MEDIATING EFFECT OF TECHNOLOGICAL INNOVATION ON THE RELATIONSHIP BETWEEN KNOWLEDGE MANAGEMENT AND COMPETITIVE ADVANTAGE OF TELECOMMUNICATION FIRMS IN KENYA

BY

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DECLARATION

Declaration by the Student:

This research thesis is my original work and has not been presented for a degree in any other university. No part of this thesis may be reproduced without prior written permission of the author and Moi University.

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DEDICATION

I dedicate this proposal to my employer, the Ministry of ICT and Digital Economy, who sponsored me for the Degree of Masters in Business Administration (Strategic Management), enabling me to achieve my dreams.

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ABSTRACT

A firm is more likely to achieve superior performance if its competitive edge is distinct and unparalleled. Thus, the study sought to examine the mediating effect of technological innovation on the relationship between knowledge management and competitive advantage of telecommunication firms in Kenya. The study was informed by the Michael Porter's framework and knowledge-based view theories. The explanatory research design was utilized in the study. The study targeted employees from the top and middle level management of Safaricom, Airtel Kenya and Telkom Kenya. According to HR records by end of 2020 there were 602 employees from the top management and 2385 employees from the middle management from the three telecommunication firms. The sample size was 353 obtained using Yamane formula. The researcher used stratified random sampling technique to get the sample size from each firm. Questionnaires were used as the research instruments. The pilot study was conducted to examine the validity and reliability of research instruments. The study was analyzed using descriptive and inferential statistics. The study used descriptive and inferential statistics. The results found a significant correlation between knowledge management practices and the competitive advantage of telecommunication firms in Kenya. Specifically, the study found that knowledge creation ($r=0.757$, $p<0.0001$), knowledge transfer ($r=0.704$, $p<0.0001$), knowledge storage ($r=0.717$, $p<0.0001$), knowledge implementation ($r=0.763$, $p<0.0001$), and technological innovation ($r=0.757$, $p<0.0001$) were all positively associated with competitive advantage. In addition, the study found that knowledge management indirectly influence a firm's competitive advantage through its effect on technological innovation. The study concluded that telecommunication firms should invest more in learning processes to enhance innovativeness. They should also be ready to adopt innovations in knowledge management in areas such as acquiring, sharing, storing, and applying knowledge. This can be done through the employment of competent officials as well as sufficient funding for innovations.

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ABBREVIATIONS

APP: Application

CAK: Communications Authority of Kenya

BLUE: Best Linear Unbiased Estimator

BP: Bbusiness Performance

FGLS: Feasible General Least Squares

HR: Human Resource

KEBS: Kenya Bureau of Standards

KEMRI: Kenya Medical Research Institute

KIC: Kknowledge Iinfrastructure Ccapability

KM: Kknowledge Mmanagement

KPC: Kknowledge Precess Ccapability

OPERATIONAL DEFINITION OF TERMS

Competitive advantage: Competitive advantage is achieved when the organization has gained an edge over its competitors by offering more value to customers through lower prices or by providing additional benefits and services to its services and products (Mwangi, 2021).

Knowledge creation: Knowledge creation involves utilizing internal and external resources of an organization to generate new knowledge for achieving the organizational goals (Kinyua, 2018).

Knowledge implementation: Knowledge implementation illustrates the utilization of knowledge and the use of existing knowledge for decision-making aimed at improving the organisation's performance (Mungai, 2019).

Knowledge management: Knowledge management practices are the processes that deal with the creation, sharing, storage and implementation of information and expertise within an organization to support and improve its business performance (Abusweilem & Abualoush, 2019) and include knowledge creation, sharing, storage and implementation.

Knowledge storage: Knowledge storage mean both the physical places where information is kept and the digital systems are used to save and look up that information (Novak, 2017). The knowledge storage included the availability of a structured format, documenting lessons and a classification scheme

Knowledge transfer: Knowledge transfer is a process through which personal and organizational knowledge is exchanged (Chuma, 2019). It incorporates

Technological Innovation: Technological innovation can be described as the introduction of a novel or enhanced product or process that exhibits substantial technical distinctions compared to its predecessors (Azar & Ciabuschi, 2017.

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter is the introductory section of the study, encompassing several components such as the study background, research issue statement, objectives, research hypotheses, rationale, scope, limitations, and assumptions.

1.2 Background of the Study

Telecommunication firms play a central role in the fundamental operations of a society. The competitive advantage in the realm of goods or services can serve as a foundation for increased innovation, leading to enhanced performance (Lam, Nguyen, Le, & Tran, 2021). A characteristic that permits companies to outperform competitors is a competitive advantage (Gyemang & Emeagwali, 2020). Alkasim, Hilman and Bin Bohari (2018) described a competitive advantage strategy as threefold: cost leadership, differentiation, and focus. Firms commonly use these strategies to respond to business objectives efficiently. Competitive advantage can also occur when an organisation acquires or develops attributes to outperform its competitors (Mugo & Namada, 2020). Telecommunications help reduce transaction costs in different sectors of the economy, thereby inducing better efficiency (Riungu, 2017). Thus, developing a competitive advantage in these firms is beneficial not only to firms but to the entire nation.

The primary objective of a business unit's competitive strategy is to identify a strategic position that enables the company to effectively shield itself from competitive industry forces or exert influence over these forces in a manner that benefits the organisation (Quagraine & Ahakwa, 2021). Several studies (Mugo and Namada, 2020; Obeidat, Alrowwad, Masadeh and Abuhashesh, 2021; Karanja, Namusonge and Kireru, 2018;

Nashiruddin, 2019 and Kireru, Karanja, and Namusonge, 2017) discuss how competitive advantage can be influenced by knowledge management.

Tong, Tak, and Wong (2015) argue that knowledge management entails creation, archiving, and sharing of valuable knowledge, expertise, and insight among people in organisations who share similar needs. Mulhim (2017) views knowledge management as the process of creating methods, tools, techniques and organisational values that facilitate knowledge flow among individuals and access to this knowledge for its storage, processing and use in enhancing and evolving activities. The process develops an interface between internal and external information of a firm, which is accessible to the correct person at the right time (Dickson, 2019). Yen, Shatta, and Ahmed (2021) conducted a study in Saudi Arabia, which shown that the establishment of efficient knowledge management practises confers a competitive edge upon enterprises operating within the telecommunications industry. In a study conducted by Mehralian, Nazari, and Ghasemzadeh (2018), knowledge generation and performance within the context of telecommunication firms operating in Pakistan exhibited a positive correlation. According to North and Kumta (2018), knowledge management encompasses the processes of sharing, creation, and dissemination within the context of Germany. Furthermore, Wijaya and Suasih (2020) believe that the implementation of knowledge management practises, including knowledge storage, development, and transfer, has a favourable influence on Indonesian SME's competitive advantage. Furthermore, the research conducted by Jyoti, Kotwal, and Rani (2015) suggests that the implementation of knowledge management practises has a positive impact on the competitive advantage of telecommunications enterprises operating in the Indian market. According to Obire and Asaolu (2018), telecommunication enterprise's comparative advantage in Nigeria is influenced by knowledge management.

Knowledge management encompasses the systematic processes of organising, transferring, identifying, and employing information within an organisational context. According to a study conducted by Ofori, Osei, Mensah, and Affum (2015) in Ghana, it was found that information sharing had a favourable impact on the competitive advantage of enterprises operating in the mobile telephony market. The study conducted by Elfar, Elsaid, and Elsaid (2017) in Egypt revealed a strong correlation between knowledge infrastructure and process capabilities, and the success of companies. Organisations that possess comprehensive training and development plans exhibit significantly higher levels of competence in knowledge infrastructure and capability in knowledge processes, as compared to those organisations that do not have such plans in place. The acquisition and dissemination of knowledge have been identified as significant factors in determining the competitive advantage of businesses, as evidenced by a study conducted in Sudan by Abker, Mohamed, Ibrahim, and Eltayeb (2019). If utilised correctly, knowledge management could improve business performance (Chuma, 2019; Mtswenem, 2020; Ongus, Aming'a, Nyamboga & Okello, 2016; Anser, Zhang & Kanwal, 2018).

An organisation's precise application of unique insights and information can earn a sustainable competitive advantage and higher performance (North & Kumta, 2018; Dickson, 2019). Satisfactory knowledge management is considered fundamental in determining innovation in an organisation. Innovation incorporates new financial products, services or processes to gain a competitive advantage (Anser, Zhang & Kanwal, 2018). The fundamental ambition toward innovation is to minimise costs and maximise returns (Kariu, 2017). Most innovative institutions can outsmart their competitors and expand their influence beyond one country (Kibisu & Awino, 2017).

Based on the findings of Mwangi's (2021) research conducted in Kenya, it is apparent that knowledge creation practises play a substantial role, representing 32.2% of the observed competitive advantage in communications firms. Furthermore, in accordance with the study conducted by Riungu (2017), mobile telecommunications enterprises operating inside the Kenyan market see knowledge management as a feasible strategy to augment their competitive performance. Mwangangi (2018) asserts that the influence of knowledge management on the competitive advantage of mobile communications businesses in Kenya is significant. The research conducted by Ongus, Aming'a, Nyamboga, and Okello (2016) revealed a noteworthy and positive association between the implementation of knowledge management practises and the overall performance of organisations.

Moreover, as stated by Kamau and Kwanya (2019), the use of knowledge management methods, including the development and preservation of knowledge, is a strategic approach in Kenya's insurance sector. Furthermore, the research conducted by Wanyama (2018) shown that the various stages involved in knowledge generation, dissemination, implementation, and retention had a positive influence on the overall effectiveness of public service institutions. Kiseli and Senaji (2016) conducted a study that revealed the positive influence of technical knowledge management infrastructure, social knowledge management infrastructure, knowledge management processes, and knowledge management innovation agility on competitive advantage.

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1.2.1 Telecommunication Firms in Kenya

The telecommunication enterprise in Kenya is highly volatile and competitive (Mugo & Macharia, 2020). The high competitiveness level has led Safaricom to dominate the telecommunication industry in Kenya for an extended period (Communications Authority, 2022). Safaricom has a market share of over 60%, above the 50% rate stipulated by Kenya's Competition Act (Competition Authority of Kenya, 2022). According to statistics by Airtel Kenya, the second-largest telecommunication firm in Kenya, Airtel Kenya has been reporting persistent losses; for instance, in 2019, the loss was Ksh. 2.7 billion, and in 2020, it was Ksh. 5. 9 billion (Airtel Kenya, 2021). Additionally, Airtel Kenya experienced a net loss of Ksh.4.45 billion in its voice and data business, despite the ongoing increase in user base and market share for talk time in comparison to its competitor, Safaricom (Airtel Kenya, 2021).

