffection towards its adoption not to talk of implementation. Aside these, inadequate training organized for employees and users of e-business related activities on construction projects have led to its low prominence and utilisation in the construction sector. Most construction firms which have existing e-business systems in place have often not prioritise the need to train their employees on best practices. Inadequate training affects users opportunity to enhance their skills and knowledge towards effective ways of conducting business online. It was found that e-business in construction firms have resulted in enhanced efficiency in business processes, enhanced collaboration through effective communicating and information sharing among stakeholders on construction projects. It leads to transactional speed and eliminates many manual activities and enhance competitive advantage.

5.3 Conclusions

The adoption of e-business on construction activities have been moderately accepted by most firms within the construction industry. However, its utilization has been poor despite inherent benefits such as time-saving, collaboration with stakeholders through effective communication and cost saving. This poor utilization of e-business were attributed to lack of security and trust in transacting business online, lack of technological expert, huge implementation cost and poor training and skills development. Despite these challenges, careful and effective e-business systems were found to have led to construction firms gaining competitive advantage, increased transactional speed and eliminates many manual activities and enhance efficiency in conducting construction business processes. It is appropriate to state that through effective implementation of e-business, productivity and performance increases which enhance success of the firms.

5.4 Recommendations

The following recommendations were given based on the findings:

- ❖ It is expected that adequate awareness are created on significance attached to the adoption of e-business in construction firms. Effective awareness creation will enhance and promote construction firms desire to adopt e-business in their activities. It is appropriate for construction industry of Ghana to promote and create adequate awareness on e-business and its related significance. This will help inspire confidence in construction firms' owners and management to adopt e-business practices. Awareness creation will reduce apathy in dealing with construction firms using e-business platforms.
- ❖ Management of construction firms should see investment in e-business related activities as profitable venture and not cost-burden. There should be commitment

from management of construction firms to adopt e-business practices in their activities. Their decisions to use e-business should not be interfered on the organizational culture towards change.

- ❖ Adequate training should be provided to employees and other users of e-business on construction projects. This will enhance their skills and capabilities in achieving efficiency, effectiveness on construction activities.
- ❖ It is imperative for construction firms to ensure there exist maximum security on their websites to prevent hackers from invading into private information of clients and construction firms as well. Preventing and ensuring maximum data protection will build trust and confidence in the use of e-business in construction firms. This will help increase the rate at which e-business is patronised in construction firms within Kumasi Metropolis.

5.5 Suggestion for future studies

The study was focused on e-business adoption among construction firms in the Kumasi Metropolis alone. It is expected that future studies stretch their concerns on examining the impact of e-business on performance of firms using the entire Ashanti Region.

REFERENCES

- Adzroe, E. K. & Ingirige, B. (2013). Exploring e-Business Technology to Support Improvement in the Infrastructure Procurement Process in the Ghanaian Construction Industry. *In: Proceedings of 11th International Postgraduate Research Conference 8-10 April 2013 University of Salford.*
- Aibinu, A.A. & Al-Lawati, A.M. (2010). Using PLS-SEM technique to model construction organizations' willingness to participate in e-bidding. *Autom. Constr.*, 19, 714-724.
- Alashwal, A. & Fong, P. (2015). Empirical study to determine fragmentation of construction projects. *Journal of Construction Engineering Management*, 141(7).
- Almaatouk, Q., Othman, M. S. B. & Al-khazraji, A. (2016). A review on the potential of cloud-based collaboration in construction industry, *3rd MEC International Conference on Big Data and Smart City (ICBDSC), Muscat, 1-5.*
- Aranda-Mena, G. & Stewart, P. (2004). *E-business adoption in construction : international review on impediments. CRC for Construction Innovation, Brisbane. Research Report 2003- 003-A. available at <http://eprints.qut.edu.au/26957/1/26957.pdf>, 1-31* (Retrieved on 13/12/17).
- Ashworth, A. & Perera, S. (2015). *Cost studies of buildings* (6th ed.). London: Routledge.
- Atalah, A., & Seymour, A., (2013). The current state of wireless information technology in the construction industry. *The Journal of Technology Studies*. 14–27.
- Ayarkwa, J., Ayirebi-Dansoh, D. & Amoah, P. (2010). Barriers to implementation of EMS in construction industry in Ghana. *International journal of engineering science*, 2, 37-45.

