INNOVATION IN SMALL ARCHITECTURAL AND CIVIL CONSTRUCTION FIRMS IN KENYA

BY

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DECLARATION

This research project is my original work and has not been submitted for any award to any other college, institution, or university.

Signature …….. Date ……

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D61/P/7725/2001

This research project has been submitted for examination with my approval as the University supervisor.

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DEDICATION

This work is devoted to my family, particularly my spouse Phyllis and my daughters Lynette and Cynthia, for their continual support and forbearance during my academic expedition to realize my long valued dream.

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ABBREVIATIONS AND ACRONYMS

AEC - Architecture, Engineering and Construction Industry

BIM - Building Information Modelling

CAD - Computer Aided Design

CIS - Community Innovation Survey

DOI - Diffusion of Innovation

NCA - National Construction Authority

RBV - Resource Based View

UK - United Kingdom

ABSTRACT

Innovations are acknowledged because of playing vital roles in value creation and also maintenance of the construction firms' competitive gains. However, the innovation traits vary from one industry to the other, and this creates external or internal challenges for construction firms. Besides, new inventions are very risky, costly plus possibilities of being successful deem to be very small, which dampened the ability of small construction and architectural firms to adopt new technologies. Compared to large firms, small firms in the construction sectors are characterized by low productivity with a lack of new technologies being the fundamental cause of low outputs. This study, therefore, examined the degree to which innovation practices were adopted by small architectural and civil construction companies and the factors influencing the adoption of innovation in small architectural and civil construction companies in Kenya. The research was anchored on the technology adoption life cycle theory, diffusion of innovation model, and the resource-based view. The research employed a cross-sectional descriptive study design, and the population was made of 650 licensed civil construction firms and 80 architectural firms in Nairobi County from which a sample of 73 companies was carefully chosen through simple random sampling. The study entirely used primary data, which was gathered using a semi-structured questionnaire. The collected data was sorted and keyed into the SPSS then summarized using descriptive statistics and factor analysis to establish the interconnection and decrease the various factors into small variables. The findings revealed that the major innovation practice used by small construction and architectural firms in Kenya included continuous research and development, internet adoption, entering new markets, adoption of modern equipment and timely completion and delivery of projects, engineering innovations, retraining of human resource and devolving to counties respectively. The study also found that the major challenges included financial resources, research and development funds, competition, and pressure from other industries, equipment availability, available skill level, and project risks and insurance. The other challenges included industry standards, leadership support, user desires, and industry networks. The study recommended that management of small architectural and civil construction firms should ensure that the adopted innovation practices are frequently reviewed to ensure that they conform to the firms' goals and objectives and that they are cost-effective in the long run.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Innovation is a significant element for improving the production levels along with advancements made in different sectors in a country, together with the construction sector (Davis et al., 2016). The objective of adopting an innovation is to make available adaptive behaviour, enabling the business to sustain or enhance its performance. Due to its significance, innovation and its management constitute a major strategic issue (Bekkenutte, 2016). In industrial and environmental settings, innovation is considered as a source of development and maintaining the competitiveness of companies (Parida, Johansson & Larsson, 2009). The architectural and construction companies thus have to put into practice particular activities to effectively implement or create innovation for ensuring growth in the industry as well as a continued survival into the future (Iranmanesh & Kamal, 2015).

This study is based on the technology adoption life-cycle theory, the diffusion of innovation theory, and the resource based view model. The life cycle theory of technology adoption postulates that the adoption of technology goes from left to right for enthusiasts who realize the offer and convey it to visionaries who will transmit the information to the pragmatists, then to the conservatives and lastly to the late adopters (Ahmad, 2011). The diffusion of innovation model states that the procedure of making innovation decisions is an activity of trying to find more information, where a person is motivated to reduce the improbability on the usefulness and shortcomings for new improvements (Sahin, 2016). Resource-based view argues that advantages in a firm's competitive state happen when a firm in a different way merge the intangible and

physical assets along with their potentials and that a firm's innovative capabilities can explain a business' strength or weakness in the competition (Genç, Özbağ & Esen, 2013).

In Kenya, architectural and construction firms belong to the construction sector, which contracts with the building of new constructions such as apartments, residences, plants, offices, and institutions (Ondara, 2017). The construction sector in Kenya deals with designing and road constructions, ports, bridges, railroads, sewers, and many others (Niagara & Datche, 2015). Construction companies take care of the maintenance, repair of all structures, and produce the basic materials, such as concrete, used in the construction industry. The importance of the sector is due not only to the fact that it provides the buildings and infrastructure on which virtually all other sectors depend, but also because it is such an important sector to the economy on its own (Competition Authority of Kenya, 2017).

1.1.1 Concept of Innovation

Innovation is referred to the act of initiating and also the use of new technologies, ideas, services as well as referred to the practices that are geared to solve organizational constraints, taking a different point of view on things, and also enhancing organizational effectiveness along with efficiency (Lu & Sexton, 2004). Innovation also refers to the process by which companies seek to build and acquire their unique technological competencies (Widén, 2012). Innovation is as well explained as the innovative resource combinations and fund conceptualization as a product of knowledge procedures in which information is grouped and controlled keen on bringing new resolutions with universal implications (Vargas et al., 2017).

Innovation signifies the improvement of a completely new commodity, service, or the process of production and service delivery, where experiences along with knowledge are not adequately presented (Genç, Özbağ & Esen, 2013). Innovation can be categorized in terms of adoption and creation of innovation according to its innovator. Generally, creating innovation involves introducing a new product or service before competitors, while adopting innovation involves adopting the ideas of competitors (Iranmanesh & Kamal, 2015). The innovation types may be linked to the provision of new services; the adjustment of processes used in the creation or preparation of the services; the presentation of new planning methods; new markets discovery; and the outcomes of the processes of solving problems (Vargas et al., 2017).

The innovative technology is an essential competence for the long term company growth and expansion (Nalband, Alkelabi & Jaber, 2016). The types of technological and non-technological practices of innovation create diverse influences on the company's productivity, the industrial sector, and also the national level (Ozorhon, Abbott & Aouad, 2010). At the level of the company, improvement is an essential basis for the competitive advantages, providing the methods of achieving the customer's requirements indefinite ventures or the company's aims in various business opportunities (Ozorhon, Abbott & Aouad, 2010).

Innovation is explained to be the convenient method of bringing into existence improvements in performances of construction industries (Bekkenutte, 2016). The main aim why companies come up with innovations is to raise their competitive level (Widén, 2012). More innovative companies become flexible plus they have better capacities of adapting to change in industry conditions meaning that they can survive in adverse

environments and also utilize the real chances to a superior level than their competitors (Nalband, Alkelabi & Jaber, 2016). Innovations are manifested in a new service of product, strategy, or decision processes, and their influences are determined by the distinctions that accrue to the company when adopted (Laryea & Ibem, 2014).

1.1.2 Architectural and Civil Construction Industry

Architectural and civil construction companies are grouped in official statistics, but their operations and strategies differ (Jewell, Flanagan & Anaç, 2010). Architects are defined as inventive entities in which qualified professionals transform creative concepts into systematic practices and profit-making practices (Oluwatayo & Amole, 2011). Civil construction firms, on the other hand, are concerned with the setting up, renovate, and demolish building structures along with the civil-engineering constructions in a nation (Niagara & Datche, 2015). Architects formulate the building structures offering a room of meeting with customer requirements also including artistic while civil construction firms deal with construction, maintenance and utilization as well as with the modulation, modification, and demolition or deconstruction (Ghaben & Jaaron, 2015).

Firms in the architectural and civil construction sector belong to the construction sector, and the services offered by both firms are inputs of the construction process (Jewell, Flanagan & Anaç, 2010). The construction industry is important in most economies in relation to its input in the national economy at large (Davis et al., 2016). The major constrains to building engineering make it a problem in assessing new ideas relating to building and construction. For instance, managing the rapidly changing customer requirements for more and more well-designed and refined buildings and equipment;

offer flexibility while anticipating the reduction of investment and operational costs; increased requirements for building renewal and maintenance (Davis et al., 2016).

Because of the considerable deviations in the structural design, production and building firms, civil construction and architectural companies must adjust fast to remain in a competitive state. Firms must not only innovate in their services and products but also bring more changes that are essential in a manner that creates and enhances their value, thus interchanging or transforming the design of their business approach (Vos et al., 2014). However, the financial crisis, global societal changes have forced the architectural, engineering, and construction sectors to undergo significant changes over the last decade (Jewell, Flanagan & Anaç, 2010). Besides, the swift improvement of digital technologies has made construction and building a succession of diverse evolutionary plan courses of action (Ramilo, 2014).

1.1.3 Small Architectural and Civil Construction Firms in Kenya

In Kenya, small architectural and civil construction firms belong to the engineering, architecture, and building industry (AEC). Companies in the Kenyan architectural, engineering and construction industry are categories into seven classes; NCA-1 to NCA-7, whose monetary value ranges from unlimited value contracts (NCA-1) to contracts of up to KS 20 million (NCA-7) (NCA, 2018). The big construction companies are grouped in category 1-3 while minor companies are grouped in categories 4 to 8. Each class is bound upon the size and value of the projects that are worth doing, where small contractors work for small projects while major contractors work in large-scale projects (Competition Authority of Kenya, 2017).

Firms in the architecture, engineering, and construction in Kenya are registered, licensed, and regulated by the NCA. The key NCA's objective is the regulation, rationalizing, and building capacities in engineering industries in Kenya and is the watchdog for the international and local construction firms operating in the country. Relating to the NCA (2017), 18,000 construction firms were listed with the National construction authority in 2015 and the local firms being almost fifty per cent. As of 2015, 111 NCA 1 firms were functional by listing under the NCA. Above fifty per cent of NCA 1 were local Kenyan firms. Eighty per cent of the Kenyan firm falls below NCA 4, and they tend to require adequate financial capacity, equipment along with the human resources to execute significant undertakings (Competition Authority of Kenya, 2017).

Architectural and civil construction firms in Kenya are vital in sustaining the economies infrastructural sector through building constructions (residing homes, offices, factory plants) railways, roads, water-supply projects amongst other developments (Niagara & Datche, 2015). Presently, the Kenyan economy is experiencing building bangs plus the state has significantly ventured on building sectors for improving infrastructures and also offers new homes to the local people (Competition Authority of Kenya, 2017). However, architectural and civil construction firms in Kenya have encountered countless problems and predicaments that affect their operations (Ondara, 2017).