Moreover, the Communications Authority of Kenya (2017) report revealed that the closure of Yu mobile from the telecommunication industry in Kenya was due to stiff competition. Furthermore, stiff competition led to the closure of Orange, which had a 70% share in Telkom Kenya (Communications Authority of Kenya, 2017). In 2019, the market share of Telkom reduced significantly after losing 600,000 customers, and its voice market share declined by 0.9 per cent to 3.1 per cent (Communications Authority, 2019).

1.3 Statement of the Problem

Firms in an industry are supposed to develop competitive advantage over their competition. Over the years, Safaricom has been able to gain this advantage compared to its competitors such Airtel Networks Kenya Limited, Telkom Kenya Limited, Jamii Telecoms and the Equitel money platform of Equity Bank Limited. This can be seen in the instance where the company's results have been excellent compared to other players

in the industry. Safaricom has a market share of over 60%, above the 50% rate stipulated by Kenya's Competition Act (Competition Authority of Kenya, 2022).

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This issue has led industrial companies to formulate strong innovation strategies in order to establish a competitive edge over their competitors, with the objective of ensuring their long-term viability and expansion in the increasingly competitive marketplace. According to the research published by the Communications Authority of Kenya (CAK, 2019), statistical data reveals that the telecommunications sector in Kenya exhibits significant development prospects, primarily attributable to its historically limited penetration in both mobile and fixed markets.

According to the research, Telkom Kenya, which was previously the largest telecommunications company, experienced a decline in its market dominance in the fixed line and international bandwidth sectors as a result of market liberalisation implemented by the post-millennium governments in Kenya. The issuance of licences to a regional carrier, in conjunction with the inclusion of a third mobile operator and multiple new data carriers, constituted a significant transformation in the competitive landscape of telecommunications services nationwide (CAK, 2019).

The consistent growth observed in the telecommunications industry serves as a dynamic indicator of operators' heightened emphasis on delivering inventive and competitive offerings that captivate consumers (Gituma et al., 2016). Therefore, the introduction of additional network operators has resulted in a significant increase in

competition within the market. The escalating competitive environment has resulted in price disputes, ultimately leading to the establishment of the most affordable pricing in Africa (Osano & Koine, 2015). This study, therefore, examined the mediating effect of technological innovation on the relationship between knowledge management and competitive advantage of telecommunications firms in Kenya.

Based on the reviewed literature, there was scanty information to make comprehensive inferences. Some studies (Mulhim, 2017; Mehralian, Nazari & Ghasemzadeh, 2018; Wanyama, 2018; Kiseli & Senaji, 2016; Chuma, 2019; Ongus, Aming'a, Nyamboga & Okello, 2016; Cumari, 2018; Novak, 2017; Riungu, 2017; Abusweilem & Abualoush, 2019; Mtswenem, 2020; Elfar, Elsaid & Elsaid, 2017; Kinyua, 2018; Mungai, 2019) showed that knowledge management (knowledge creation, knowledge sharing, knowledge storage, knowledge implementation) are positively related competitive advantage.

Contrarily several studies conducted by Kelechi, Hamed, Akpa, Priscillia, and Chan (2020), North and Kumta (2018), Khuram (2016), Dickson (2019), and Chebii (2018) have identified a negative correlation between knowledge management, encompassing knowledge creation, knowledge transfer, knowledge storage, and knowledge implementation, and the attainment of competitive advantage. Furthermore, the majority of the research that were analysed were carried out in locations other than Kenya, and none of the studies conducted within Kenya specifically focused on telecommunication corporations. Hence, the literature that was examined did not provide sufficient evidence to draw a comprehensive conclusion, thereby establishing the basis for the present investigation.

The significance of conducting this study was deemed important in order to offer empirical data about the correlation between Knowledge management and competitive

advantage within the particular context of telecommunications companies in Kenya. The components of Knowledge Management encompass the activities of knowledge creation, knowledge sharing, knowledge retention, and knowledge application.

The rationale for employing information development, knowledge exchange, knowledge storage, and knowledge application as metrics of Competitive Advantage is derived from their previous employment in various research endeavours. The study conducted by Wanyama (2018) investigated the impact of knowledge management on the attainment of competitive advantage within the public service sector in Kenya. The primary aims of this study were to examine the impacts of knowledge development, knowledge sharing, knowledge application, and knowledge storage on the attainment of competitive advantage within the public service sector of Kenya. The research employed a multiple regression methodology. The study encompassed a cohort comprising 2343 individuals who were actively involved in diverse ministries, such as the Ministry of Devolution, the Ministry of Labour, Social Security and Services, and the Ministry of Information Communication and Technology. The researcher employed a combination of basic random and stratified sampling techniques in order to acquire a sample size consisting of 303 participants. The findings of the investigation revealed a correlation coefficient denoted as R, with a value of 0.897, signifying a strong association between the variables. The study's findings indicate that the diverse processes encompassing information production, sharing, application, and storage exert a favourable impact on the competitive advantage of public service in Kenya.

Hamed, Akpa, Priscillia, and Chan (2020) examined knowledge management's impact on firm performance. The study focused on food and beverage manufacturers. The research employed a survey methodology to gather data from 320 individuals, from the 1587 employee population in the food and beverage industries in Nigeria. Validated

questionnaire informed the data collection approach, while the analysis gathered was conducted using structural equation modelling techniques. The study's results indicated that the practice of knowledge sharing had a statistically insignificant and negative impact on the attainment of competitive advantage.

1.4 Objectives of the Study

1.4.1 General Objective

The study aimed at examining the mediating effect of technological innovation on the relationship between knowledge management and competitive advantage of telecommunications firms in Kenya.

1.4.2 Specific Objectives

The specific objectives of the study were;

i.   To examine the effect of knowledge creation on the competitive advantage of telecommunication firms in Kenya.

ii. To determine the effect of knowledge transfer on the competitive advantage of telecommunication firms in Kenya.

iii. To establish the effect of knowledge storage on the competitive advantage of telecommunication firms in Kenya.

iv. To examine the effect of knowledge implementation on the competitive advantage of telecommunication firms in Kenya.

v.   To determine the mediating effect of technological innovation on the relationship between knowledge management and the competitive advantage of telecommunication firms in Kenya.

1.5 Research Hypotheses

i.   **Ho$_1$:** There is no statistically significant effect of knowledge creation on the competitive advantage of telecommunication firms in Kenya.

ii. **Ho$_2$:** There is no statistically significant effect of knowledge transfer on the competitive advantage of telecommunication firms in Kenya.

iii. **Ho$_3$:** There is no statistically significant effect of knowledge storage on the competitive advantage of telecommunication firms in Kenya.

iv. **Ho$_4$:** There is no statistically significant effect of knowledge implementation on the competitive advantage of telecommunication firms in Kenya.

v.   **Ho$_5$:** Technological innovation does not mediate the relationship between knowledge management and the competitive advantage of telecommunication firms in Kenya.

1.6 Significance of the Study

The findings of this study are significant to the management of telecommunication firms in finding out factors that may influence the competitive advantage of the companies. They get an insight into whether knowledge creation, transfer, storage, and implementation affect the competitive advantage. Strategies to increase the competitive advantage of telecommunication firms in Kenya may be based on these findings.

The study results are also significant to the government and, notably, the policymakers. The Communications Authority of Kenya (CAK) can draw policies based on the study's recommendations. CAK can also look at ways to increase the competitive advantage of telecommunication firms in the country. The findings also inform future research and contribute to the existing knowledge base.

1.7 Scope of the Study

The study investigated the role of technical innovation as a mediator in the association between knowledge management and competitive advantage within the telecoms industry in Kenya. The study was restricted to four overlapping areas of knowledge management; knowledge creation, knowledge transfer, knowledge implementation and knowledge storage. The theories that guided the study were Michael Porter Five Forces Model and Knowledge-Based View. While the unit of analysis was Safaricom, Airtel Kenya and Telkom Kenya. The study was conducted within the geographical boundaries of Kenya, encompassing the period from October 2021.

1.8 Study Assumptions

The researchers made the assumption that the selected individuals possessed qualities of honesty and impartiality throughout the data gathering process. The study operated on the assumption that the senior managers refrained from intervening in the respondents' feedback provision process. The study made the assumption that the participants included in the research possessed the necessary skills and knowledge to provide informed perspectives on the internal workings of the organizations. To assure the fulfilment of the necessary requirements, the management of the enterprises obtained data gathering licences from both the university and NACOSTI. The issuance of licences instilled a sense of assurance within the individuals, leading them to acknowledge that the research endeavour was exclusively designed for scholarly objectives. The researcher made a commitment to provide the manager of the firm with a digital version of the study findings as required.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter provides a comprehensive examination of relevant literature, including an overview of key topics such as competitive advantage, knowledge management, and technological innovation. It also delves into ideas pertaining to knowledge management and competitive advantage, offering both a theoretical and empirical evaluation. Additionally, the chapter identifies gaps in the existing literature and presents a conceptual framework to guide future research.

2.2 Concept of Competitive Advantage

The attainment of competitive advantage occurs when an organisation establishes a superior position relative to its competitors by delivering greater value to clients through either cheaper prices or the provision of supplementary benefits and services in relation to its offerings (Mwangi, 2021). According to Porter (1980), various types of competitive advantages exist. The benefits can be categorised into two groups: those that are contingent upon the firm's position and those that are contingent upon the firm's skills. The maintenance of a persistent competitive advantage can enable organisations to sustain their position as market leaders within their respective industries, hence leading to enhanced levels of performance (Mohamed, Ibrahim, Eltayeb & Abker, 2019). Furthermore, it can also result in improved profitability and enhanced market dominance.

According to Karanja, Namusonge, and Kireru (2018), a competitive advantage refers to the strategic approach adopted by a corporation to attain its long-term objectives within a specific scope. Given the presence of both current and prospective competitors, it is imperative for the firm to possess a persuasive rationale for its anticipated ability

to effectively engage in competition with them. In order to attain a competitive edge, a high-performing organisation must surpass its rivals. In order to achieve success, it is not necessarily required for a corporation to possess a competitive advantage over its rivals (Gyemang & Emeagwali, 2020). This phenomenon can be attributed to the presence of multiple enterprises in various marketplaces, each possessing equal opportunities to engage in competitive activities.

Nevertheless, a company is more likely to achieve superior performance if its competitive edge is distinct and unparalleled. According to Ofori, Osei, Mensah, and Affum (2015), a company that demonstrates superior performance in a certain activity compared to its current and potential competitors possesses a competitive advantage in that specific area.

According to Mugo and Namada (2020), the performance level is determined by three distinct forms of competitive advantages: cost leadership, differentiation, and focus (which includes cost-focus and differentiation-focus). The objective of a cost leadership strategy is to achieve the status of being the most economical producer (Nashiruddin, 2019). This is achieved by the application of economies of scale in the context of extensive production. If a corporation is able to leverage economies of scale to achieve cost advantages in the production of goods or services, it may consequently set a selling price that is difficult for competitors to match.