- Bayo-Moriones, A., Billon, M., & Lera-Lopez, F. (2013). Perceived performance effects of ICT in manufacturing SMEs. *Industrial Management and Data Systems*, 113(1), 117–35.
- Bhutto, K, Thorpe, A. & Stephenson, P. (2005). E-commerce in UK Construction, 3rd *International Conference on Innovation in Architecture, Engineering and Construction*, Rotterdam, The Netherlands, 2, 989-998.
- Boomer, L.G. (2006). The 10 rules of technology management, *Accounting Today*, 20(3), 20–23.
- Bowmaster, J., Rankin, J. & Perera, S. (2017). *E-business in the Atlantic Canadian Architecture, Engineering and Construction (Aec) Industry*, International Council for Building (CIB), 3-38.
- Brandon, P., & Lu, S.-L. (2008). *Clients Driving Innovation*. West Sussex, Chichester. Wiley-Blackwell.
- Brewer, G. & Gajendran, T. (2009). Emerging ICT trends in construction project teams: a Delphi survey. *ITcon, Special Issue Technology Strategies for Collaborative Working*, 14, 81-97.
- Carter, L., & Belanger, F. (2003). *Diffusion of innovation & citizen adoption of e-government*. In The Fifth International Conference on Electronic Commerce, 57-63.
- Cherian, T.M., & Kumaran, L., (2016). E-Business in Construction Industry: Opportunities and Challenges. *Indian Journal of Science and Technology*, 9, 35-63.
- Chen, S., Khosrowshahi, F., Ruikar, K., Underwood, J. & Carrillo, P. (2011). e-Business in the Construction Industry. Available at http://construction-ebusiness.org/docs/e-Business_Construction2011%20v5.0.pdf (Retrieved on 13/12/17).

- CICA (2000b). *E-commerce Are we ready?* Construction Industry Computing Association, Ecommerce Report produced for Construction Products Association.
- CID (2006). *Readiness for the networked world: A guide for developing countries*. Retrieved from <http://cyber.law.harvard.edu/readinessguide/guide.pdf> (Accessed 27 February, 2018).
- Construct, I.T. (2008). *Strategic Positioning of IT in Construction. An Industry Leader's Perspective*, Construct IT for Business, Salford, Greater Manchester, UK.
- Egbu, C.O., (2008). *Knowledge Management for Improved Construction E-Business Performance*. Blackwell Publishing Ltd., West Sussex, UK.
- Fang, Z. (2002). E-government in digital era: concept, practice, and development. *International journal of the Computer, the Internet and management*, 10(2), 1-22.
- Hosseini, R., Chileshe, N., Zou, J., Baroudi, B., (2013). Approaches of Implementing ICT Technologies within the Construction Industry. *Australasian Journal of Construction Economics and Building-Conference Series* 1, 1–12.
- Iddris, F. (2012). Adoption of E-Commerce Solutions in Small and Medium-Sized Enterprises in Ghana. *European Journal of Business and Management*, 4,11-13.
- Jaeger, P. T. (2003). The endless wire: E-government as global phenomenon. *Government Information Quarterly*, 20(4), 323-331
- Janom, N. & Zakaria, M. S. (2008). *B2B e-commerce: Frameworks for e-readiness assessment. Proceedings of the International Symposium on Information Technology*, August 26-28, 2008, Kuala Lumpur, Malaysia, 1-8.