1.2 Research Problem

Innovations are acknowledged because of playing vital roles in value creation and also maintenance of the construction firms' competitive gains (Nalband, Alkelabi & Jaber, 2016). However, the innovation traits vary from one industry to the other; this creates external or internal challenges for construction firms (Vargas et al., 2017). Besides, new

inventions are very risky, costly plus possibilities of being successful deem to be very small; which dampened the ability of small construction and architectural firms to adopt new technologies (Šuman & Semič El-Masr, 2013). Further, innovation models in the construction sector differ in many ways from those in other sectors, in part because of their fragmented and project-based nature (Ozorhon, Abbott & Aouad, 2010). Iranmanesh and Kamal (2015) posit that compared to large firms, small firms in the construction sectors are characterized by low productivity with a lack of new technologies being the fundamental cause of low outputs.

In Kenya, the building industry plays a fundamental role in economic development (Niagara & Datche, 2015). Thus, architectural and civil construction companies take a vital task in the Kenyan building and engineering sector. However, international companies have increased in the Kenyan construction sector in the previous few years (Kihoro & Waiganjo, 2015). As such, many of the local companies do not have the technological capacities, and the know-how of handling the engineering ventures and the job quality of the local firms are usually very low since most workers are not very well experienced as well as equipped (Ondara, 2017). Further, there is much competition in the construction sector. This results in competition between foreign-owned firms and local entrepreneurs, who view visitors as a threat to industry managers (Competition Authority of Kenya, 2017).

Empirically, various authors have explored the need for innovation in the construction industry across the globe. For instance, Iranmanesh and Kamal (2015) investigated how characteristics of construction firms influenced the adoption of innovation and revealed that old and big firms were more innovative than young and small firms though the study

did not identify the various innovative practices adopted by the firms. Ramilo, Embi and Datta (2015) assessed the effect of organizational and technological barriers on digital innovation and revealed that technical, governmental, financial, and psychosomatic and also development hurdles were more present in smaller architectural practices than big architectural practices though the study did not examine the innovation practices by employed by the firm.

Locally, Niagara and Datche (2015) in Kenya assessed the dynamics influencing the productivity of the Kenyan construction companies, revealed that resources shortage, leadership skills and availability of personal were the significant factors, but the study did not cover innovation as a factor. Kihoro and Waiganjo (2015) assessed the factors affecting the productivity of building schemes in Kenya and revealed that planning for schemes, control of the stakeholders, and capabilities of the planning group affected the productivity of the construction schemes; however, the study did not incorporate innovation as a factor. From the assessed studies, it remains apparent that compared to other economic sectors like manufacturing, retail, and other services sectors like banking, innovation in the construction sectors is generally slow. Besides, very few studies, especially in Kenya, have explored innovation and innovation practices in the construction despite being one of the most significant and fast-growing sectors, which leads to an empirical research opening. This research thus seeks to provide answers to the question, how is innovation in small architectural and civil construction firms in Kenya?

1.3 Research Objectives

i. To establish the extent to which innovation practices are adopted by small architectural and civil construction companies in Kenya.

ii. To determine the factors influencing the adoption of innovation in small architectural and civil construction firms in Kenya

1.4 Value of the Study

The research outcomes shall be of significance to the board of management for small architectural and civil construction firms who may adopt the study results and conclusions to formulate strategic policies on innovations and competitive advantage in their firms. The management of small architectural and civil construction firms will use the research findings to identify the various challenges that affect the implementation of innovation practices.

The findings will also be of benefit to policymaking entities like the national construction authority and the administrative agencies in control of the building and engineering industry. The various policy-making and regulatory entities may use the study's conclusions and recommendations to develop strategic policies to enhance innovation and the various challenges facing small architectural and civil construction firms in Kenya.

Lastly, the findings will supplement the existing empirical literature on innovations in small architectural and civil construction firms and theoretical literature on the technology adoption life cycle theory, the DOI, and RBV models. The paper shall as well form a base for future researches as well the forthcoming scholars can adapt the study to be a base for their study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The section provides the academic works of literature related to the study, an evaluation of various innovation practices and challenges faced by firms when implementing innovative practices and lastly an assessment of empirical studies and the various gaps in those studies.

2.2 Theoretical Foundation

This study discussed Moore's (1999) technology adoption life cycle theory, Rogers (1962) diffusion of innovation theory and the Penrose's (1959) resource-based view

2.2.1 The Technology Adoption Life Cycle Theory

The theory was developed by Moore (1999) and split the technology implementation life-cycle into groups of five final users' traits as well as motivations. The theory postulates that the circulation of new technologies across the groups of final users is assumed to trail on a normally distributed bell curve prototype (Coughlan, Dew & Gates, 2008). The life-cycle is an expected blueprint pursued by technical modernism beginning from the setting up and project growth to market dissemination and into market subrogation (Ahmad, 2011).

The theory defines five classes of persons: the innovators, early adopters, early majority, the late majority, and the laggards. The innovators seek new technologies insistently (Ahmad, 2011) while early adopters acquire new invention ideas very early in their life-cycles and unlike the modernizers, they are not technicians (Coughlan, Dew & Gates, 2008). The early majorities contribute to be part of the early adopters' capacity of relating

to technologies, except eventually, they are motivated by sharp realism senses (Vasseur, 2012). The late majority waits in anticipation of a thing to be an established in levels for their adoption to the technology and finally, the laggards; those who do not want everything dealing with new technologies because of dissimilar of motives that may be economic or individual motives (Tangkar & Arditi, 2004).

Technology adoption life cycle theory is heterogeneous and is founded from different advancements. Firstly, it analyses three unique life cycles: invention, industry and technology and secondly, this literature is on the rise due to assistances from various studies like business plans, economics, promotional and sociological studies (Vasseur, 2012). According to theory, unless corporations match their clients with suitable innovation to ensure sustainable profit levels, such will be compromised; and trivialization, a kind of natural means by which the price of inventions decreases over time, mainly owing to standardization, expansion, and economies of scale (Ahmad, 2011).

2.2.2 Diffusion of Innovation Theory

The diffusion of innovation (DOI) model was authored by Rogers (1962) and described diffusion as a means by which new technology is communicated via some specific delivery channels over time (Dube & Gumbo, 2017). Innovation is the knowledge that is deemed to be new by organizations or individuals. The conduits of information delivery comprise of how information relating to the new invention streams from the foundation to the recipient and time relates to the innovation acceptance rate or the duration used by various people to accept the new technology. The social-system is a group of

interconnected elements affianced in a collective crisis solving to achieve similar goals (Besharati et al., 2017)

The DOI indicates that the supposed innovation aspects include the relative advantages (the apparent gains and costs); compatibility (extend to which a new technology is alleged to match customer requirements, values, and their immediate societal standards) and intricacy (level to which a new technology is deemed to be complex to know and adopt it). Others include trial-ability (level to which new technology can be tested on a narrow base along with observability (level to which the outcomes of a new product are observable by other people (Laryea & Ibem, 2014). The DOI theory also explains that the processes of making improvement decisions are composed of five phases that are; knowledge, affiliation, resolution, performance and the verification phase (Besharati et al., 2017).

The DOI is a premise that tries to explain by what means, why, and at what proportion of new technologies and information expanse in societies (Dearing & Cox, 2018). DOI explains how new information is communicated to the members belonging to a particular societal structure (Nalband, Alkelabi & Jaber, 2016). The theory postulates that acceptance rate is the comparative promptness through which a new idea is accepted by community members and is usually determined by the amounts of persons that implement that technology within a particular time (Dube & Gumbo, 2017). In this study, the DOI theory supports that project acceptance is a verdict of full implementation of technology because it is the best strategy presentable, whereas denunciation is the verdict not to implement the technology.

2.2.3 Resource Based View

This model was authored by Penrose (1959) based on the argument that it is the not the homogeneity, but the heterogeneity for the dynamic services presentable by its resources that provide every industry with its distinctive nature (Kostopoulos, Spanos & Prastacos, 2002). However, the connotation of resource perception as an original course in the field of strategic managing was expounded by Wernerfelt (1984) he concluded that company's evaluation in relation to their financial resources could accrue to imminent differing from the conventional business point of views (Costello & Donnellan, 2011).

The resource-based views analyze the resource aspects along with proficiencies plus how they can assist firms in differentiating themselves from the other industries and maintain competitive advantage (Costello & Donnellan, 2011). According to the RBV, capitals are contributing factors to the company's process of production like financial assets, staff's proficiencies, patents, and the gifted directors (Genç, Özbağ & Esen, 2013). The theory indicates that companies having assets that can improve the firms' net worth are exceptional and they are not easy to emulate them, plus are capable of organizing as well as exploit them, and the resources could offer a base of sustainable competitive advantage (Vargas et al., 2017).

The RBV supports that innovation is a vital growth driver and the nations that make and use new ideas, as well as breed novelty, tend to grow faster than the nations who do not, firms must have an excellent indulgent regarding the background of new ideas so as to be intelligent in increasing the productivity (Genç, Özbağ & Esen, 2013). In this study, the RBV is used to explain that a firm's sensation does not automatically link with market

control or business construction, but moderately is the outcome of new technologies that are very vital in affecting the vibrant of outside environments along with competitions.

2.3 Innovation Practices

Innovation practices have turned out to be an engine by which methodologies, connections, and procedures of firms can be improved to enhance effectiveness along with competitive gains (Ghaben & Jaaron, 2015). Relating to Schumpeter, improvement is distinguished in five different forms: new commodities, new production methods, new markets, new suppliers, and new organizational structures (Bekkenutte, 2016). In architecture, engineering, and construction, there are four distinct innovation practices among them technological innovation, organization improvement, product advancement, and process innovations (Ramilo, 2014). This study focuses on technology innovation, organizational innovation, process innovation, product innovations, and marketing innovation.

Technical innovation refers to an iterative action initiated through the insight of prospect for a technology-rooted discovery primarily to start, expansion, construction, commercialization, and advertising of innovations (Laryea & Ibem, 2014). The technical inventions consist of the applied scientifically new commodities and the processes of delivery with considerable technical enhancements to the goods and also services (Ozorhon, Abbott & Aouad, 2010). This makes use of new ideas and methods of providing goods and services at lesser costs or superior qualities (Ramilo, 2014). Technological improvement entails making use of technological outlooks for the processes of product innovation (Davis et al., 2016).