According to Nawaz and Shaukat (2017), a differentiation strategy is employed by a firm to distinguish its goods or services from those offered by its competitors. This objective can be achieved by the provision of high-quality products or services to clients, as well as the growth and development of novel offerings. According to Mugo and Namada (2020), if a corporation is able to effectively establish differentiation, it has the potential to establish a higher pricing point for its products or services. The

corporation places its primary emphasis on a specific and limited market niche (Kireru, Karanja & Namusonge, 2017). The effectiveness of this approach hinges on the company's ability to provide products or services that effectively meet the needs of these client segments, which can be further categorised into two distinct focuses: cost-focus and differentiation-focus. According to Quagraine and Ahakwa (2021), the cost-focus strategy involves being the most economical producer within a certain market segment, whereas the differentiation-focus strategy entails offering distinct products or services within a limited market segment.

2.3 Concept of Knowledge Management

Organisations have implemented knowledge management as a means to extract tacit knowledge from individuals, acquire knowledge through observation and experience, and convert it into explicit knowledge that can be formally processed and kept (Abusweilem & Abualoush, 2019). According to Kelechi et al. (2020), these practises facilitate knowledge management processes that enable organisations to obtain information for the purpose of making informed decisions.

North and Kumta (2018) noted that knowledge management practices have to entail sharing information within the organization, learning of new skills and carrying out performance reviews. Knowledge management comprises knowledge creation, knowledge storage, knowledge transfer and knowledge implementation (Riungu, 2017; Mtswenem, 2020; Elfar, Elsaid & Elsaid, 2017). The importance of adopting knowledge management practices is increasing, which is necessary in improving decisions, learning organizations, and stimulating cultural change and innovation (Novak, 2017).

Knowledge management capabilities improve organizational performance by informing innovation, creating new products and increasing competitiveness (Obire &

Asaolu, 2018). Cumari, (2018) defines knowledge utilization as the use of knowledge in enhancing organizational performance. Mungai (2019) argues that acquisition and Utilization of Information alone cannot be a competitive advantage for an organization. The accumulated information should be distributed to the employees in order to enhance organization's performance to a great extent. The knowledge transfer practice involves the distribution of knowledge sourced from the external environment to employees enhancing their efficiency. (Kiseli & Senaji, 2016; Novak, 2017; Kinyua, 2018).

2.4 Concept of Technological Innovation

A technological innovation refers to a novel or enhanced product or process that exhibits substantial differences in its technical qualities compared to previous iterations (Azar & Ciabuschi, 2017). According to Cheng, Awan, Ahmad, and Tan (2021), an invention can be classified as such if it attains specific benefits for the firm in question, regardless of whether these advantages are novel in relation to other companies or the market. According to Kibugo and Maina (2017), innovation refers to the practical application of concepts that lead to the introduction of novel products or services, or the enhancement of existing ones. The primary objective of technical innovation is to reduce expenses and optimise profits (Kariu, 2017). According to Muia (2017), highly innovative institutions possess a strategic advantage over their competitors, enabling them to surpass them and extend their sphere of influence beyond national boundaries.

According to Ngando (2017), the integration of technological advancements can encompass the automation of financial aid processes within institutions, hence reducing the need for human participation. Institutional innovation plays a crucial role in companies as it facilitates the process of reconfiguring and enhancing many forms of innovation, such as goods, business models, and management systems (Mwangi, Kuria

& Atheru, 2018). The presence of internet connectivity within organisations facilitates online transactions for clients and aids businesses in cultivating a desired image across several platforms (Omwanza & Jagongo, 2019).

Intermediaries, such as agents, play a crucial role in enhancing an organization's financial success and serving as representatives of the corporation (Mwangi, 2014). Computerization is a vital element of technology advancement within an institutional context. The process entails transferring activities or operations that were previously not performed on a computer to a computer system, resulting in enhanced efficiency (Munywoki, 2016). The integration of technological innovation into an organisation involves the process of reimagining the current industry framework in order to generate novel benefits for customers, disrupt competitors, and generate additional income for all parties involved (Ngamsutti & Ussahawanitchakit, 2016).

2.5 Theoretical Review

2.5.1 Michael Porters Five Forces Model

The subject of competitive strategy was addressed by Michael Porter through the development of several theories and models. According to De Wit and Meyer (2004), the initial and primary factor influencing a firm's profitability is the attractiveness of the industry in which it operates. Consequently, he developed the Michael Porter's Five Forces Model. The author identified five key elements that pose significant challenges to the profitability of organisations operating within the same industry. These factors have a direct impact on the expected profit levels of competing entities.

Fitzroy, Hulbert, Ghobadian, Hulbert, and O'Shannasy (2012) assert in their publication titled "Strategic Management" that the removal of competitive advantage can be attributed to shifts in client demand, advancements in technology, and the blurring of industry borders. The five competing forces encompass the potential entry of new

participants into the market, the possibility of alternative products serving as substitutes, the influence wielded by suppliers in negotiations, the intensity of competition among current rivals, and the purchasing influence held by customers.

The determination of industry profitability is contingent upon the influence exerted by the five forces, since they have a direct impact on the pricing dynamics, cost structure, and capital investment requirements of firms operating within a given industry. These factors collectively contribute to the overall return on investment, as outlined by De Wit and Meyer (2004). Porter posited that managers at various levels within an organisation, including corporate, business, and functional, bear the responsibility of devising strategies to mitigate these threats. This enables the organisation to effectively navigate its task and general environments, thereby achieving superior performance and attaining a competitive advantage over competitors through the generation of substantial profits. The selection of this theory is optimal due to the necessity for firms operating in the telecommunications sector in Kenya to comprehend the prevailing competition among themselves, the influence of customers' purchasing power in relation to voice, data, and other associated products/services, the potential of new participants entering the market, and the presence of alternative products/services such as M PESA in comparison to Airtel Money and T-Cash.

2.5.2 Knowledge-Based View Theory

The knowledge-based view theory was formulated by Robert Grant in 1996. According to Grant (1996), the theory posits that a company's acquisition of potential resources may not provide favourable outcomes unless it establishes a strong knowledge base. The establishment of a solid knowledge base is essential in attaining enduring distinctiveness within the market, leading to a lasting competitive edge (Blome, Schoenherr & Eckstein, 2014). Knowledge-based resources are resources that possess

a level of protection against replication by competitors. The reproduction of these entities is infrequent because to their distinctive characteristic of being difficult to ascertain their influence on a specific outcome, as they encompass individuals' talents (Gassmann & Keupp, 2007).

The theory posits that the competitive advantage of a corporation is closely tied to its knowledge. Consequently, firms that allocate greater resources and effort towards knowledge investment and management are likely to reap greater benefits (Srivardhana & Pawlowski, 2007). The knowledge of an organisation can be stored in several repositories, such as the cognitive faculties and perspectives of individuals on the organization's everyday operations, processes, or structure, as well as in external social networks formed with other institutions or companies (Hayter, 2016).

The effective implementation of a knowledge management scheme necessitates both the presence of substantial knowledge-based resources and the seamless transfer of knowledge throughout the entire operational system, hence facilitating the appropriate dissemination of acquired knowledge (Hörisch, Johnson & Schaltegger, 2015). Palacios and Garrigos (2014) assert that the implementation of strategic knowledge management can yield substantial outcomes across multiple dimensions within the company context.

The aforementioned factors encompass the execution of suitable initiatives and strategies, the development of durable resolutions to enduring obstacles, and the optimisation of operational efficiency inside businesses, ultimately resulting in improved organisational performance (Felin & Hesterly, 2007).

According to Ettlie and Pavlou (2010), the likelihood of successfully developing a new product or service is increased by effective knowledge management. The possession of employee knowledge is seen crucial inside service-oriented organisations, particularly

in business operations that necessitate teamwork and engagement with clients. Nonetheless, it is imperative within the realm of knowledge management to develop a strategic approach that enables the integration of current information into novel organisational frameworks and day-to-day operations, thereby mitigating the potential loss of critical knowledge resulting from staff attrition (Hayter, 2016).

The theory is considered pertinent for informing the present study. The establishment of a comprehensive knowledge management system including the creation, transfer, storage, and implementation of information inside telecommunication enterprises in Kenya has the potential to serve as a fundamental basis for the cultivation of a competitive advantage. It is recommended that telecommunication companies in Kenya devise strategies to incorporate individuals' knowledge into their strategic plans, thereby establishing a durable and adaptable corporate knowledge base. The possession of this type of knowledge need to be an inherent attribute of the firm as a distinct organisational unit. The loss of personnel from an organisation should not be seen as a mere accumulation of their diverse qualities and competencies. The possession of this shared knowledge is crucial for gaining a competitive edge, as it possesses distinct qualities that are unique to the organisation, unlike individualised properties or attributes. Therefore, the theory provides guidance on the variables under investigation in the present study, namely knowledge creation, knowledge transfer, knowledge storage, and implementation.

2.6 Empirical Review

2.6.1 Knowledge Creation and Competitive Advantage

sMwangi (2021) conducted a study examining the influence of knowledge management on the competitive advantage of telecoms enterprises operating within the telecommunications industry in Kenya. The research utilised a cross-sectional survey

methodology, employing a sample of 134 persons who were recognised as experts in their respective fields of specialisation. The current investigation utilised a mixed-methods methodology, integrating both primary and secondary data collection techniques. The process of obtaining secondary data entailed completing an extensive literature review on the topics of knowledge management and competitive advantage. The study's findings suggest that the integration of knowledge creation practises is associated with roughly 32.2% of the observed competitive advantage in communications firms. The findings of the research demonstrate a statistically significant association between externalisation and the achievement of a competitive advantage in a commercial context.

The study undertaken by Jyoti, Kotwal, and Rani (2015) sought to examine the impact of knowledge management practises on the competitive advantage of the telecoms sector in India. The study utilised a descriptive research design. The data gathering methodology employed in this study involved the administration of questionnaires. The data analysis was performed using a combination of descriptive and inferential statistical methods. This paper presents empirical evidence suggesting that the implementation of knowledge management practises, such as knowledge production, storage, and transfer procedures, has a positive impact on achieving competitive advantage. Based on the existing empirical evidence, it can be concluded that the adoption and utilization of knowledge management practices have a discernible and statistically significant impact on the achievement of competitive advantage.

Mehralian, Nazari, and Ghasemzadeh (2018), examined the influence of the knowledge generation process on organizational performance. To achieve this purpose, the researchers utilized the Balanced Scorecard (BSC) methodology. The research investigated the relationship between knowledge acquisition and organizational

performance through the distribution of 350 surveys to middle-level managers working in three telecommunications companies based in Pakistan. The present study's statistical research shown a noteworthy association between the advancement of knowledge and the achievement of organizational success. The research findings demonstrate a strong and statistically significant relationship between the process of acquiring knowledge and the achievement of organisational prosperity.