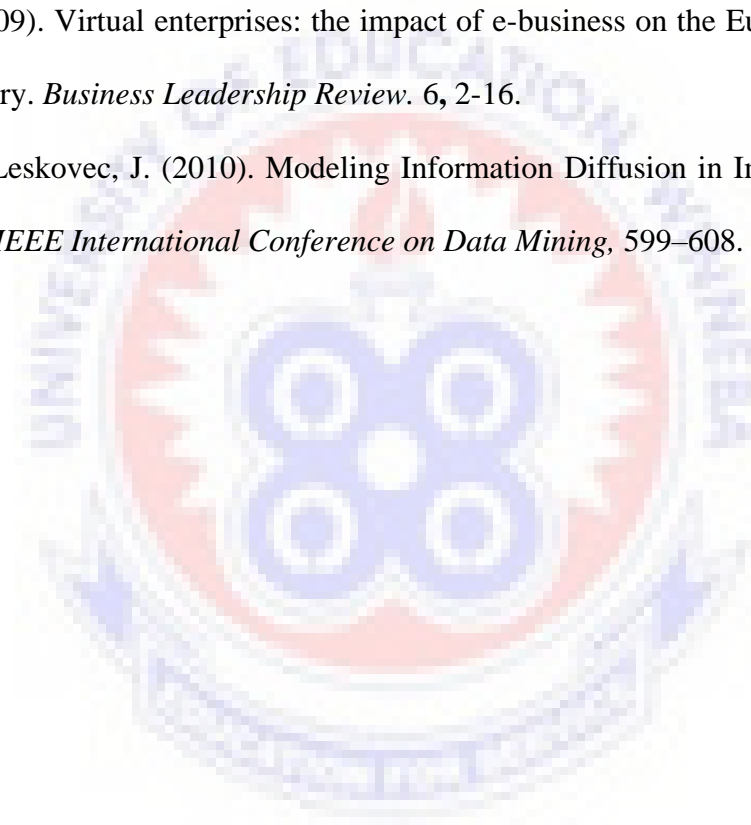
- Khanapuri, V. B., Nayak, S. Soni, P., Sharma, S. & Soni, M. (2011). Framework to Overcome Challenges of Adoption of E-procurement in Indian Context. *International Conference on Technology and Business Management*. March 28-30. 208.
- Klinc, R., Turk, Ž., & Dolenc, M. (2016). A service-oriented framework for interpersonal communication in architecture, engineering and construction. *Tehnicki vjesnik – Technical Gazette*. 23, 1855–1862.
- Kocarev, L., (2012). *ICT Innovations 2011*. Springer Science & Business Media.
- Kodama, M., (2012). *Competing Through ICT Capability: Innovation in Image Communication*. Palgrave Macmillan.
- Lenny, K.S.C. (2009). *Information and Communication Technologies Management in Turbulent Business Environments*. IGI Global.
- Levy, S.M. (2007). *Project Management in construction (5th ed.)* McGraw Hill companies, 261-293.
- LI, F. (2007). *What is e-Business? How the Internet Transforms Organizations*, Great Britain, Blackwell Publishing.
- London, K. & Bavinton, N. (2006). Economic, Social and Cultural Impediments and Drivers for Adoption of E-Business Innovations within the Industrial Structure of the Construction Sector. In: *Clients Driving Construction Innovation: Moving Ideas into Practice*, Brown, K. (Ed.). Cooperative Research Centre for Construction Innovation for Icon, Net Pty Ltd., Brisbane, 313-336.
- Lou, E.C.W., (2010). *E-readiness: How ready are UK construction organizations to adopt IT*. Association of Researchers in Construction Management, Atlanta City, USA.

- Love, P., Zhou, J., Matthews, J., Sing, C., Olatunji, O., & Carey, B. (2015). Discussion of State of practice of Building Information Modeling in the electrical construction industry by Awad S. Hanna, Michael Yeutter, and Diane G. Aoun. *Journal of Construction Engineering Management*, 142(3),21-32.
- Mastor, S. H. (2010). *The Impact of E-Procurement Application on business Activities in Malaysian Construction Industry*. 2, 21-39.
- McCarthy, F. & John, C. (1999). The social Impact of Electronic Commerce, *IEEE Communication Magazine*, 53-57.
- Mohamed, I.S. (2010). *An empirical study on factors determining E-Business usage on business performance in Malaysian service industry*, 5-34.
- Morais, E.P., Pires, J.A., & Goncalves, R.M. (2012). E-Business Maturity: Constraints associated with their evolution. *Journal of Organizational Computing and Electronic Commerce*. 22(3), 280–300
- Mutula, S.M. & P. van Brakel, (2006). An evaluation of e-readiness assessment tools with respect to information access: Towards an integrated information rich tool. *Int. J. Inform. Manage.*, 26: 212-223.
- Ofori, G. (1994a). Construction industry development: role of technology transfer. *Construction Management & Economics*, 12, 379-392.
- Onyegiri, I., Nwachukwu, C., (2011). Information and communication technology in the construction industry. *Am. J. Sci. Ind. Res.* 2, 461–468.
- Oyediran, O. S. (2011). *Awareness And Adoption of Information and Communication Technology (ICT) by Architectural Engineering and Construction (AEC) industry*