Organizational innovation comprises of considerable variations in the structures of organizations, implementations of improved administration strategies along with the realization of new or significantly varied company strategic courses (Ozorhon, Abbott & Aouad, 2010). Managerial improvements are viewed to be the facilitators for technical enhancements, instantaneous competitive advantage source, and they are related to information development prerequisites in organizations (Bekkenutte, 2016). Organizational innovation requires no technical improvements; however, it entails societal know-how that is changing the connotations amid behaviours, feelings, and standards (Ramilo, 2014).

Product innovation denotes the making of beneficial changes to a produced good with the aim of increasing its offering value, and it is often used in contrast to related terms such as product design, research and development and new product development, which all offers a perspective to the degree of changes to the product (Akintan, 2013). Product improvement is the realization or commercialization of goods having advanced features like the delivery of meaningful new and better services (Widén, 2012). Product improvement has a small dependency on the hardware, gives an improved resource utilization, plus it entails the technological advances arising from better goods and service provision (Ramilo 2014).

Process innovation is a class of innovation that involves the introduction of an improved set of a method in other to enhance the production and delivery of value-adding outputs. It encompasses all the operational activities involved commencing from the beginning up until when the final value is being delivered to the customer (Akintan, 2013). Method improvements considerably raise competence with no substantial knowledge proceeds

(Ramilo, 2014). Process improvement leads to better processes in the firm, such as advancements in building procedures or the competence of average dealings (Tangkar & Arditi, 2004).

Market improvements is an organized course of action that is responsible for the planning of prospect actions to be identified, the anticipation and profitably satisfying the consumer necessities and is linked to marketing actions of advertising, pricing, and delivery, and product role (Tangkar & Arditi, 2004). Market improvement will comprise of achievements of new marketing methodologies relating to considerable changes in commodities, prices along with the promotional strategies (Ozorhon, Abbott & Aouad, 2010). Marketing innovation is keen on ensuring that the customer needs are met, venturing to different markets or moving a business service in the markets with the objectivity of increasing sales volume (Vargas et al., 2017).

2.4 Factors Affecting the Adoption of Innovation

Although several benefits are associated with the adoption of innovation, the various factor that affects the innovation process and the overall business model (Parida, Johansson & Larsson, 2009). Apart from the advantages and new opportunities for organization in innovations in particular for the small and medium-sized companies, possess some vital predicaments (Rodríguez & Lorenzo, 2011). There significant challenges as identified in literature which affect the implementation of innovation include organizational challenges, resources, and firm capabilities, environmental/industry characteristics, personnel challenges, project challenges, management factors among others

Šuman and Semič El-Masr (2013) posits that innovation is a vital element for expansion along with the maintenance of a competitive state for the construction firms. Nonetheless, lack of skills and also capital are significant constraints that can only survive within the company with a specific skilled person. Sexton and Lu (2004) show that small companies require requisite finances, staff and time to take on strategic preparation, plus as an alternative aim at the operational factors aimed for survival with the daily routines.

Ramilo (2014) posits that small architectural firms experience several defies caused by digital modernization among them unvarying preface of new digital equipment, inadequate plan cost, enlarged international competitions, rising customer needs, and inadequate soft-ware familiarity are part of the defies. Hardie (2009) found that small firms usually do not have enough slack finances to take on improvement actions. She further posits that the transfer and retention of knowledge for the engineering companies tend to be challenging because of the competitive character of excellent building activity, and construction managers tend to be more practical in recognizing industry opportunities than investing in education and training in their workforces.

Wilis and Suhendri (2017) in Indonesia found that the scarcity of skilled building information modelling users, low customer demand, high venture costs, plus the firm's reluctance to switching into technology were the critical challenges. Maina (2018) revealed that high computer specifications cost of machines, needs for extensive training, insufficient daily incorporation, the need for stable power supplies and period to gain expertise were the utmost essential constraints of proficient CAD/BIM adoption.

In Kenya, the building sector is analyzed as a scheme that involves customers, contractors, sub-contractors, professionals, and designers. However, technological

improvement is driven mainly by the suppliers while the practitioner's lean-to launch services as well as company improvements (Niagara & Datche, 2015). The Kenyan building firms are as well susceptible to the troubles and obstructions like in other developing nations. Cases of the construction drawbacks consist of the need for transparency in bidding actions; demand is inelastic, large customer numbers, and sub-contracting agencies plus many more(Competition Authority of Kenya, 2017).

2.5 Summary of Literature Review and Research Gaps

A study by Gupta (2017) analyzed the impacts of value and innovation applies to firms' productivity. The study used primary data collected through questionnaires from 126 manufacturing firms in India, which is analyzed through descriptive statistics, exploratory factor analysis, and the regression model. The findings established that sustainability leaning modernization activities helped foster the development and productivity gains to leading manufacturing firms in India. The study, however, focused on innovation practices in manufacturing firms while this research concentrates on architectural and construction firms hence a contextual gap.

Ghaben and Jaaron (2015) in Palestine assessed how innovation practices influenced construction projects. The study adopted a mixed-methods approach and collected data using questionnaires from 365 consulting and contracting firms. The findings showed that there existed a statistically considerable connection among strategic administration, inside and outside inventive functioning setting, stakeholders' managing, and the scheme administration. The study was inclined to project management and was carried out in consulting and contracting firms.

Laryea and Ibem (2014) examined the patterns of technical improvement in the adoption of electric buying within the building sectors. The study carried out a systematic assessment of 102 study pieces and decisive records from 72 books in print from 1978-2013 for the identification of technological patterns. The study revealed that the three most used technological patterns included the recognition as well as acceptance of web-based proficiencies along with submissions from different divisions, enhancement, and adoption of already acknowledged technicalities and the combination acceptance of the new and presented web-based techniques along with submissions in building procurements. The study was, however, a critical review of the literature, and no empirical analysis was carried.

Ebersberger et al. (2010) studied the open invention practices and their effect on invention productivity. The analysis was founded on Community innovation survey data from Norway, Belgium, Austria, and Denmark. The study established that open invention practices had a strong impact on innovation performance. It was also revealed that wide founded approach yields the strongest influence and that the joint open invention strategies appear more significant than the personal dealings. The study was, however, cross-country in nature and did not use firm-level data and focused on open innovations.

Reichstein, Salter, and Gann (2008) assessed the foundation along with the determinants for the process as well as product innovation amongst the UK building companies firms. The study adopted Logistic regression to analyze the data. The outcomes indicated that functioning well with clients, suppliers, plus having an extensive market course might assist the construction companies to pass over the margins of their critical engineering

perspective. The study focused on product and process innovations and did not assess other innovation practices.

In their study, Lu and Sexton (2006) assessed innovations in the small building and engineering know-how demanding certified service companies. The study used longitudinal 22-month case research for small architectural companies. The study found that the explorative innovation was collective in instant new venture realms, and involved exploration, disparity, testing of activities so as to unravel projects' specific problems whilst manipulative innovation strenuously aimed at improving the standard organizational infrastructure of refining as well as enhancing the efficiency of company dealings in nurturing capabilities for future activities. The study, however, focused on explorative and exploitative innovations and was not carried out amid the small architectural and construction firms.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The study methodology gives an outline of how research is to be carried out and, amongst other aspects; it arrays the method to be adopted for the research. The section, therefore, presents the adopted study design under section 3.2, study population in section 3.3, the sample design under section 3.4, the procedure of collecting under section 3.5 and finally the data analysis technique in section 3.6.

3.2 Research Design

The key aims for this study were to establish the extent to which small architectural and civil construction companies in Kenya adopted innovation practices and to assess the factors that influence the adoption of innovation in small architectural and civil construction firms in Kenya. In line with past studies on innovation among them Wilis and Suhendri (2017), Gupta (2017), Ebersberger et al. (2010), Ghaben and Jaaron (2015), Maina (2018) and Hardie (2009) this study adopted a cross-sectional descriptive study design.

Coopers and Schindler (2009) support that a cross-sectional descriptive survey is generally organized and precisely intended to study the characteristics termed in the research questions. Thus, a cross-sectional study design was vital in exploring and describing the adopted innovative practices as well as establishing the foremost factors that influence innovation adoption among the sampled small architectural and civil construction firms and generalizing the findings to the whole population.

3.3 Population of the Study

The population relates to the whole set of persons or things under concern in the fields of analysis with a common goal (Coopers & Schindler, 2009). In Kenya, the national construction authority classifies small architectural and civil construction firms under categories NCA-4 to NCA-7 and the firms mostly undertake the construction and designing of small projects based on the requirements stipulated by the construction authority.

The study's population therefore comprised small architectural and civil construction firms in Nairobi which ranged from classes four (4) to seven (7) as classified by the National Construction Authority of Kenya. According to the National Construction Authority, there are 650 licensed civil construction firms and 80 architectural companies in Nairobi County. Therefore, the study's population was made of 650 licensed civil construction firms and 80 architectural firms in Nairobi County.

3.4 Sample Design

Sample design refers to the techniques or procedures that the researcher likes to use when choosing items for the sample population (Kothari, 2009). The study targeted a population of the 650-licensed civil construction firms and 80 architectural firms within Nairobi County, and since the population was large and comprised of many firms, the study selected a representative sample from the total population.

The study thus sampled 73 firms. The sample was 10% of the entire population as recommended by Gay et al. (2006) that for a sample to be suitably representative, the

sample size must range between 10% and 30% of the total population to achieve normal distribution. The sample was selected using simple random sampling

3.5 Data Collection

This paper entirely used primary data, which was gathered through a semi-structured questionnaire. A questionnaire was selected since the sampled architectural and civil construction firms were many; hence, it was appropriate for obtaining data from the sampled individuals within a small time frame and in a moderately cost-effective manner.

The questionnaire was segmented into two sections where the first segment secured information relating to the company's background facts while the second segment encompassed a Likert scale questions and obtained data on the innovation practices and the factors affecting innovation adoption by architectural and civil construction firms. The questionnaires were administered to innovation managers or their equivalents in the selected small architectural and civil construction firms.

3.6 Data Analysis

The obtained data was prearranged and keyed into the SPSS then analyzed using descriptive statistical tools like percentages, frequencies, and the mean. Descriptive statistics were employed to summarize the study data and to indicate the extent to which innovation practices were adopted and the extent into which the assessed factors affected innovation adoption among small architectural and civil construction firms in Kenya

The study also used factor analysis to identify the inter-association and reduce the innovation practices as well as the factor affecting innovation adoption to smaller variables set, which had the greatest impact. Factor analysis is based on the idea that

observable and measurable variables can be reduced to less latent variables that share a common variation (Yong & Pearce, 2014). The presentation of the analyzed data was through charts, tables, and diagrams and the findings were compared with the reviewed literature.