Wanyama (2018) investigated knowledge management and competitive advantage attainment within the public service sector of Kenya. The primary aims of this study were to assess the impacts of knowledge acquisition, knowledge dissemination, knowledge utilisation, and knowledge retention on the attainment of competitive advantage within the public service sector of Kenya. The research employed a multiple regression methodology. The study encompassed a cohort including 2343 persons who were employed across various government ministries; Devolution, Labour, Social Security and Services, and ICT. The researcher employed a combination of basic random and stratified sampling methodologies in order to acquire a sample size comprising 303 participants. The research investigation revealed a correlation coefficient, denoted as R, of 0.897, showing a strong positive relationship between the study variables. The available empirical data indicates that the different phases of information generation, dissemination, utilization, and retention have a favorable impact on the competitive advantage of public service within the specific setting of Kenya.

Kelechi, Hamed, Akpa, Priscillia, and Chan (2020) investigated the impact of knowledge management on the competitive advantage of enterprises operating within the Nigerian food and beverage manufacturing industry. The research employed a survey methodology, utilizing a sample size of 320 individuals from a total population

of 1587 individuals involved in specific food and beverage industries in Nigeria. The data collection methodology utilized in this study includes the administration of a validated questionnaire. The following analysis of the collected data was conducted using structural equation modelling. The study established no significant correlation between the practice of information sharing and the attainment of a competitive advantage. Indeed, the impact of knowledge sharing on competitive advantage is detrimental.

Kiseli and Senaji (2016) investigated the impact of knowledge management on the acquisition of competitive advantage in the Kenyan hotel industry. The study examined the impact of technical knowledge management infrastructure capability, social knowledge management infrastructure capability, knowledge management process capability, and knowledge management innovation agility on the attainment of competitive advantage. A descriptive research design was used. The study sample consisted of 313 persons who occupied managerial roles and were employed at five-star hotels in Nairobi. Structured questionnaires were employed to facilitate the collection of primary data. The available empirical data indicates that there is a positive relationship between the capabilities of technical knowledge management infrastructure, social knowledge management infrastructure, knowledge management processes, knowledge management innovation agility, and the achievement of competitive advantage. The findings indicate that organizations should adopt knowledge management strategies in order to improve their product offerings while also reducing additional costs.

2.6.2 Knowledge Transfer and Competitive Advantage

The study conducted by North and Kumta (2018) examined the influence of knowledge management on the competitive advantage of manufacturing companies in Germany.

The study employed a cross-sectional research design. The study utilized a sample including 17 manufacturing businesses. The study's findings suggest that knowledge management involves the many activities of exchanging, developing, and disseminating knowledge. The outcomes of the study suggest that the relationship between knowledge management and competitive advantage does not necessarily result in a positive outcome.

Osagie and Olajide (2019) explored the influence of knowledge sharing on the competitive advantage of telecommunication businesses operating within the Nigerian market. The study utilized a cross-sectional and descriptive research methodology. The study employed a combination of primary and secondary data sources to examine the influence of organizational learning on the competitive advantage of select telecommunications companies in Nigeria. The study sample comprised all operational telecommunications firms in Nigeria. The study's sample size was derived from the offices of MTN and Globacom Nigeria, situated in Lagos. The sample selection process involved the utilization of the Taro Yamane formula, a well-established scientific approach, resulting in the selection of a total of 267 elements. The study's results demonstrate a robust and statistically significant correlation between the implementation of information sharing practices and the attainment of a competitive advantage.

Furthermore, the study conducted by Al-Nawafah, Nigresh, and Tawalbeh (2019) aimed to investigate the impact of knowledge management on the competitive advantage of manufacturing companies in Jordan. The study employed a descriptive analytical methodology. Furthermore, a self-administered questionnaire was devised in accordance with the research hypothesis and objectives in order to achieve the aims of the study. The study sample comprised a total of 255 individuals. The research that was

conducted has revealed a significant correlation between the implementation of knowledge management practices and the attainment of a competitive advantage. The performed research has demonstrated a noteworthy positive correlation between the behaviors of information sharing and knowledge storing, and the attainment of a competitive advantage.

Meihami (2020) examined the influence of knowledge management on industrial firms' performance from a competitive standpoint. The study utilized a descriptive research design. The data collection in this study was carried out by the delivery of questionnaires. The findings of the research demonstrate a favorable correlation between the management of knowledge and firm performance from a competitive standpoint, a conclusion supported by the actual data presented. The available empirical research indicates that the adoption of knowledge management strategies is crucial for the cultivation of a competitive advantage. Knowledge management comprises a range of operations that involve the development, organization, transmission, and utilization of knowledge to facilitate learning and innovation.

The study undertaken by Ongus, Aming'a, Nyamboga, and Okello (2016) explored knowledge management practices and the impact on organizational performance. The main aim of this research was to examine the influence of knowledge capture and acquisition, knowledge sharing, and knowledge management policies on the overall organizational performance. The study utilized a descriptive research design. The study findings revealed a significant association between the adoption of knowledge management practices and organizational performance.

The objective of Khuram's (2016) study was to investigate the impact of knowledge management on the competitive advantage of publicly listed companies in India. The research utilized a descriptive survey methodology, in which data was gathered by the

distribution of a semi-structured questionnaire to the participants of the study. The findings of the research indicate a restricted level of correlation between knowledge management and the competitive advantage of the organizations under investigation. The findings of the research indicate that the adoption of a knowledge management strategy does not yield a statistically meaningful impact on the improvement of knowledge management competencies. However, it is widely recognized that these competencies play a pivotal role in facilitating organizational innovation and attaining a competitive advantage.

In a study undertaken by Cumari (2018), the primary aim was to investigate the impact of knowledge management (KM) practises on the operational effectiveness of KEBS. The research study employed a descriptive research approach, wherein data was gathered from primary sources through the administration of questionnaires. The study sample consisted of 22 individuals who were employed at KEBS, including employees from various departments and regional offices. The researchers utilised the census method, resulting in a sample size of 22. The procedure of collecting primary data involved the utilisation of questionnaires, which were subsequently entered into SPSS for the purpose of facilitating analysis. The study utilised varied statistical analysis techniques; statistical and descriptive. The research revealed that the core knowledge management practises employed at KEBS encompass knowledge generation, information exchange, knowledge preservation, knowledge retrieval, and knowledge distribution. The available empirical research indicates that the diverse range of activities associated with the generation, transfer, conservation, retrieval, and dissemination of knowledge exert a favorable impact on the performance of organizations.

2.6.3 Knowledge Storage and Competitive Advantage

Mwangangi (2018) investigated knowledge management's impact on the competitive advantage of mobile communications companies in Kenya. The study utilized a semi-structured questionnaire as the major tool for data collection, and descriptive statistics were employed for data analysis. The findings of the study indicate that the implementation of knowledge management inside organizations manifests in various ways in order to enhance innovation processes and thus enhance the competitive advantage of the firm. The findings of the study suggest that the processes of knowledge storage, sharing, and creation have a favorable impact on an organization's competitiveness.

Dickson (2019) explored knowledge management's impact on the competitive advantage of faith-based organizations in Nigeria. The research included a combination of quantitative and qualitative methodologies. A survey and a questionnaire were utilized for data collection. The researcher purposively selected ten churches from an infinite population, employing a judgmental sampling approach. The selection of these particular organizations was based on their size. The study employed a convenience sample technique, whereby a total of 250 participants were picked from various organizations. Specifically, 25 individuals were chosen from each business. The selection process involved a random selection procedure with a lottery draw. The results established a positive relationship between management of knowledge and organizational performance, from a competitive standpoint.

In a study conducted by Novak (2017), knowledge management and organizational performance were examined. The study explored the connections between knowledge management processes (creation, storage, transfer, and application) and organizational performance. This investigation was conducted through an extensive assessment of

relevant literature and is suggested as a potential area for additional empirical research in a doctoral dissertation. The analysis of existing literature reveals that the activities of knowledge management, including generation, storage, transmission, and application, have a favorable impact on organizational performance. The research findings indicate that the processes of information production, storage, transmission, and application have a crucial role in defining the overall performance of organizations.

Riungu (2017) examined knowledge management practices and competitive advantage of mobile telephone firms in Kenya. The research design utilized in this study was a descriptive survey. The research revealed that mobile telecommunications businesses operating in Kenya saw knowledge management as a viable approach to enhance competitive performance. Knowledge management is a strategic approach employed inside organizations to effectively acquire, disseminate, and utilize management knowledge. This process aims to enhance the management of both tangible and intangible knowledge assets, with a particular focus on the professional knowledge, experiences, and competences possessed by the organization's staff members. The findings indicate that knowledge management practices impact competitive advantage across multiple dimensions. These dimensions include the presence of knowledgeable employees, enhanced operational capabilities within the organization, improved service provision to clients, decreased operational costs, and heightened organizational competitiveness. This phenomenon can be attributed mostly to the heightened consciousness regarding the indispensable nature of vital information in attaining the objectives of an organization.

Abusweilem and Abualoush (2019) did a study with the objective of evaluating the impact of the knowledge management method on organizational performance. The study objective sought examine the effects of knowledge generation, knowledge

sharing, knowledge utilization, and business intelligence on organizational performance. The study primarily examined banks situated in Irbid, Jordan, and employed a sample of 126 questionnaires for the purpose of data collecting. The study adopted a multiple regression model. The study established a significant relationship between knowledge generation, knowledge sharing, knowledge utilization, and business intelligence, and their influence on organizational success.

2.6.4 Knowledge Implementation and Competitive Advantage

Nzongi (2018) examined the influence of knowledge management on the attainment of competitive advantage in the real estate sector of Kenya. Descriptive research design was selected. The data was gathered by use of questionnaires. The available empirical research indicates that the implementation of knowledge management practices has a positive influence on the achievement of competitive advantage. These practices involve a wide range of activities, including the storage, implementation, development, and sharing of information. The research findings suggest that the level of knowledge management has a substantial influence on the competitive advantage of firms.

Wijaya and Suasih (2020) investigated knowledge management and form performance SMEs in Indonesia from a competitive standpoint. Descriptive research design was used. The data in this study was collected by the administration of a questionnaire. The research findings suggest that the implementation of knowledge management practices has a favorable impact on the competitive advantage of small and medium-sized enterprises (SMEs) in Indonesia. Knowledge management encompasses three core components: the procurement of knowledge, the dissemination of information, and the application of acquired knowledge. The concept of knowledge implementation involves the practical use of knowledge and the application of existing knowledge to enhance decision-making processes, with the ultimate goal of increasing competitive advantage.