- educators in Nigeria*. [Online]. From: <http://itc.scix.net/data/>. (Accessed on January, 29, 2018).
- Oyediran, O. S. & Odusami, K. T. (2005). A study of computer usage by Nigerian Quantity Surveyors *ITcon*, 10, 291-303.
- Peansupap, V. (2004). *An Exploratory Approach to the Diffusion of ICT in a Project Environment*. PhD, School of Property, Construction and Project Management. Melbourne, RMIT University
- Perera, S., Ruikar, R. & Ingirige, B. (2011). Editorial: Innovation in e-business, *ITcon Special Issue Innovation in Construction e-Business*, 16, 635-36.
- Perreira, C.S. & Saores, A.L. (2007). Improving the quality of collaboration requirements for information management through social networks analysis. *International Journal of Information Management*, 27, 86-103.
- Piotrowicz, W., & Irani, Z. (2010). Analysing B2B electronic procurement benefits: information systems perspective. *Journal of Enterprise Information Management*. 23(4),559–79.
- Raymond, L., Croteau, A.M. & Bergeron, F. (2012). The strategic role of IT as an antecedent to the IT sophistication and IT performance of manufacturing SMEs. *Int. J. Adv. Syst. Meas.*, 4: 203-211.
- Rogers, M. (2003). *Diffusion of Innovations*. New York: Free Press.
- Ruikar, K. & Anumba, C. J. (2008). *Fundamentals of e-Business-Business in Construction*. In: Anumba, C. J and Ruikar, K (Eds) Book Oxford: Blackwell.1-22.
- Ruikar, K., Anumba, C.J. & Carrillo, P.M. (2006). Verdict-An e-readiness assessment application for construction companies. *Autom. Constr.*, 15: 98-110.

- Ruikar, D., Anumba, C.J. & Duke, A. (2008). *Using Next Generation Web Technologies in Construction e-Business*. In: e-Business in Construction, Anumba, C.J. and K. Ruikar (Eds.). Chapter 10, Blackwell Publishing Ltd., 167-194.
- Sekou, E. A. (2012). *Promoting the use of ICT in the Construction Industry: Assessing the factors hindering usage by Building Contractors in Ghana*. MSc thesis, Kwame Nkrumah University of Science and Technology-Kumasi, 6-72.
- Sexton, M., & Barrett, P. (2003). Appropriate Innovation in Small Construction Firms. *Construction Management and Economics*, 21 (6), 623-633.
- Sloan, B. & Low, B. K. (2000). *Current developments in electronic commerce: What it meant for property and construction industry*, Research Review Series, London RICS Foundation,
- Smyth, H. (2010). Construction industry performance improvement programmes: the UK case of demonstration projects in the 'Continuous Improvement' programme. *Construction Management and Economics*, 28, 255-270.
- Stewart, P. (2001). The role of e-commerce systems for the construction industry. *The Australian Journal of Construction Economics and Building*, 1(2), 24-36.
- Streeten, P. P. (1991). The Impact of the Changing World Economy on Technological Transformation in the Developing Countries. In: Singer, H. W. Hatti, N. and Tandon, R. (Eds), *Joint Venture and Collaborations, Indus, New Delhi*, 39-56.
- Sun, C., Jiang, S., Skibniewski, M. J., Man, Q., & Shen, L. (2015). A literature review of the factors limiting the application of BIM in the construction industry. *Technological and Economic Development of Economy*, 1-14.

- Vitkauskait, E., & Gatautis, R. (2008). E-procurement perspectives in construction sector SMEs. *Journal of Civil Engineering and Management*. 14 (4):287–94.
- Wong, C. H. & Sloan, B. (2004). Use of ICT for E-Procurement in the UK Construction Industry. A Survey of Smes Readiness. In Khosrowshahi, F. (Ed.). *20th Annual ARCOM Conference*. 1-3 September 2004. Heriot Watt University. Association of Researchers in Construction Management. 1. 620-8.
- Worst, J. (2009). Virtual enterprises: the impact of e-business on the European construction industry. *Business Leadership Review*. 6, 2-16.
- Yang, J., & Leskovec, J. (2010). Modeling Information Diffusion in Implicit Networks. In *2010 IEEE International Conference on Data Mining*, 599–608.



APPENDIX A

QUESTIONNAIRE FOR EXAMINING THE IMPACT OF E-BUSINESS ON PERFORMANCE OF CONSTRUCTION FIRMS IN THE KUMASI METROPOLIS

QUESTIONNAIRE

This study is being conducted to examine the impact of E-business on performance of construction firms in the Kumasi Metropolis. The researcher is a Master of Technology (Construction) student who would appreciate very much if you could take some time off your tight schedule to complete the questionnaire. The questionnaire is for academic purposes only and the responses will be treated with the utmost confidentiality.