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This part presents the research results and findings. The chapter contains the response rate results, results on the number of years the firms had been in existence, employees number and number of completed projects. The chapter also presents the detailed analysis results on innovation practices, factors affecting the adoption of innovation, factor analysis results, and finally, a discussion of the research findings.

4.2 Response Rate

The study sampled 73 firms and used questionnaires to gather data from innovation managers or their equivalents in the selected small architectural and civil construction companies in Kenya. The study managed to obtain complete data from 61 firms. The 61 firms made up a response rate of 84%, which was deemed sufficient for the research. Babbie (2004) posits that a 50% response rate is acceptable for analysis and publication, 60% is good, while 70% is excellent. Figure 4.1 shows the response rate results.

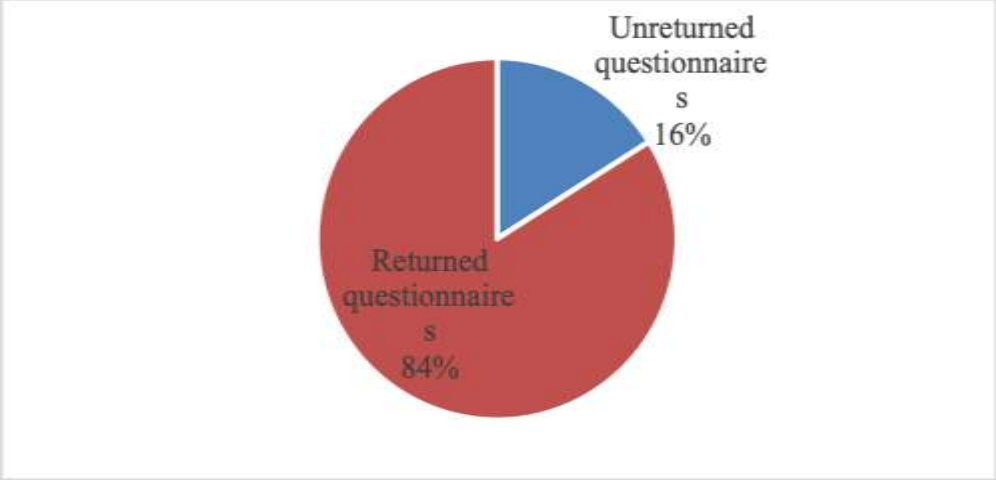

Figure 4.1: Response Rate
Source: Study Data

4.3 Firms Profile

This section indicates the findings on the category of the firm, the age of the firms, employees number, and the number of projects the firms had completed. The results were as follows

4.3.1 Category of the Firms

Figure 4.2 displays the results of the firms' categories

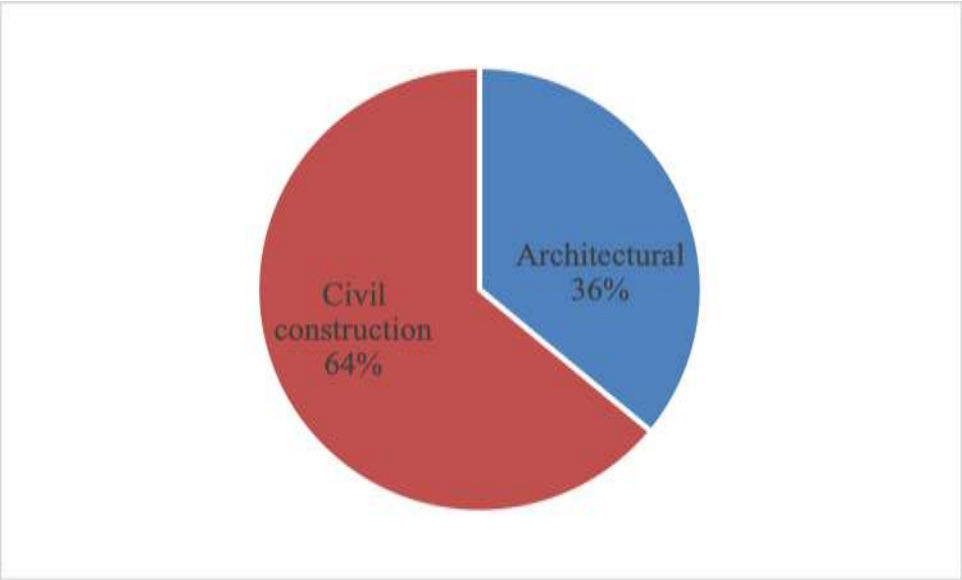

Figure 4.2: Category of the Firms

Source: Study Data

Figure 4.2 shows that 64% of the firms were small civil construction firms, while 36% were small architectural firms. The results, therefore, indicate that most of the firms belonged to the small civil construction firms' category.

4.3.2 Years in Operation

The results of the years the firms were in existence operation are presented under table 4.1

Table 4.1: Years in Operation

Years	Frequency	Per cent
< 5 years	9	14.8
6 – 10 years	18	29.5
11- 15 years	15	24.6
> 15 years	19	31.1
Total	61	100.0

Source: Study Data

The findings in table 4.1 indicate that 31.1% of the firms were in operation for more than 15 years, while 29.5% were existence for 6-10 years. The findings further indicate that 24.6% of the companies had been in operation for 11 to 15 years, whereas 14.8% had been operating for less than five years. The results, therefore, indicate that a large number of the firms had been operating for more than five years; hence, the respondents were knowledgeable about the operations of the firms.

4.3.3 Number of Employees

Table 4.2 illustrates the findings of the number of employees in the firms.

Table 4.2: Number of Employees

Number	Frequency	Percent
< 20 employees	32	52.5
21-40 employees	20	32.8
41-60 employees	9	14.8
Total	61	100.0

Source: Study Data

Table 4.2 indicates that 52.5% of the firms had less than 20 employees, while 32.8% of the firms had 21 to 40 employees. The finding also shows that 14.8% of the respondents had 41 to 60 employees. The results, therefore, indicate that most of the small civil construction and architectural firms had less than 20 employees.

4.3.4 Number of Projects Completed

The results of the number of projects completed by the small civil construction and architectural firms are indicated by table 4.3

Table 4.3: Number of Projects Completed

Number	Frequency	Percent
< 5 projects	14	23.0
6-10 projects	19	31.1
> 11 projects	28	45.9
Total	61	100.0

Source: Study Data

Table 4.3 illustrates that 45.9% of the firms had completed more than 11 projects, whereas 31.1% had completed 6 to 10 projects. The results further show that 23% of the firms had completed less than five projects. The results, therefore, indicate that the majority of the firms had completed more than five projects.

4.4 Innovation Practices

This section examined the extent to which the small architectural and civil construction firms applied the various innovation practices. The study used a scale of 1-5 where 1 indicated not at all, 2 indicated a minimal extent, 3 was a moderate extent, 4 represented a large extent, and 5 represented a very large extent. Table 4.4 displays the findings

Table 4.4: Innovation Practices

Practices	Indicators	Mean	Std. Dev
Technological innovations	Internet adoption	4.25	.722
	Web based support technology	4.31	.743
	Electronic commerce	3.54	.502
	Electronic data interchange	3.67	.473
	Email technology	4.61	.493
	Electronic procurement	3.89	.709
	Computer related designs	4.41	.496
Organizational innovations	Mission oriented innovations	4.33	.676
	Enhanced management techniques	3.90	.746
	New strategic orientations	4.16	.610
	Enhancing coordination and reporting structures	3.70	.460
	Enhancing reward and incentives schemes	3.87	.763
Product innovations	Review of construction and architectural designs	4.43	.618
	Continuous research and development	4.54	.502
	Adoption of new construction techniques	3.75	.596
	Timely completion and delivery of projects	4.08	.737
	Diversification into other areas	3.84	.610
Process innovations	Adoption of modern equipment	4.43	.694
	Operations automation	3.80	.572
	Revision of working methods	3.64	.484
	Retraining of human resources	3.80	.703
	Standardization of operations and processes	4.10	.651
Market innovations	Enhanced promotion techniques	3.64	.517
	Flexible pricing and payment agreements	3.61	.493
	Devolving to counties	4.43	.670
	Entering new markets	4.74	.444
Others	Engineering innovations	3.74	.603
	Collaborative innovations	4.15	.654
	Knowledge based innovations	4.02	.619
	Public support for innovation	2.89	.709

Source: Study Data

The findings on technological innovations shows that small architectural and civil construction firms use internet adoption, web based support technology, email technology, and computer-related designs at a large extent as indicated by mean values of 4.25, 4.31, 4.61 and 4.41 which relates to the scale value of 4 which stands for "large extent" respectively. According to the findings, electronic procurement was used at a moderate extent as shown by an average value of 3.89 whereas electronic commerce and electronic data interchange were also used at a moderate extent as showed by average values of 3.54 and 3.67 correspondingly.

Second, the outcomes on organizational innovations established that mission-oriented innovations and new strategic orientations were used to a large extent as specified by average values of 4.33 and 4.16 correspondingly. The results further show that enhanced management techniques, enhancing coordination and reporting structures and enhancing reward and incentive schemes were used moderately as indicated by mean values of 3.90, 3.70, and 3.87, respectively.

Third, the findings on product innovations revealed that review of construction and architectural designs, continuous research and development and the timely completion and delivery of projects were used to a large extent as indicated by average values of 4.43, 4.54 and 4.08 respectively. The results further show that the adoption of new construction techniques and diversification into other areas were moderately used as showed by average values of 3.75 and 3.84, respectively.

Besides, the results on process innovations established that adoption of modern equipment and standardization of operations and processes were used to a large extent as shown by average values of 4.43 and 4.10, respectively. The findings also revealed that

operations automation and revision of working methods were used at a moderate extent as indicate by mean values of 3.80 and 3.64 while retraining of human resources was employed at a moderate extent as indicated by an average value of 3.80, which stands for "moderate extent" in the Likert scale respectively.

Further, the results on market innovations revealed that enhanced promotion techniques and flexible pricing and payment agreements were moderately used as shown by mean values of 3.64 and 3.61, respectively. The results indicate that devolving to counties and entering new markets were applied at a large extent as shown by mean values of 4.43 and 4.74, respectively.

Finally, on other forms of innovation, the findings found that engineering innovations and knowledge-based innovations were used to a large extent as shown by average values 4.15 and 4.02 correspondingly. The results further indicate that collaborative innovations were moderately used while public support for innovation was used at a minimal extent, as shown by mean values of 3.74 and 2.89, respectively.