A study was undertaken by Mtswenem (2020) to investigated knowledge management's impact on construction enterprises performance in Nigeria. The indices pertaining to knowledge management comprised knowledge development, storage, sharing, and application. On the other hand, performance was evaluated by indices such as profitability, growth, and survival. A cross-sectional survey design was employed in the study to conduct the examination. The population for this study consisted of 5,657 senior and middle-level managers from the six Quoted Construction Firms in Nigeria. A sample size of 411 was determined using Taro Yamen's formula for sample size determination. The research revealed that the process of knowledge generation and storage exhibited a noteworthy impact on profitability, albeit lacking a similar influence on growth and survival. Conversely, the act of information sharing and application demonstrated a considerable effect on not just profitability, but also on the dimensions of growth and survival. The study suggests that it would be beneficial for the management of construction businesses in Nigeria to develop additional compensation packages, support activities that promote knowledge generation, establish repositories for information storage, foster communities of practise, provide coaching and mentoring opportunities, and promote the implementation of knowledge within the organisation. Implementing these measures can significantly contribute to enhancing work processes, leading to increased profitability, consistent growth, and enhanced organisational resilience.

In their study, Elfar, Elsaid, and Elsaid (2017) aimed to examine the impact of knowledge management adoption on the competitive advantage of construction enterprises in Egypt. The study evaluated knowledge management in Egypt's construction sector, focusing specifically on the capabilities of knowledge infrastructure (KIC) and knowledge processes (KPC). Furthermore, the primary

objective of this study is to evaluate the influence of these competencies on competitive advantage across various dimensions; financial, consumer and internal perspectives. The research encompassed a sample of 75 building firms in Egypt that were acknowledged for their exceptional performance and esteemed repute. The data in this study was collected by the administration of a questionnaire. The findings of the study indicate that the incorporation of knowledge infrastructure (KIC) and knowledge processes (KPC) has a favourable impact on the achievement of competitive advantage.

In a study conducted by Kinyua (2018), an examination was carried out to explore the correlation between knowledge management and the operational effectiveness of commercial banks within the Kenyan context. The research employed a survey design that was both explanatory and cross-sectional in nature. The sample population consisted of forty-three commercial banks located in Kenya. Each bank's functional area was observed, and the commercial bank itself served as the unit of analysis. A total of five distinct functional areas were discovered. The organisational components consisted of human resources, finance, marketing, information communication technology, and operations. The present study employed both primary and secondary data sources. Primary data was gathered by the administration of a semi-structured questionnaire, while secondary data was obtained through a thorough evaluation of relevant documents. The purpose of utilizing secondary data was to corroborate and confirm the information gathered through the questionnaire. The research outcomes have demonstrated that knowledge management has a favorable impact on performance. Additionally, the statistical analysis has revealed that knowledge conversion, implementation/application, and knowledge transfer play a vital role in deciding performance.

Mungai (2019) examined knowledge management practices and the impact on competitive advantage of SMEs in Kenya. The study investigated knowledge implementation, creation, acquisition, and sharing/transfer's influence on performance. The study utilized a descriptive research design, with a specific focus on a target population consisting of 532 SMEs in Kenya. The study involved the selection of a sample size of 150 SMEs representing several industries. The study utilized questionnaires that incorporated a blend of open-ended and closed-ended questions to gather data. The findings of the research demonstrate a positive correlation between the utilization, growth, procurement, and dissemination of information and the achievement of a competitive edge.

Chebii (2018), explored the correlation between knowledge management and the organisational performance of state-owned commercial enterprises in Kenya. The main aims of this study were to investigate the relationships between knowledge acquisition, knowledge generation, knowledge conversion, knowledge sharing, and knowledge implementation in the organisational performance of state-owned commercial enterprises in Kenya. The research study utilized the positivist research philosophy. Explanatory and descriptive design was used. The study was centered on a cohort of 275 persons who had positions within the upper echelons of management in 55 state-owned commercial enterprises in Kenya. The study adopted a research methodology that utilized a simple random sample procedure. The study's findings suggest that there is not a significant correlation between knowledge acquisition, creation, conversion, knowledge sharing, implementation, and return on assets. The paper posits that state-owned commercial organisations ought to use effective knowledge management strategies inside their entities to improve their overall operational efficiency.

2.6.5 Mediating Effect of Technological Innovation

The concept of innovation refers to the process of introducing novel ideas, methods, or products that Von Stamm (2008) posits that the concept of innovation encompasses qualities such as curiosity, a proclivity for experimentation, discontentment with the existing state of affairs, and a persistent drive to enhance and refine. The term in question is frequently employed in a manner that is synonymous with the concept of creativity. Creativity can be defined as the cognitive process of generating novel and original ideas. This singular factor, in and of itself, does not suffice. In order to derive the advantages, individuals must take action in relation to it. Innovation can be defined as the combination of imagination and effective application. The process of implementation, which involves the practical application of ideas, comprises three key components: idea selection, development, and commercialization. According to Chell (2001), innovation refers to the development of novel offerings within the market, resulting in a modification of the equilibrium between supply and demand. In academic discourse, innovation refers to the process of implementing novel ideas that aim to address and resolve problems.

A study was undertaken in 2019 by Mohamed, Ibrahim, Eltayeb, and Abker examined knowledge management and firm performance among manufacturing enterprises in Sudan, using a descriptive research design. A convenience sampling technique was also used. The findings established that radical innovation plays a mediating role in the relationship between knowledge management (specifically, knowledge acquisition, information sharing, knowledge storage, and knowledge application) and cost-based competitive advantage in industrial enterprises operating in Sudan.

The study conducted by Shafia, Shavvalpour, Hosseini, and Hosseini (2016) aimed to investigate the potential mediating effect of technical innovation capabilities on the

association between dynamic capacity and the competitiveness of research and technology organisations. The research methodology utilised in this study was an explanatory research design. The results of the study indicate that the relationship between dynamic capabilities and the competitiveness of research and technology enterprises is affected by the mediating influence of technical innovation capabilities. The available empirical research indicates that the presence of technical innovation skills plays a crucial role in facilitating firms to cultivate core competencies and attain a competitive advantage.

In addition, the research conducted by Nawaz and Shaukat (2017) examined the function of technological innovation as a mediator in the relationship between knowledge management practises and the competitive advantage of manufacturing businesses in Pakistan. The study utilised a descriptive research design. The data gathering process involved obtaining information from a sample of 407 manufacturing enterprises that are publicly listed on the Karachi Stock Exchange. These organisations mostly function within sectors such as textiles, fast-moving consumer goods, cement, petroleum, fertilisers, pesticides, chemicals, electronics, medicines, and other associated businesses. Data analysis was conducted using the statistical software tool IBM SPSS (Version 27). The available empirical data suggests that there exists a somewhat moderating influence of technical innovation on the relationship between knowledge management practises and competitive advantage.

Valmohammadi, Sofiyabadi, and Kolahi (2019) did a study with the objective of investigating the potential mediating function of innovation practises in the relationship between knowledge management practises and sustainable, balanced performance. The study employed a descriptive research design. The research instruments employed in this study included of questionnaires. The study's findings indicate that innovation

practises have a helpful role in moderating the relationship between knowledge management practises and sustained, balanced performance.

Kibisu and Awino (2017) examined innovation's mediating effect on risk management strategies and the performance of the Christian-businesses in the hospitality sector in Kenya. The study adopted a positivist philosophical framework and employed a cross-sectional survey methodology to examine a sample of 76 unlisted Christian-related businesses within the hospitality sector. The study achieved a response rate of 65.8%. The study's results suggest that the Christian Hospitality Sector in Kenya significantly influences the connection between enterprise risk management strategies and performance through the adoption of innovations.

2.7 Summary of Research Gaps

The existing body of empirical literature highlights the presence of a knowledge gap, which may be understood in terms of conceptual, contextual, and methodological gaps. Specifically, the contextual gap identified in the literature study is attributed to the inclusion of studies conducted beyond the scope of telecommunication enterprises. Furthermore, the presence of a contextual gap is also evident due to the inclusion of studies conducted in locations other than Kenya. However, it is important to note that the existing research did not specifically investigate the impact of knowledge generation, information transfer, storage, and application on competitive advantage, taking into account the potential mediating role of technological innovation. Additionally, based on the analysis of existing scholarly works, it can be observed that there is a gap in the methodology employed. The presence of a methodological gap is evident in various aspects, such as the nature of the data, the design of the research, and the methodologies employed for sampling, among other factors.

In addition, some of the reviewed studies (Mulhim, 2017; Mehralian, Nazari & Ghasemzadeh, 2018; Wanyama, 2018; Kiseli & Senaji, 2016; Chuma, 2019; Ongus, Aming'a, Nyamboga & Okello, 2016; Cumari, 2018; Novak, 2017; Riungu, 2017; Abusweilem & Abualoush, 2019; Mtswenem, 2020; Elfar, Elsaid & Elsaid, 2017; Kinyua, 2018; Mungai, 2019) showed that knowledge management (knowledge creation, transfer, storage and implementation) are positively related performance.

In contrast, Kelechi, Hamed, Akpa, Priscillia and Chan (2020), North and Kumta (2018), Khuram (2016), Dickson (2019), and Chebii (2018) found a negative effect between knowledge management practices (knowledge creation, knowledge transfer, knowledge storage, knowledge implementation) and performance. Moreover, most of the reviewed studies were conducted outside Kenya, and among those conducted in Kenya, none were conducted within the telecommunication firms in Kenya. Therefore, the literature reviewed is inadequate to give a comprehensive inference and thus forms the foundations of the current study. Conducting the current study is worthy of bridging the existing knowledge gap.