SECTION ONE: DEMOGRAPHICS OF RESPONDENTS

All responses will be confidential and will not be connected in any way to yourself or your institution

SECTION A: Background Information of Respondents.

1. Please indicate your gender. *Please tick* [✓]
 - a. Male
 - b. Female

2. What age category do you belong? *Please tick* [✓]
 - a. Less than 30 years

 - b. 31 – 40

 - c. 41-50

 - d. 51+

3. What is your highest educational qualification? *Please tick* []

- a. J. H.S
- b. S. H. S
- c. HND
- d. First degree
- e. Post-graduate
- f. No formal education
- Others (Please state) _____

4. How long have been working in your of firm? (*Please tick*)

- a. Less than a year
- b. 1-10 years
- c. 11-20 years
- d. 20+ years
- Other (Please state) _____

SECTION B: ADOPTION OF E-BUSINESS IN CONSTRUCTION ACTIVITIES

5. Does your firm have E-business in its operations?

- a. Yes [] b. No []

6. Does your firm utilise E-business in their operational activities?

- a. Yes [] b. No []

7. Give reasons to your answer in Question 2

.....
.....
.....
.....

8. Rank the following components of **reasons for adopting E-business in construction activities** in a range of one (1) to five (5) with one (1) being the most important factor and (5) being the least important factor. Just tick (✓) the blank space for the answer which is right to you.

No.	Reasons for adopting E-business in construction activities	RESPONSES				
		1	2	3	4	5
1	Increasing usage of the internet					
2	For conducting research					
3	Collaborating with business partners					
4	Better channel partnership					
5	For the purposes of data capture and management					
6	It reduce costs					
7	It saves time					
8	Improve services quality					
9	Improve advertising in construction firms					

9. Rank the following components of **challenges to E-business in construction firms** in a range of one (1) to five (5) with one (1) being the most important factor and (5) being the least important factor. Just tick (✓) the blank space for the answer which is right to you.

		RESPONSES
--	--	-----------

No.	CHALLENGES	1	2	3	4	5
1						
2	Lack of security and trust in transacting business on line					
3	Poor ICT infrastructure					
4	Lack of familiarity with ICT system					
5	Lack of technological expertise					
6	Lack of feeling of transfer in some electronic communication tools					
7	Poor backup system					
8	Low awareness of customers and suppliers					
9	Huge implementation cost					
10	Lack of uniformity of decision makers					
11	Reluctance from management and hesitant to change the way of working					
12	Lack of ICT investment decisions					
13	Anti-intellectual culture					
14	Poor training and skills development					
15	Financial constraint is one of the restraining factors					

SECTION C

10. Rank the following components of **Impact of E-business on construction firm** in a range of one (1) to five (5) with one (1) being the most important factor and (5) being the least important factor. Just tick (✓) the blank space for the answer which is right to you.

No.	Impact	RESPONSES				
		1	2	3	4	5
1	Time/cost savings					
2	More up-to-date information					
3	Increased transactional speed and eliminates many manual activities.					
4	Leads to changes in the structure of jobs and other organisational practices					
5	Conflict in the social structure in firms					
6	Competitive advantage					
7	Contribute to enhanced efficiency in business process					
8	Better management control					
9	Enhance collaboration by supporting communication among project members and sharing of information					

12. In your view, do you think E-business adoption have effect on performance of construction firms?

- a. Strongly agree []
- b. Agree []
- c. Strongly disagree []
- d. Disagree []
- e. Do not know []

13. In your view, do you think E-business adoption have effect on productivity of construction firms?

- a. Strongly agree []
- b. Agree []
- c. Strongly disagree []
- d. Disagree []
- e. Do not know []

14. In your opinion, how will you rate the extent of adoption of E-business in construction firms?

- a. Often []
- b. Rarely []
- c. Common []

15. In what way(s) can E-business in construction firms be improved in the Kumasi Metropolis?.....

APPENDIX B

INTERVIEW SCHEDULE FOR CONTRACTORS

General Information

1. How many years have you been in business?.....
2. What do you understand by e-business?.....
3. Do you adopt e-business in your activities?.....
4. If yes, can you describe it?.....
5. To what extent do you utilise it in your activities?.....
6. What are some of the challenges inherent in e-business?.....
7. What are the impact of e-business on your firm?.....
8. What strategies can be adopted to improve e-business in your firm?.....

THANK YOU FOR YOUR CO-OPERATION