4.5 Factors Influencing Adoption of Innovation

This section assessed the extent to which various factors influenced the adoption and execution of innovation practices among small architectural and civil construction firms. The study used a scale of 1-5 where 1 indicated not at all, 2 indicated minimal extent, 3 represented moderate extent, 4 represented large extent, and 5 represented very large extent. Table 4.5 displays the findings.

Table 4.5: Factors Influencing the Adoption of Innovation

Factors	Indicators	Mean	Std. Dev
Organizational factors	Management structure	4.05	.740
	Organization size	4.28	.686
	Scope of activities	3.92	.781
	Performance standards	3.66	.479
Environment/ industry factors	Competition and pressure from other industries	4.23	.739
	Government policies and regulations	3.72	.552
	Industry standards	4.64	.484
	Customer/client demands	4.61	.493
	Mass media	3.90	.790
	Industry networks	4.93	.727
Resources	Financial resources	4.69	.467
	Available time	4.29	.367
	Equipment availability	4.41	.616
	Consulting costs and charges	3.72	.452
	Research and development funds	4.57	.499
Staff based factors	Available skills level	4.23	.761
	Motivation	3.77	.462
	Change resistance	3.66	.479
	Leadership support	4.28	.662
Task related factors	Project risks and insurance	4.03	.657
	User desires	4.08	.614
	Conditions and requirements	3.90	.651
	Supplier relationships	3.79	1.156

Source: Study Data

The finding on organizational factors that affect innovation revealed that management structure and organization size affected innovation by small architectural and civil construction firms to a large extent, as shown by average values of 4.05 and 4.28 correspondingly. The results also show that the scope of activities and performance standards affected innovation at a moderate extent, as shown by average values of 3.92 and 3.66 correspondingly.

The results on environment/industry factors revealed that competition and pressure from other industries and industry standards affect innovations by small architectural and civil construction firms to a large extent as shown by average values of 4.23 and 4.61 correspondingly. According to the results, government policies and regulations and the mass media affected innovation by small architectural and civil construction firms at a moderate extent, as showed by average values of 3.72 and 3.90 correspondingly. The results also indicate that customer/client demands and industry networks affected innovation by small architectural and civil construction firms to a large extent, as showed by average values of 4.61 and 4.93 in that order.

Additionally, the results on resources established that financial resources and available time affected innovation by small architectural and civil construction firms to a large extent, as shown by average values of 4.69 and 4.29 correspondingly. The results also indicated that equipment availability and research and development funds affected innovation to a large extent as indicated by mean values of 4.41 and 4.57 while consulting costs and charges had a moderate impact as shown by a mean of 3.72 respectively.

Further, the findings on staff based factors revealed that available skill level and leadership support affected innovation by small architectural and civil construction firms to a large extent as shown by average values of 4.23 and 3.66 in that order. On the other hand, motivation and change resistance affected innovation at a moderate extent, as displayed by average values of 3.77 and 2.87 correspondingly. Finally, the findings on task related factors established that project risks and insurance and the user desires affected innovation by small architectural and civil construction firms to a large extent as shown by mean values of 4.03 and 4.08. Further, conditions and requirements and supplier relationships affected innovation by small architectural and civil construction firms at a moderate extent as indicated by mean values of 3.90 and 3.79, respectively.

4.6 Factor Analysis

The study employed factor analysis to determine the inter-correlations and reduce the variables set of variables to a smaller variable set. Thus, factor analysis was employed to ascertain the significant innovation practices adopted by small architectural and civil construction firms and the key factors influencing innovations adoption. The results were as follows;

4.6.1 KMO and Bartlett's Test

To determine whether factor analysis was feasible, the Kaiser-Meyer-Olkin (KMO) proxy for sampling adequacy and Bartlett’s test of sphericity were first to be undertaken. KMO forecasts if the data yields distinct and reliable factors based on partial correlations. Table 4.6 and 4.7 display the KMO and Bartlett's Test for innovative practices and factors influencing innovation adoption.

Table 4.6: KMO and Bartlett's Test for Innovation Practices

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.836
Bartlett's Test of Sphericity	Approx. Chi-Square	1349.097
	df	435
	Sig.	.000

Source: Study Data

The results in table 4.6 illustrate that the value of the KMO statistics is 0.836, which is above the recommended 0.5 value; hence, factor analysis is suitable for this data. Similarly, Bartlett's Test statistics value is 0.000, which indicates that Bartlett's test is greatly significant, since (p-value < 0.05); hence, factor analysis is suitable.

Table 4.7: KMO and Bartlett's Test for Factors Influencing Innovation Adoption

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.534
Bartlett's Test of Sphericity	Approx. Chi-Square	303.218
	df	253
	Sig.	.017

Source: Study Data

The results in table 4.7 illustrate that the KMO statistics value is 0.534, which is above the recommended 0.5 value; hence, factor analysis is relevant for this data. Similarly, Bartlett's Test statistics value is 0.17, which indicates that Bartlett's test is significant since (p-value < 0.05); thus, factor analysis is applicable.

4.6.2 Factor Extraction

In factor extraction, the total number of common components or elements that could be extracted are equal or less to the number of variables involved. The results were as follows;

Table 4.8: Factor Extraction for Innovation Practices

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.303	41.008	41.008	12.303	41.008	41.008	11.148	37.162	37.162
2	2.075	6.915	47.924	2.075	6.915	47.924	1.966	6.553	43.715
3	1.648	5.495	53.418	1.648	5.495	53.418	1.682	5.605	49.320
4	1.555	5.185	58.603	1.555	5.185	58.603	1.660	5.535	54.855
5	1.371	4.569	63.172	1.371	4.569	63.172	1.625	5.418	60.273
6	1.247	4.155	67.327	1.247	4.155	67.327	1.548	5.159	65.431
7	1.121	3.736	71.063	1.121	3.736	71.063	1.461	4.870	70.302
8	1.031	3.437	74.500	1.031	3.437	74.500	1.259	4.198	74.500
9	.945	3.148	77.648						
10	.816	2.721	80.369						
11	.768	2.559	82.928						
12	.679	2.264	85.192						
13	.588	1.960	87.152						
14	.541	1.802	88.954						
15	.534	1.780	90.734						
16	.419	1.398	92.131						
17	.383	1.277	93.408						
18	.334	1.113	94.522						
19	.282	.939	95.460						
20	.254	.847	96.307						
21	.212	.706	97.013						
22	.202	.672	97.685						
23	.171	.569	98.255						
24	.139	.464	98.718						
25	.096	.319	99.037						
26	.090	.299	99.336						
27	.078	.261	99.598						
28	.061	.203	99.801						
29	.035	.118	99.919						
30	.024	.081	100.000						

Extraction Method: Principal Component Analysis.

Source: Study Data

Table 4.8 illustrates the factor extraction for innovation practices. The findings show that only eight components have been extracted and the eight components account for 74.50% of the variance while 25.5% is accounted for by the other components. The tables shows that component 1 accounts for 41.008% while component 2, 3, 4, 5 and 6 account for 6.915%, 5.495%, 5.185%, 4.569% and 4.155% respectively. Besides, components 7 and 8 accounts for 3.736% and 3.437% respectively. The scree plot on Figure 4.3 displays the graphical presentation of the twelve components, which were extracted with eigenvalues larger than 1.