2.8 Conceptual Framework

Figure 2.1 illustrates the Conceptual Framework of the study which shows the hypothesized relationship between variables.
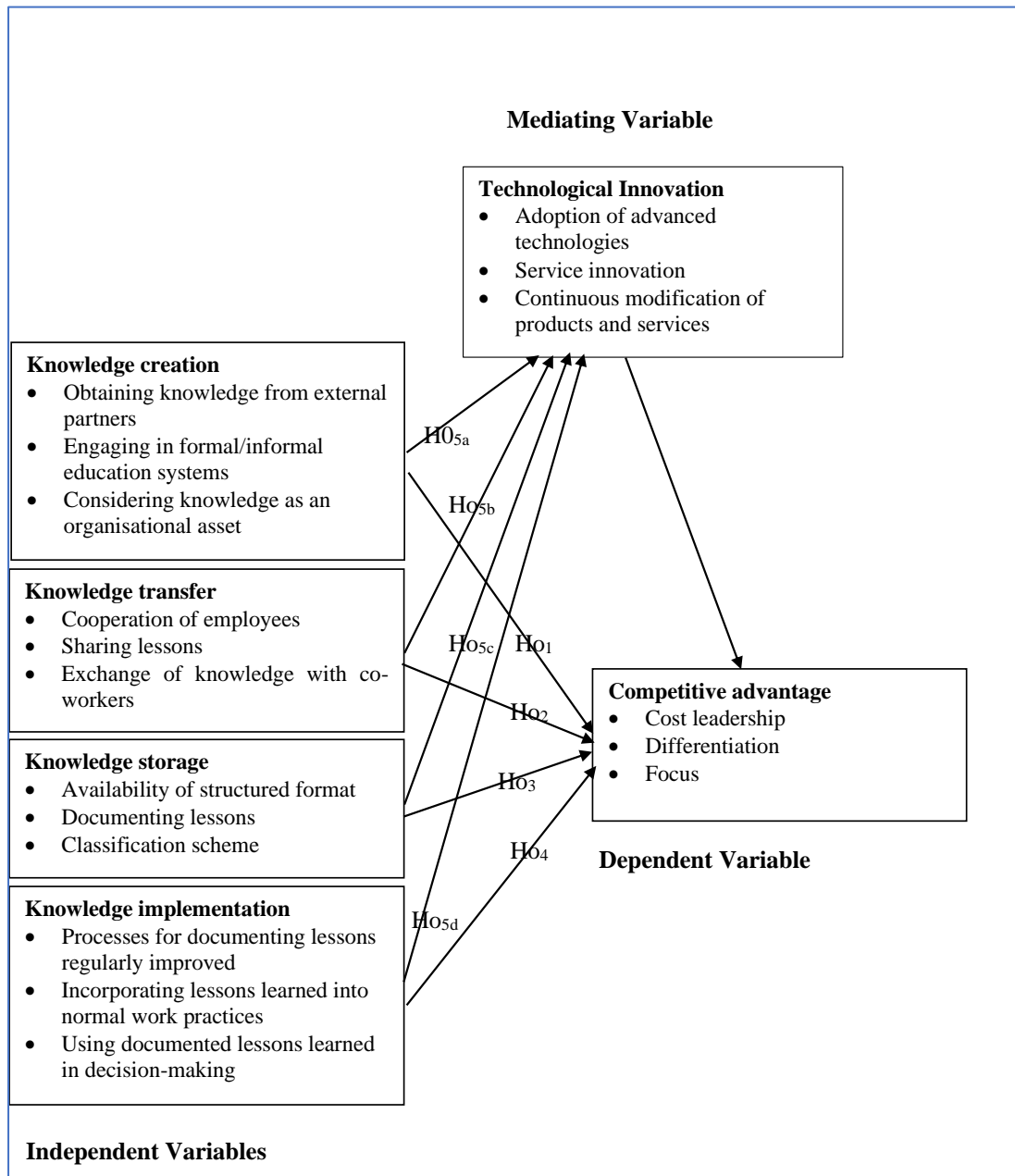
Figure 2.1 Conceptual Framework
Source: Researcher (2021)

A conceptual framework depicts the relationships among the various variables in the study. From the foregoing discussion of the literature review, the study theorizes that technological innovation could mediate the relationship between knowledge management and competitive strategy. The independent variable was the knowledge management while the dependent variable was competitive advantage. Technological

innovation was the mediating variable. The expected signs of the relationships between knowledge management, technological innovation, and competitive advantage could either be positive or negative.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter provides an overview of the analysis conducted on the study region, the research design employed, the target population selected, the sampling design utilised, the technique for data collecting, the pilot testing conducted, the measurement of variables, the procedure for data analysis, and the ethical considerations taken into account.

3.2 Study Area

The study area encompasses the specific geographic location in which the research will be conducted. The present investigation focused on the geographical region of Kenya. The rationale for undertaking the study within Nairobi City County is predicated on the fact that the headquarters and offices of the firms are located in this particular city. Therefore, Nairobi City County was a good representation of the other firms in making the inference.

3.3 Research Design

Research design refers to the framework or structure employed by researchers to address their inquiries or issues (Creswell, 2003). An explanatory research design was adopted for this study. The chosen research design was considered suitable as it attempted to elucidate the causal link between the variables. Rahi (2017) posits that an explanatory research strategy is appropriate in cases where the researcher seeks to enhance their comprehension of a particular topic and generate novel insights to address and ameliorate the existing circumstances. Furthermore, the study conducted by Nyaribo, Prakash, and Owino (2012) posited that the utilisation of an explanatory research design is instrumental in formulating hypotheses that elucidate the occurrence

of particular occurrences. This type of research is typically undertaken to address problems that have not been comprehensively investigated. The present study employed an explanatory research design in order to investigate the impact of technological innovation on the association between knowledge management and the competitive advantage of telecommunication companies in Kenya, as supported by scholarly reasons.

3.4 Study Population

The term population denotes a complete assemblage of entities that share identifiable and measurable attributes (Cooper & Schindler, 2014). The phenomenon frequently has a broad geographic distribution, and typically, the investigator's focus does not necessarily encompass the entire or global population (Kothari, 2004). The target demographic of this study consisted of high and medium level managers from Safaricom, Airtel Kenya, and Telkom Kenya, as they play a significant role in important decision-making processes.

The target population of the employees is presented in Table 3.1.

Table 3.1: Target Population

Company	Top management	Middle management (Supervisors)	Total
Safaricom PLC	349	1474	**1823**
Airtel Kenya	137	584	**721**
Telkom Kenya	116	327	**443**
TOTAL			**2987**

Source: Researcher (2021)

3.5 Sample Size

Sampling is selecting individuals within the entire population whose results can be generalised to the entire population (Mugenda & Mugenda, 2008). A sample is, therefore, a population subset (Cooper & Schindler, 2014). The researcher used Yamane's (1967) formula to compute the sample size as follows;

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

n = sample

N = population

e = Level of precision (0.05)

1 = Constant

Sample size =2987/ (1+2987 (0.05$^{2)}$ =352.76≈353

Consequently, the sample size was 353. The sample size is presented in Table 3.2:

Table 3.2: Sample Size

Company	Top management	Middle management (Supervisors)	Total
Safaricom PLC	41	174	215
Airtel Kenya	16	69	85
Telkom Kenya	14	39	53
TOTAL			**353**

Source: HR Departments (2021)

3.6 Sampling Design and Procedure

Sampling technique pertains to the methodology employed in obtaining a sample (Cooper & Schindler, 2014). The study employed a stratified random sample method to assure equal representation and inclusion of all categories and potential respondents.

The utilization of the stratified random sample technique facilitated the acquisition of data across several categories. The participants were stratified into several groups depending on their respective positions, namely top management and middle management (supervisors). All participants from each company were selected with equal probability to take part in the study.

3.7 Data Collection

3.7.1 Data types and sources

The study utilised primary data. The primary data was obtained by direct collection from employees of the business, with the purpose of evaluating the influence of knowledge management on the competitive advantage of telecommunication firms. The primary data was obtained from the participants via the distribution and completion of questionnaires.

3.7.2 Data Collection instruments

The researcher used questionnaires for data collection. Other studies (Mulhim, 2017; Wanyama, 2018; Ongus, Aming'a, Nyamboga & Okello, 2016; Dickson, 2019; Elfar, Elsaid & Elsaid, 2017; Kinyua, 2018; Mwangi, 2016) used questionnaires in similar research.

3.7.3 Data Collection Procedures

Prior to commencing the data gathering endeavor, the necessary documents pertinent to the data collection procedure were acquired. The aforementioned documents encompassed a research authorization issued by NACOSTI as well as an introductory letter provided by Moi University. The companies were formally solicited to provide their consent for participation in the study. Upon obtaining the companies' approval to

partake in the study, the researcher proceeded to distribute physical questionnaires to the aforementioned companies, ensuring strict adherence to all COVID-19 guidelines.

3.8 Pilot Study

A pilot study, also referred to as a test, is a preliminary and scaled-down iteration conducted as a precursor to the primary study (Kothari, 2004). In this stud, the study was carried out at Jamii telecoms Ltd, a telecoms service provider located in Nairobi City County. According to Cooper and Schilder (2014), the thumb rule recommends that the pilot test should consist of 5% to 10% of the sample. In line with this recommendation, the present study allocated 10% (33 employees) of the sample size for the pilot test. Jamii Telecom was not included in the final data collection.

3.8.1 Validity of the Research Instrument

The investigation encompassed an evaluation of both construct and content validity in order to determine the questionnaire's validity. The latter relates to extent to which a survey instrument accurately captures the content it intends to measure, as evaluated from the standpoint of experts in the relevant field. Content validity necessitates the involvement of acknowledged subject matter experts in the evaluation of test items, ensuring that they effectively measure the specified content. Additionally, the utilisation of more rigorous statistical tests is vital in this process. The concept of construct validity pertains to the alignment between the chosen measurement approach and the intended construct being assessed (Rahi, 2017).

Construct validity refers to the extent to which a test accurately assesses the specific construct it is intended to evaluate, aligning with its stated purpose or claim. The supervisor assessed the content validity of the research instruments by reviewing the questions to ensure their adequacy for data collection. Furthermore, the determination of construct validity was conducted utilising the Kaiser-Meyer-Olkin (KMO) measure.

The KMO test is a statistical method employed to assess the suitability of data for factor analysis.

3.8.2 Reliability of the Research Instrument

The attainment of reliability is observed when instruments consistently produce similar findings across several instances of utilisation (Sekaran & Bougie, 2016). Cronbach alpha coefficient was used to assess reliability. In accordance with the findings of Tavakol and Dennick (2011), coefficients that surpassed the threshold of 0.7 were deemed to be satisfactory.

3.9 Measurement of Variables

Table 3.3 presents a comprehensive overview of the variables examined in the study, together with their operationalization. This entails the identification of specific indicators for each variable and the corresponding measures utilised to estimate these variables.

Table 3.3: Measurement of Variables

Objectives	Variable	Indicators	Scale of Measurement	Data Collection Tools	Tools of Analysis
To examine the effect of knowledge creation on the competitive advantage of telecommunication firms in Kenya	knowledge creation	• Obtaining knowledge from external partners • Engaging in formal/informal education systems • Considering knowledge as an organisational asset	Ratio scale	Questionnaire	Frequency, Percentage, Mean, Standard deviation
To determine the effect of knowledge transfer on the competitive advantage of telecommunication firms in Kenya	knowledge transfer	• Cooperation of employees • Sharing lessons • Exchange of knowledge with co-workers	Ratio scale	Questionnaire	Frequency, percentage, Mean, Standard deviation
To establish the effect of knowledge storage on the competitive advantage of telecommunication firms in Kenya	knowledge storage	• Availability of structured format • Documenting lessons • Classification scheme	Ratio scale	Questionnaire	Frequency, percentage, Mean, Standard deviation
To examine the effect of knowledge implementation on the competitive advantage of telecommunication firms in Kenya	knowledge implementation	• Processes for documenting lessons regularly improved • Incorporating lessons learned into everyday work practices • Using documented lessons learned in decision-making	Ratio scale	Questionnaire	Frequency, percentage, Mean, Standard deviation
To determine the mediating effect of technological innovation on the relationship between knowledge management and the competitive advantage of telecommunication firms in Kenya	technological innovation	• Adoption of advanced technologies • Service innovation • Continuous modification of products and services	Ratio scale	Questionnaire	Frequency, percentage, Mean, Standard deviation

Source: Researcher (2021)

3.10 Data Analysis Procedure

Data analysis is a systematic procedure that involves the acquisition of unprocessed data and its transformation into valuable information that can be utilised by individuals or organisations to facilitate decision-making (Albright, Winston & Zappe, 2010). IBM SPSS (Version 27 was employed to encode, analyse, and produce the quantitative report. The data underwent analysis utilising both descriptive statistics and inferential statistics. Inferential statistics consisted of both correlation and regression analyses.