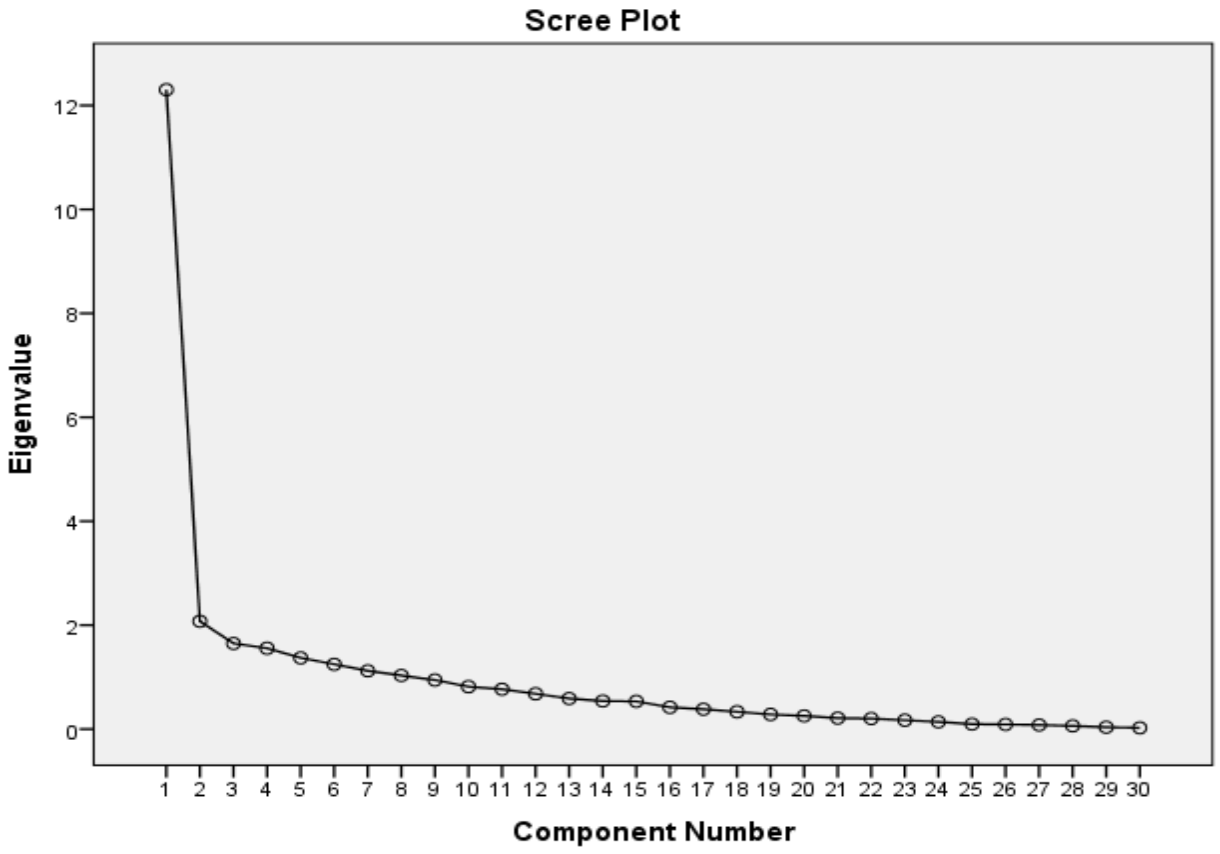

Figure 4.3: Scree Plot for Innovation Practices

Source: Study Data

Table 4.9: Factor Extraction for Factors Influencing Innovation Adoption

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.395	10.415	10.415	2.395	10.415	10.415	1.867	8.118	8.118
2	2.176	9.462	19.877	2.176	9.462	19.877	1.782	7.748	15.866
3	1.838	7.991	27.868	1.838	7.991	27.868	1.779	7.735	23.600
4	1.763	7.663	35.531	1.763	7.663	35.531	1.692	7.357	30.957
5	1.661	7.221	42.752	1.661	7.221	42.752	1.665	7.240	38.197
6	1.556	6.766	49.518	1.556	6.766	49.518	1.661	7.223	45.420
7	1.363	5.925	55.443	1.363	5.925	55.443	1.649	7.169	52.589
8	1.214	5.277	60.719	1.214	5.277	60.719	1.529	6.646	59.235
9	1.134	4.929	65.649	1.134	4.929	65.649	1.257	5.467	64.702
10	1.023	4.447	70.096	1.023	4.447	70.096	1.241	5.394	70.096
11	.990	4.303	74.399						
12	.836	3.633	78.032						
13	.773	3.361	81.393						
14	.738	3.208	84.601						
15	.660	2.870	87.471						
16	.620	2.695	90.166						
17	.542	2.358	92.524						
18	.469	2.038	94.561						
19	.373	1.622	96.183						
20	.346	1.505	97.689						
21	.216	.938	98.627						
22	.184	.802	99.429						
23	.131	.571	100.000						

Extraction Method: Principal Component Analysis.

Source: Study Data

Table 4.9 shows the factor extraction for the factors influencing innovation adoption. The findings show that only ten components were extracted and accounted for 70.096% of the variance, while 29.904% is accounted for by the other components. According to the results, components 1, 2, 3, 4 and 5 accounts for 10.415%, 9.462%, 7.991%, 7.663% and 7.221% while components 6, 7, 8, 9 and 10 accounts for 6.766%, 5.925%, 5.277%, 4.929%, and 4.447% respectively. The scree plot in figure 4.4 illustrates the graphical presentation of the ten factors, which were extracted with eigenvalues larger than 1.

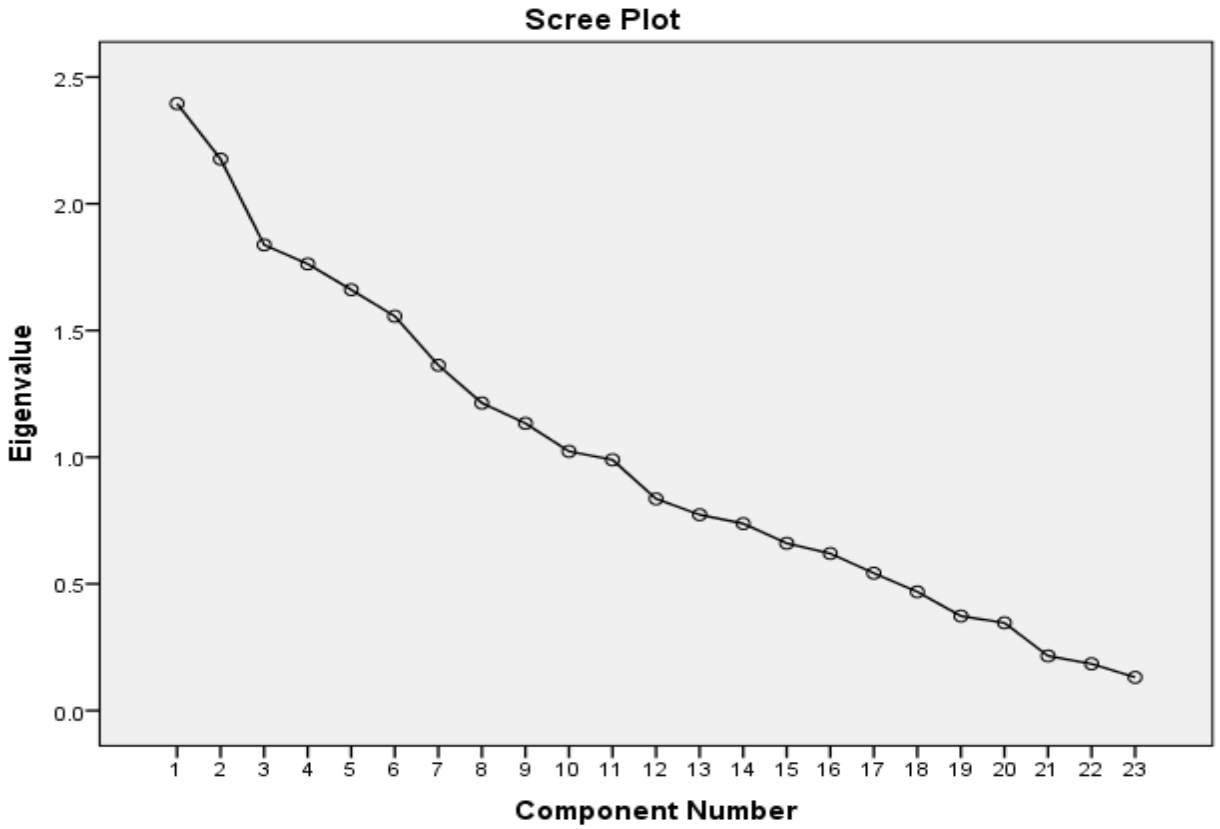

Figure 4.4: Scree Plot for Factors Influencing Innovation Adoption

Source: Study Data

4.6.3 Rotated Component Matrix

Factors are rotated to make them easier to interpret, and rotation ensures that different elements are explained or predicted by different underlying factors, and each factor explains more than one element. To achieve the factor loadings that were easier to interpret a Varimax rotation was adopted, which has a differentiating effect of the original variables by factor. The effect is that it minimizes the number of variables and leaves which had high loadings on any one given factor. However, factor labeling is a subjective exercise, and there is no guarantee that the factors chosen present the real situation and can be challenged. The results were as follows;

Table 4.10: Rotated Component Matrix for Innovation Practices

	Component							
	1	2	3	4	5	6	7	8
Continuous research and development	.929							
Computer related designs	.921							
Email technology	.890							
Electronic data interchange	.867							
Web based support technology	.866							
Review of construction and architectural designs	.859							
Mission oriented innovations	.857							
Enhancing coordination and reporting structures	.854							
Standardization of operations and processes	.810							
New strategic orientations	.781							
Electronic commerce	.777							
Enhanced management techniques	.742							
Electronic procurement	.726							
Public support for innovation	.638							
Enhancing reward and incentives schemes	.598							
Collaborative innovations	.523							
Knowledge based innovations	.522							
Internet adoption		.652						
Enhance promotion techniques		.627						
Operations automation		.606						
Entering new markets			.833					
Revision of working methods			.668					
Adoption of modern equipment				.903				
Timely completion and delivery of projects					.819			
Engineering innovations						.674		
Retraining of human resources							.836	
Devolving to counties								.823

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 12 iterations.
Factor Loadings with less than 0.5 have been excluded
Source: Study Data

By analyzing each of the innovative practices and their cluster variables in table 4.10, component 1 was continuous research and development, which had the utmost factor

loading of 0.929 whereas component 2 was internet adoption with a factor loading of 0.652 respectively. Components 3, 4, and 5 were identified as entering new markets, adoption of modern equipment and timely completion and delivery of projects as indicated by factor loadings of 0.833, 0.903, and 0.819 correspondingly. The results further indicate that components 6, 7, and 8 were identified as engineering innovations, retraining of human resources and devolving to counties as indicated by factor loadings of 0.674, 0.836, and 0.823 correspondingly.

Table 4.11: Rotated Component Matrix for Factors Influencing Innovation Adoption

	Component									
	1	2	3	4	5	6	7	8	9	10
Financial resources	.822									
Change resistance	.604									
Organization size	.541									
Research and development funds		.731								
Mass media		.711								
Competition and pressure from other industries			.774							
Performance standards			.762							
Scope of activities			.559							
Equipment availability				.778						
Consulting costs and charges				.623						
Available skills level					.803					
Motivation					.744					
Project risks and insurance						.799				
Supplier relationships						.732				
Industry standards							.786			
Management structure							.597			
Leadership support								.791		
Available time								.587		
User desires									.895	
Industry networks										.870

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 11 iterations.
Factor Loadings with less than 0.5 have been excluded
Source: Study Data

The rotated component matrix for factors influencing innovation adoption on table 4.11 indicates that components 1, 2 and 3 were identified as financial resources, research and development funds, and competition and pressure from other industries as indicated by factor loadings of 0.822, 0.731 and 0.774 in that order. The findings identified components 4, 5, and 6 as equipment availability, available skill level and project risks and insurance with factor loadings of 0.778, 0.803, and 0.799 respectively. The results further show that components 7, 8, 9 and 10 were identified as industry standards, leadership support, user desires and industry networks as indicated by factor loadings of 0.786, 0.791, 0.895 and 0.870 correspondingly.

4.7 Discussion of the Findings

The findings indicated that internet adoption, web-based support technology, email technology, and computer-related designs were the most used technological innovations in addition to electronic commerce and electronic data interchange. The findings also revealed that mission-oriented innovations and new strategic orientations were the most used organizational innovations in addition to enhanced management techniques, enhancing coordination and reporting structures, and enhancing reward and incentive schemes. These findings correspond to those of Laryea and Ibem (2014) who revealed that the most used technological patterns included the recognition as well as acceptance of web-based proficiencies along with, enhancement, and adoption of already acknowledged technicalities and the combination acceptance of the new and presented web-based techniques along with submissions in building procurements.

The results also established that review of construction and architectural designs, continuous research and development and the timely completion and delivery of projects were the most employed product innovations in addition to the adoption of new construction techniques and diversification into other areas. The results also established that the adoption of modern equipment and standardization of operations and processes were the most used process innovations in addition to the retraining of human resources. Lu and Sexton (2006) which revealed that the explorative innovation was collective in instant new venture realms, and involved exploration, disparity, testing of activities to unravel projects' specific problems while manipulative innovation strenuously aimed at improving the standard organizational infrastructure, support the findings.

Further, the results revealed that devolving to counties, entering new markets were the largely used practices in addition to enhanced promotion techniques, flexible pricing, and payment agreements. The study also found that small architectural and civil construction firms largely used engineering innovations and knowledge-based innovations. Reichstein, Salter, and Gann (2008) indicate that functioning well with clients, suppliers, plus having a broad market course might assist the construction companies to pass over the margins of their critical engineering perspective.

Factor analysis results revealed the primary innovation practices as continuous research and development, internet adoption, entering new markets, adoption of modern equipment, and timely completion and delivery of projects correspondingly. The other significant innovative practices included engineering innovations, retraining of human resources, and devolving to counties correspondingly. Ramilo (2014) posits that in architecture, engineering, and construction, there are four distinct innovation practices

among them technological innovation, organization improvement, product advance, and process innovations.

The finding revealed that management structure and organization size affected innovation by small architectural and civil construction in addition to the scope of activities and performance standards, which had a moderate effect. These findings are supported by Ramilo (2014) who found that small architectural firms experience several defies caused by digital modernization among them unvarying preface of new digital equipment, inadequate plan cost, enlarged international competitions, rising customer needs, and inadequate soft-ware familiarity are part of the defies.

The results revealed that competition and pressure from other industries, industry standards, customer/client demands, and industry networks were the major environment/industry factors affecting innovations by small architectural and civil construction firms. The results also revealed that government policies and regulations and the mass media moderately affected innovation by small architectural and civil construction firms. A study by Wilis and Suhendri (2017) in Indonesia found that the scarcity of skilled building information modeling users, low customer demand, high venture costs, plus the firm's reluctance to switching into technology were the critical challenges.

The results established that financial resources, available time, equipment availability and research and development funds strongly affected innovation by small architectural and civil construction firms in addition to consulting costs and charges which had a moderate effect. A study by Hardie (2009) found that small firms usually do not have enough slack finances to take on improvement actions. Sexton and Lu (2004) show that small

companies need requisite finances, staff and time to take on strategic preparation, plus as an alternative aim at the operational factors aimed for survival with the daily routines.

The findings revealed that available skill level and leadership support strongly affected innovation by small architectural and civil construction firms in addition to motivation and change resistance. Finally, the findings established that project risks and insurance and user desires were the primary task-related factors affecting innovation by small architectural and civil construction firms. Šuman and Semič El-Masr (2013) established that lack of skills and also capital are significant constraints that can only survive within the company with the specific skilled person. Maina (2018) revealed that high computer specifications cost of machines, needs for extensive training, insufficient daily incorporation, the need for stable power supplies and period of skills mastering were the utmost essential constraints of proficient CAD/BIM adoption.

Factor analysis results identified the significant challenges as financial resources, research and development funds, competition, and pressure from other industries. The other challenges were identified as equipment availability, available skill level and project risks and insurance, industry standards, leadership support, the user desires, and industry networks. A study by Niagara and Datche (2015) revealed that resources shortage, leadership skills, and availability of personal were the major factors, but the study did cover innovation as a factor. Kihoro and Waiganjo (2015) also revealed that planning for schemes, control of the stakeholders, and capabilities of the planning group affected the productivity of the construction schemes.

CHAPTER FIVE: SUMMARY, CONCLUSION, RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary and conclusion of the research findings, the research recommendations, limitations, and finally propositions for additional research.

5.2 Summary

This study sought to examine the extent to which innovation practices are adopted by small architectural and civil construction companies and the factors influencing the adoption of innovation in small architectural and civil construction companies in Kenya. The research adopted a cross-sectional descriptive study design with 650-licensed civil construction firms and 80 architectural firms in Nairobi County, forming the targeted population from which a sample of 73 companies was carefully chosen through simple random sampling. The study managed to obtain complete data from 61 firms, which made up a response rate of 84%, which was considered acceptable for the study.

The findings on technological innovations established that internet adoption, web-based support technology, email technology, and computer-related designs were largely used while electronic procurement electronic commerce and electronic data interchange were moderately used. The findings on organizational innovations established that mission-oriented innovations and new strategic orientations were largely used while enhanced management techniques, enhancing coordination and reporting structures, and enhancing reward and incentive schemes were used moderately.

Further, findings on product innovations revealed that review of construction and architectural designs, continuous research and development and the timely completion and delivery of projects were largely used while the adoption of new construction techniques and diversification into other areas were moderately used. Besides, the results on process innovations established that adoption of modern equipment and standardization of operations and processes were largely used while operations automation and revision of working methods and retraining of human resources were moderately used.

The results on market innovations revealed that enhanced promotion techniques and flexible pricing and payment agreements were moderately used while devolving to counties and entering new markets were largely used. Finally, on other forms of innovation, the findings found that engineering innovations and knowledge-based innovations were largely while collaborative innovations were moderately used.

The findings on organizational factors, which affect innovation, revealed that management structure and organization size mostly affected innovation by small architectural and civil construction firms while the scope of activities and performance standards moderately affected innovation. The results on environment/industry factors revealed that competition and pressure from other industries, industry standards, customer/client demands and industry networks mostly affected innovations by small architectural and civil construction firms while government policies and regulations and the mass media moderately affected innovation by small architectural and civil construction firms.

The results on resources established that financial resources, available time, equipment availability and research and development funds affected innovation by small architectural and civil construction firms to a large extent while consulting costs and charges affected innovation at a moderate extent respectively. The findings on staff based factors revealed that available skill level and leadership support affected innovation by small architectural and civil construction firms to a large extent, while motivation and change resistance affected innovation to a moderate extent. The findings on task-related factors established that project risks and insurance and the user desires largely affected innovation by small architectural and civil construction firms while conditions and requirements and supplier relationships had a moderate effect.

The findings of factor analysis established ten innovative practices, which accounted for 70.096% of the variance. The study established that component 1 was continuous research and development, while component 2 was internet adoption whereas 3, 4 and 5 were identified as entering new markets, adoption of modern equipment and timely completion and delivery of projects respectively. The results also established that components 6, 7, and 8 were engineering innovations, retraining of human resources, and devolving to counties correspondingly.

Factor analysis results on the factor affecting innovation identified 10 major challenges, which accounted for 70.096% of the variance. Components 1, 2 and 3 were identified as financial resources, research, and development funds and competition and pressure from other industries while components 4, 5 and 6 were equipment availability, available skill level and project risks and insurance respectively. The results further established

components 7, 8, 9, and 10 as industry standards, leadership support, user desires, and industry networks, respectively.

5.3 Conclusion

The first aim of the research was to assess the extent to which innovation practices adopted by small architectural and civil construction companies in Kenya. The study finding identified 10 major innovation practices. Centered on the results, the study concludes that the major innovation practices were continuous research and development, internet adoption, entering new markets, adoption of modern equipment, and timely completion and delivery of projects. The other major innovation practices included engineering innovations, retraining of human resources and devolving to counties, respectively.

The second objective was to ascertain the factors influencing the adoption of innovation in small architectural and civil construction companies in Kenya. The study findings established 10 major challenges. The study thus concludes that financial resources, research and development funds and competition and pressure from other industries, equipment availability, available skill level and project risks and insurance, industry standards, leadership support, user desires, and industry networks respectively.

5.4 Recommendations

The study concluded that the major innovation practices by small architectural and civil construction companies were continuous research and development, internet adoption, entering new markets, adoption of modern equipment and timely completion and delivery of projects, engineering innovations, retraining of human resources and devolving to

counties. The study, therefore, recommends that the management of small architectural and civil construction firms should ensure that the adopted innovation practices are frequently reviewed to ensure that they conform to the firm's goals and objective and they are cost-effective in the long-run.

The research findings led to the conclusion that financial resources, research and development funds, competition, and pressure from other industries, equipment availability, available skill level and project risks and insurance, industry standards, leadership support, user desires, and industry networks were the major factors affecting innovation adoption. The study recommends that the management of small architectural and civil construction firms should develop effective strategies and seek government and other stakeholders' support to mitigate the various challenges affecting innovation adoption.

5.5 Limitations of the Study

The context of this research was small architectural and civil construction companies in Kenya. The findings of the research are thus limited to the sampled firm and may not be generalized to other large-scale firms' architectural and civil construction companies in Kenya. The research was also carried out in Kenya; hence, the findings may not be generalized to other architectural and civil construction firms, which are not in Kenya.

The researcher faced several logistical challenges among them, resistance by the respondents to participate, however, the researcher explained the intentions of the research to the respondents and guaranteed them that their confidentiality would be maintained and the study would be used for academic purposes only. Besides,

absenteeism by the main respondents was a key challenge; however, the researcher made prior arrangements with the intended respondents on the appropriate time to administer the questionnaires.

5.6 Suggestion for Further Research

This research focused on the extent to which innovation practices are adopted by small architectural and civil construction companies and the factors influencing the adoption of innovation in small architectural and civil construction companies in Kenya.The study, therefore, did not assess the effect of innovation practices on the profitability of small architectural and civil construction companies.

The study, therefore, recommends additional research on the link between innovation practices and firm profitability. The study also focused on small architectural and civil construction; hence, the findings may not be replicated to large firms.

The study thus recommends similar research with the context being large and medium architectural and civil construction companies.

REFERENCES

Ahmad, A. (2011). Technology adoption life cycle model in a different environment: Exploratory evidence from Nigerian Telecom Market. *In the 2011 International Conference on Financial Management and Economics IPEDR vol.11 (2011),* IACSIT Press, Singapore

Akintan, F. O. (2013). Developing innovation in construction through an open innovation approach. Accessed online from https://www.academia.edu/7805864/ on 24/4/2019

Bekkenutte, E. (2016). Organizational Innovation Practices: A strategy-as-practice perspective on performance increasing configurations of organizational innovations in Dutch manufacturing SMEs. *Master Thesis*, In-DEI-Nomine: Feliciter

Besharati, B., Liu, F., Zhang, X., & Xu, M. (2017). Diffusion of innovation and the technology adoption curve. *Business and Management Studies*, 3(3), 25-33.

Vos, M., Lieftink, B., Volker, L., & Wamelink, J. W. F. (2014). Business model design of architectural service firms. *In Working Paper Proceedings. EPOC 2014: Proceedings of the Engineering Project Organization Conference" Beyond Boundaries*", Winter Park, CO, USA, 29-31 July 2014.