3.10.1 Descriptive Statistics

Descriptive statistics were used to describe, summarize, and organize the data. Five sets of these methods were used: frequency distributions, measures of central tendency, and measures of dispersion, skewness and kurtosis. Frequency distributions, ordered arrangement of all variables, showing the number of occurrences in each category (Norusis, 2010), were used to summarize data. Average or typical values of the data were given by the mean, the arithmetic average of values in a set.

Dispersion (variability) of data was given by the standard deviation (the average difference between observed values and the mean) and the range. Since normal distribution is a key assumption behind most statistical techniques, skew and kurtosis, were computed to determine how far the data departed from normality.

3.10.2 Correlation Analysis

Pearson's Correlation Coefficient, r, was used to establish the degree of relationships between dependent and independent variables. The correlation coefficient could take any value between -1.00 and +1.00. A value of +1.00 represents perfect positive correlation while a value of -1.00 is a perfect negative correlation. Correlation coefficients (in absolute value) which are ≤ 0.35 are generally considered to represent

low or weak correlations, 0.36 to 0.67 moderate correlations, and 0.68 to 1.0 strong or high correlations with *r* coefficients > 0.90 very high correlations (Field, 2009).

3.10.3 Tests for the Research Hypotheses

The study consisted of five null hypotheses. Hypotheses 1 and 4 tested the effects of knowledge management on the firms' competitive advantage. These comprised direct effects in the study because the study hypothesized that the various elements of knowledge management (knowledge creation, transfer, storage, and implementation) affected competitive advantage in a straight-forward manner, without any intervening variables (Baron & Kenny, 1986). Hypothesis 5 made up indirect effects of the study: the mediating role of technological innovation on the relationship between knowledge management and the competitive advantage of telecommunication firms in Kenya.

Multiple linear regression (MLR) models were used to test both the direct and indirect effects in the study. The application of multiple regression analysis is employed when the objective is to make predictions regarding the value of a certain variable, taking into consideration the values of two or more additional variables (Darlington & Hayes, 2016). The significance of employing multiple linear regression analysis is in its ability to facilitate the researcher's comprehension of the extent to which the dependent variable would be influenced by alterations in the independent variable (Roediger, Watson, McDermott & Gallo, 2001).

3.10.3.1 Tests for Direct Effects in the Study

The study focused on several independent factors, namely knowledge creation, transfer, storage, and implementation. The dependent variable under investigation was competitive advantage. The MLR used to estimate direct effects in the study was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \dots\dots\dots\dots\dots\dots\text{Model 3.1}$$

Where: -

Y= Competitive advantage

X_1= Knowledge creation

X_2= Knowledge transfer

X_3= Knowledge storage

X_4= Knowledge implementation

β_0 =Constant

$\beta_1, \beta_2, \beta_3$ & β_4= Coefficients to be estimated

ε= Error term

3.10.3.2 Test for Mediating effect of Technological Innovation

Mediating variables clarifies the link between the independent variable, and dependent variable when there is no such direct relationship between both. The study's conceptual framework had *four X* variables (knowledge creation, transfer, storage, and implementation) passing their effects directly to a single *Y* (competitive advantage), and indirectly through a single *M* (technological innovation). Thus, there were *four* direct and indirect effects, one of each for each *X*. The coefficients to be estimated to test for indirect effects are depicted in Figure 3.1.
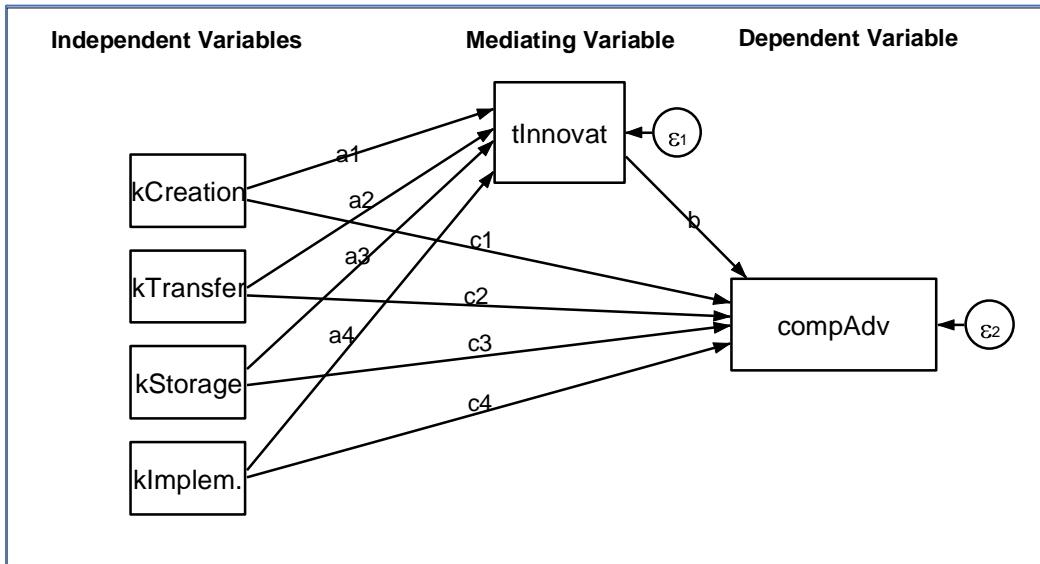
Figure 3.1 Regression coefficients to be estimated in testing for mediation

Key: kCreation=knowledge creation; ktransfer=knowledge transfer; kStorage=knowledge storage; kImplem.=knowledge implementation; tInnovat.=technological innovation; compAdv=competitive advantage

The figure shows that there were two consequent variables in this model (technological innovation and competitive advantage), so two linear models (3.2 and 3.3, respectively) were required to estimate the effects. The models were as follows:

$$M = \beta 0 + a1X1 + a2X2 + a3X3 + a4X4 + \varepsilon M \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{Model 3.2}$$

This model examined how the independent variables affect the mediating variable while controlling for errors.

To estimate the regression coefficients $c1$ to $c4$ and b in Figure 3.1, the following model 3.3 was used:

$$Y = \beta 0 + c1X1 + c2X2 + c3X3 + c4X4 + bM + \varepsilon Y \ldots\ldots\ldots\ldots\ldots\text{Model 3.3}$$

Where;

Y=Competitive advantage, *M*= technological innovation; β_0 = is the regression constant; *a1 – a4, b*, and *c1 – c4* are coefficients to be estimated; *X1* = knowledge creation; X2=knowledge transfer; X3=knowledge storage; X4=knowledge implementation; εM= errors in *M* and εY=errors in *Y*.

From the models 3.2 and 3.3, the *direct* effects of *X* on *Y* are given by the regression coefficients *c1* to *c4*. Four direct effects were estimated in this study, namely*, c1, c2, c3,* and *c4*. The *indirect* effect**s** of *X* on *Y* through *M* are given by *ab*, that is, the product between regression coefficients *a* and *b*. Four indirect effects were estimated in this study as follows: *a1b, a2b, a3b*, and *a4b*.

The *total* effects, *T*, of *X* on *Y*, is, the sum of its direct and indirect effects: *T= c + ab*. It is computed by regressing Y on all *X* variables but not *M*. This equation is similar to Model 3.1, in section 3.10.3.1.

Baron and Kenny (1986) proposed three conditions necessary for mediation: *X* is significantly related to *M, M* is significantly related to *Y*, and the relationship of *X* to *Y* decreases when M is in the model. Most of these conditions are subsumed in Models 3.2 and 3.3 and the study did not therefore set out to explicitly test these arguments. The major criticism of the Baron and Kenny (1986) causal steps is that they neither formally quantify the indirect effect nor provide an inferential test for it. The indirect effect is left to be imputed from the results of the steps and which can only be put in qualitative terms, for instance, full and partial mediation. Following more recent authors (such as, Hayes & Scharkow, 2013; Preacher & Selig, 2012 and Williams & MacKinnon, 2008), this study reported the indirect effect and the inferential test for the effect.

All the above coefficients were estimated by conducting ordinary least squares (OLS) regression analyses using the macro PROCESS (Hayes, 2013). A bias-corrected bootstrapping method was used to construct confidence intervals for the indirect effect based on 5,000 bootstrap samples. Such a method has been found to have higher power and better ability to deal with heterogeneity of variance (Hayes, 2013).

3.11 Diagnostic Tests

Prior to estimating the model, a series of diagnostic tests were done to ensure that the assumptions of the linear regression model were not violated. This intervention contributed to the mitigation of potential biases, inefficiencies, and inconsistencies in the estimation of parameters.

3.11.1 Normality Test

A normality test is employed to assess the extent to which a given data set conforms to a normal distribution model. The normalcy assumption posits that the distribution of sample means, when considering independent samples, exhibits an approaching normal distribution. Normality of the data was assessed by examining the values of skewness (the degree of asymmetry in the data) and kurtosis (how peaked or flat is the data distribution) (Neuman, 2006).

Skew indicates the degree of asymmetry in the data (how concentrated data points are at the high or low end of the scale of measurement) (Norusis, 2010). A negative value indicated skew to the left; a positive, skew to the right. Kurtosis describes how concentrated data are around the mean (that is, it assesses how peaked or flat is the data distribution). A negative value indicated platykurtosis (fewer items at the mean and at tails but more in intermediate regions) while a positive value indicated leptokurtosis (more items near the mean and at the tails but fewer in the intermediate regions)

(Norusis, 2010). Significant departures from normality were indicated if the skew or kurtosis value were outside the benchmark $\pm$ 2.0 (Norusis, 2010).

In addition, normality of the residuals (errors) was analysed by inspecting plots of residuals versus fitted (predicted) values. When the residuals for the linear regression were randomly scattered around the centre line of zero, with no discernible pattern, it indicated that the errors were normally distributed.

3.11.2 Multicollinearity Test

Multicollinearity is a phenomenon that pertains to the presence of correlations among the predictor variables within a regression model. Multicollinearity results in unstable estimations of individual predictors' coefficients by ballooning the standard errors and confidence intervals. The study employed variance inflation factors (VIF) to evaluate the presence of multicollinearity. In this study, VIF values above ten were taken to indicate the presence of multicollinearity.

3.11.3 Linearity test

The assessment of the linear association between a dependent variable and one or more independent variables is facilitated by the utilisation of the notion of linearity (Luukkonen, Saikkonen & Teräsvirta, 2008). The main aim of the linearity test was to ascertain the presence of factors that exhibit significant predictive capability with regards to the outcome variable (Rao & Gabr, 2010). The study utilised a linearity test, employing graphical analysis, to examine the existence of a linear relationship between the independent variable, knowledge management, and the dependent variable, competitive advantage.