Competition Authority of Kenya (2017). *The construction industry: Analysis of the state of competition.* Competition Authority of Kenya

Costello, G. J., & Donnellan, B. (2011). *Beyond RBV and KBV to an Innovation-Based View of the Firm.* In EURAM2011 annual conference.

Coughlan, P., Dew, N., & Gates, W. (2008). *Crossing the technology adoption chasm: Implications for DoD (No. NPS-AM-08-116).* Naval postgraduate school Monterey graduate school of business and public policy.

Davis, P., Gajendran, T., Vaughan, J., & Owi, T. (2016). Assessing construction innovation: theoretical and practical perspectives. *Construction Economics and Building*, 16(3), 104-115.

Dearing, J. W., & Cox, J. G. (2018). Diffusion of innovations theory, principles, and practice. *Health Affairs*, 37(2), 183-190.

Dube, C., & Gumbo, V. (2017). Diffusion of innovation and the technology adoption curve: Where are we? *Business and Management Studies,* 3(3), 34-52.

Ebersberger, B., Bloch, C., Herstad, S. J., & Van De Velde, E. L. S. (2012). Open innovation practices and their effect on innovation performance. *International Journal of Innovation and Technology Management*, 9(06), 1-23

Genç, N., Özbağ, G. K., & Esen, M. (2013). Resource based view and the impacts of marketing and production capabilities on innovation. *Journal of Global Strategic Management,* 14(1), 24-35.

Ghaben, R., & Jaaron, A. A. (2015). Assessing innovation practices in project management: The case of Palestinian construction projects. *International Journal of Innovation and Scientific Research*, 17(2), 451-465

Gupta, H. (2017). Integration of quality and innovation practices for global sustainability: An empirical study of Indian SMEs. *Global Business Review*, 18(1), 210-225.

Hardie, M. (2009). *Construction industry culture and innovation: an Australian view*. School of Engineering, University of Western Sydney

Iranmanesh, M., & Kamal, E. M. (2015). Innovation practices in construction firms. *Advances in Environmental Biology,* 9(5), 124-126.

Jewell, C., Flanagan, R., & Anaç, C. (2010). Understanding UK construction professional services exports. *Construction Management and Economics,* 28(3), 231-239.

Kihoro, M. W., & Waiganjo, E. (2015). Factors affecting the performance of projects in the construction industry in Kenya: A survey of gated communities in Nairobi County. *Strategic Journal of Business & Change Management,* 2(2), 37-66

Kostopoulos, K. C., Spanos, Y. E. & Prastacos, G. P. (2002, May). The resource-based view of the firm and innovation: identification of critical linkages. *In the 2nd European Academy of Management Conference* (pp. 1-19).

Laryea, S., & Ibem, E. O. (2014). Patterns of technological innovation in the use of e-procurement in construction. *Journal of Information Technology in Construction,* 19, 104-125.

Lu, S. L., & Sexton, M. (2006). Innovation in small construction knowledge-intensive professional service firms: a case study of architectural practice. *Construction Management and Economics,* 24(12), 1269-1282.

Lu, S., & Sexton, M. G. (2004). Knowledge-based innovation in small knowledge-intensive professional service firms: An underdeveloped research area?. In

Proceedings of the 4th International Postgraduate Research Conference in the Built and Human Environment, Salford, UK: 1st-2nd April (pp. 486-496).

Maina, J. J. (2018). Barriers to effective use of CAD and BIM in architecture education in Nigeria. *International Journal of Built Environment and Sustainability,* 5(3), 175-186

Nalband, N. A., Alkelabi, S., & Jaber, D. A. (2016). Innovation Practices in Saudi Arabian Businesses. *International Journal of Business and Management,* 11(4), 136-160

Niagara, P., & Datche, E. (2015). Factors affecting the performance of construction projects: A survey of construction projects in the Coastal Region of Kenya. *International Journal of Scientific and Research Publications,* 5(10), 1-43

Oluwatayo, A. A., & Amole, D. (2011). Architectural firms: workforce, business strategy, and performance. *Australasian Journal of Construction Economics and Building,* 11(4), 21-44.

Ondara, A. E. (2017). Risk management strategies and performance of construction firms in selected counties in Kenya. *Unpublished Ph.D. Thesis,* Kenyatta University

Ozorhon, B., Abbott, C., & Aouad, G. (2010). Construction innovation: towards a project-level analysis. School of the Built Environment, University of Salford.

Parida, V., Johansson, C., & Larsson, T. (2009). Implementation of open innovation practices in the Swedish manufacturing industry. *In International Conference on Engineering Design: (Vol. 1, pp. 435-446).* Design Research Society.

Ramilo, R. (2014). Key determinants and barriers in digital innovation among small architectural organizations. *Journal of Information Technology in Construction,* 19(11), 188-209.

Ramilo, R., Embi, M. R., & Datta, S. (2015). *Digital innovation for sustainable design: Technological and organizational barriers.* Universiti Teknologi Malaysia

Reichstein, T., Salter, A. J., & Gann, D. M. (2008). Break on through: sources and determinants of product and process innovation among UK construction firms. *Industry and Innovation,* 15(6), 601-625.

Rodríguez, J. L., & Lorenzo, A. G. (2011). Organizational challenges of a new paradigm of innovation management. *European Research Studies,* 14(1), 75-82

Sahin, I. (2016). A detailed review of Rogers' diffusion of innovations theory and educational technology-related studies based on Rogers' theory. *Turkish Online Journal of Educational Technology*, 5(2), 14-23.

Sekaran, U. & Bougie, R. (2010). Research methods for business: A skill-building approach (5th ed.). Chichester West Sussex UK John Wiley and Sons

Sexton, M., & Lu, S. L. (2004). The appropriate research design for investigating innovation in small professional service firms. *Management,* 2, 733-739.

Šuman, N., & Semič El-Masr, M. (2013). The Integrated Approach for Introducing Innovation in the Construction Industry. *Organization, Technology & Management in Construction: An International Journal,* 5(2), 834-843.

Tangkar, M., & Arditi, D. (2004). Innovation in the construction industry. *Civil Engineering Dimension,* 2(2), 96-103.

Vargas, S. M. L., Gonçalo, C. R., Ribeirete, F., & Souza, Y. S. D. (2017). Organizational practices required for innovation: a study in an information technology company. *Gestão & Produção*, 24(2), 221-235.

Vasseur, V. (2012). Innovation adopters: a new segmentation model. *In the World Sustainability Forum 2012*, Online Conference.

Widén, K. (2012). Innovation in the Construction Process: A theoretical framework. *Doctoral dissertation,* Lund Institute of Technology.

APPENDIX

Research Questionnaire

Dear respondent,

This questionnaire aims to collect data on innovation in small architectural and civil construction firms in Kenya. The research is academic and aimed at fulfilling the requirements for the award of a degree of Master of Business Administration (MBA) at the University of Nairobi. Therefore, we are kindly requested to voluntarily participate in the research by filling out the attached questionnaire. The information provided will be kept confidential and will only be used for the intended purpose. Your cooperation and support will be highly appreciated. Thanks in advance.

Instructions

1. Please do not write your name and contacts
2. Tick or fill where appropriate
3. Kindly read and understand the questions before responding

Section I: Firm Profile

1. Indicate the nature of your firm

   Architectural [ ] Civil construction [ ]

2. Indicate the number of years your firm has been in operation

   Less than five years [ ] 6 – 10 years [ ]

   11- 15 years [ ] More than 15 years [ ]

3. Number of employees in your firm

   Less than 20 employees [ ] 21-40 employees [ ]

41-60 employees [ ] More than 61 employees [ ]

4. Indicate the number of projects your firm has successfully completed for the last ten years _____

Section II:

Part A: Innovation Practices

5. Indicate the extent to which your firm applies the listed innovation practices. Use the following scale where appropriate

1-Not at all **2**-Minimal extent **3**-Moderate extent, **4**-Large Extent, **5**-Very large extent

Innovation practices	**Scale**				
Technological innovations	**1**	**2**	**3**	**4**	**5**
a. Internet adoption					
b. Web based support technology					
c. Electronic commerce					
d. Electronic data interchange					
e. Email technology					
f. Electronic procurement					
g. Computer related designs					
Organizational innovations	**1**	**2**	**3**	**4**	**5**
a. Mission oriented innovations					
b. Enhanced management techniques					
c. New strategic orientations					
d. Enhancing coordination and reporting structures					
e. Enhancing reward and incentives schemes					
Product innovations	**1**	**2**	**3**	**4**	**5**
a. Review of construction and architectural designs					
b. Continuous research and development					
c. Adoption of new construction techniques					
d. Timely completion and delivery of projects					
e. Diversification into other areas					
Process innovations	**1**	**2**	**3**	**4**	**5**
a. Adoption of modern equipment					
b. Operations automation					
c. Revision of working methods					
d. Retraining of human resources					
e. Standardization of operations and processes					

Market innovations	**1**	**2**	**3**	**4**	**5**
a. Enhanced promotion techniques					
b. Flexible pricing and payment agreements					
c. Devolving to counties					
d. Entering new markets					
Others	**1**	**2**	**3**	**4**	**5**
a. Engineering innovations					
b. Collaborative innovations					
c. Knowledge based innovations					
d. Public support for innovation					

Part B: Factors Influencing Adoption of Innovation

6. Kindly indicate the extent to which the following factors influence the adoption and implementation of innovative practices in your firm. Use the following scale where appropriate

   1-Not at all **2**-Minimal extent **3**-Moderate extent, **4**-Large Extent, **5**-Very large extent

Challenge	**Scale**				
Organizational factors	**1**	**2**	**3**	**4**	**5**
a. Management structure					
b. Organization size					
c. Scope of activities					
d. Performance standards					
Environment/industry factors	**1**	**2**	**3**	**4**	**5**
a. Competition and pressure from other industries					
b. Government policies and regulations					
c. Industry standards					
d. Customer/client demands					
e. Mass media					
f. Industry networks					
Resources	**1**	**2**	**3**	**4**	**5**
a. Financial resources					
b. Available time					
c. Equipment availability					
d. Consulting costs and charges					
e. Research and development funds					
Staff based factors	**1**	**2**	**3**	**4**	**5**
a. Available skills level					
b. Motivation					
c. Change resistance					
d. Leadership support					

Task related factors	**1**	**2**	**3**	**4**	**5**
a. Project risks and insurance					
b. User desires					
c. Conditions and requirements					
d. Supplier relationships					

7. Apart from the listed challenges indicate other factors which hinders your firm from adoption innovation practices successfully

_____

_____

Thank you for your time