3.11.4 Heteroscedasticity

Heteroscedasticity means that the variance of errors is the different across the levels of the independent variables (Greene, 2008). Homoscedasticity is an assumption of MLR. The assumption will be assessed by analysis of residual or errors. If the residuals are randomly scattered around the centre line of zero, with no discernible pattern, it will show that the residuals have a constant variance.

3.11.5 Autocorrelation

Autocorrelation occurs when the residuals are not independent from each other. This study will use both Durbin-Watson test and examination of the residuals plot to check for autocorrelation. The value should not be less than 1 or greater than 3 (Field, 2009).

3.13 Ethical Considerations

Prior to the commencement of data collection, the researcher obtained authorization from NACOSTI and Moi University through a formal letter of authority, granting permission to perform the research study. In addition, the participants were requested to provide informed permission regarding their voluntary participation in the research. The researcher ensured that the information provided was utilised exclusively for academic research purposes, with restricted access granted just to the designated participants planned to participate in the study. Upon request, the companies would be provided with a copy of the research findings.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter includes presentation, analysis and discussion of findings. The objectives were to determine the effect of knowledge creation, knowledge transfer, knowledge storage and implementation on the competitive advantage of telecommunication firms in Nairobi County. Data was analyzed and presented in table and graph form, using percentages and frequencies.

4.2 Response Rate

This section provides the response rate of all questionnaires issued and justification of why the response rate is adequate for data analysis. Based on the results presented in table 4.1 three hundred and six (306) of the targeted 352 respondents (86.93%) respondents. Seventy-six (76) out of 85 Airtel employees (89.41%) responded to the interview, compared to 187 out of 215 Safaricom employees (86.93%). Forty-three (43) out of 52 employees (82.69%) at Telkom Kenya responded.

Table 4.1 Response Rate

Company	Sampled	Responded	Percentage
Safaricom PLC	215	187	86.98
Airtel Kenya	85	76	89.41
Telkom Kenya	52	43	82.69
Total	**352**	**306**	**86.93**

The response rate is deemed satisfactory for further analysis and the making of the inferences. Some scholars such as Kothari (2004) and Bobbie (2004) indicate that a response rate above 60% is sufficient for the analysis. Hence the current study's average response rate is 86.96% and is considered sufficient.

4.3 Validity Test

To ascertain the instrument's validity, both internal and external validity tests were conducted. The initial step was evaluating the face validity of the questionnaire by analysing the respondents' ability to answer the offered questions with ease. Consequently, the researcher engaged in the observation of the respondents' active involvement in the pilot study. Any difficulties encountered in responding to any question were also investigated. Thereafter, any ambiguous questions were promptly corrected.

The questionnaire was distributed to the university supervisors and other research professionals in order to gauge the questionnaire's content validity. The expert's opinion was solicited, and the questionnaire was made better with the help of their review remarks. The questions' applicability to the study was also assessed in order to determine the construct validity by comparing them to the desired result. In order to fill in any gaps in the literature, the questions were also developed based on the study topics.

4.4 Reliability Test

The reliability of the surveys was examined using the Cronbach Alpha, a scale-test for related statements in questionnaires, because the questionnaires incorporated psychometric scale tests. The cutoff value for this reliability coefficient, which ranges from 0 to 1, is 0.7 (which signifies acceptable). The internal consistency of study items was tested using it. The Cronbach Alpha values in this study ranged from 0.74 to 0.86. Table 4.1 summarized the findings.

Table 4.2 Reliability Test

Variable	Items	Cronbach Alpha	Remark
Knowledge Creation	5	8.81.	α>0.7 hence reliable
Knowledge Transfer	5	0.77	α>0.7 hence reliable
Knowledge Storage	5	0.74	α>0.7 hence reliable
Knowledge Implementation	5	0.86	α>0.7 hence reliable
Technological	5	0.78	α>0.7 hence reliable
Innovation	5	0.71	
Competitive advantage			α>0.7 hence reliable

The findings shown in Table 4.2 demonstrate that the scale employed in the study exhibited high reliability, as evidenced by all variables having Cronbach Alpha values exceeding 0.7. This conclusion aligns with the assertion made by Neuman (2013) that a coefficient value above 0.7 is indicative of instrument reliability in a study.

Results presented in Table 4.2 above showed that the items for each of the six's study constructs were internally consistent, as their Cronbach alpha values were all above 0.70. Consequently, composite variables for each construct were computed by summing up all the items for each construct and then, taking an average.

4.5 Demographic Information

This section describes the respondents' demographic characteristics, which is pivotal in gaining a comprehensive knowledge of the respondents that may have influenced the study's findings. Learning about respondents' backgrounds was crucial before moving on to the study's primary goals. The research considered gender, educational background, and duration of working for the company. Background information is crucial since it provides the fundamental frameworks for the study's interpretations. The

reader and the researcher can feel confident in the study because of the respondents' backgrounds.

4.5.1 Gender of Respondents

To establish gender differences among the study respondents, they were required to indicate their gender. The results are summarized in Figure 4.1.
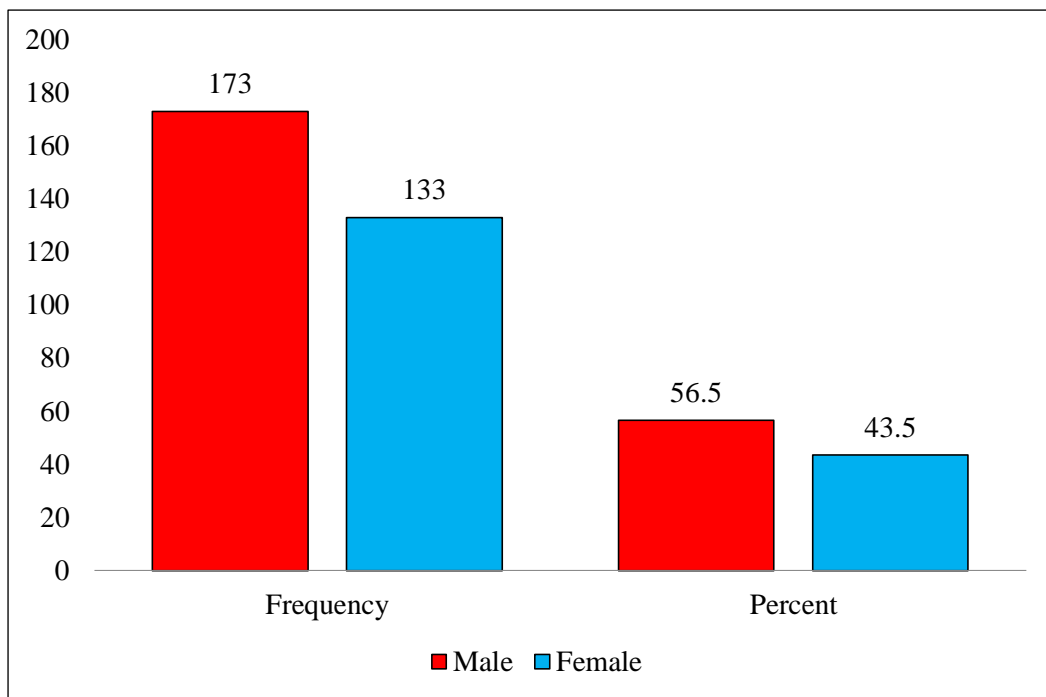
Figure 4.1 Gender of Respondents

From figure 4.1 above, 56.5% of male and 43.5% of female telecommunication workers participated in the study. From the findings, most telecommunication employees are probably male because women are less likely than men to study and work in STEM industries (Melak & Singh, 2021). Therefore, males study STEM courses and are more likely to be employed in the telecommunication sector than women.

4.5.2 Age Brackets of Respondents

The study sought to establish the age brackets of the respondents to gain insight into their responses' reliability level. The findings are presented in Figure 4.2.
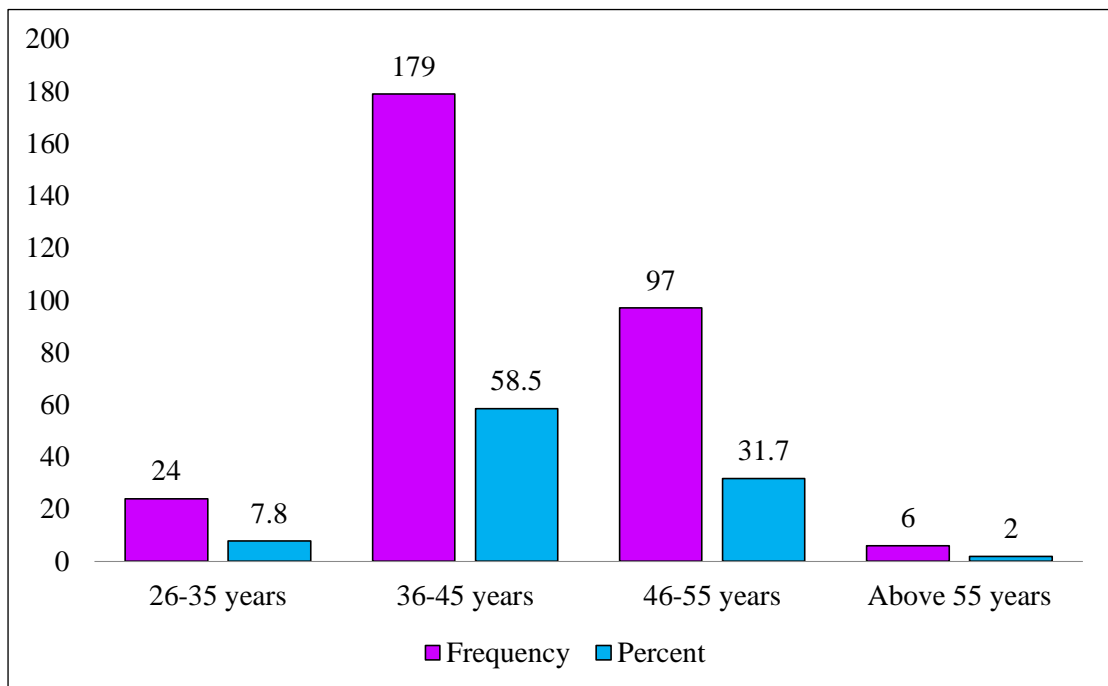
Figure 4.2 Age Brackets of Respondents

The findings in figure 4.2 show that 179(58.5%) of workers in the telecommunication sector were aged between 36-45 years old, 97 (31.7%) were between 46-55 years, 24 (7.8%) were between 26-35, and only 6(2%) were above 55 years old.

4.5.3 Academic Qualification

The study went on to establish the academic qualification of the respondents. The findings are presented in Figure 4.3.
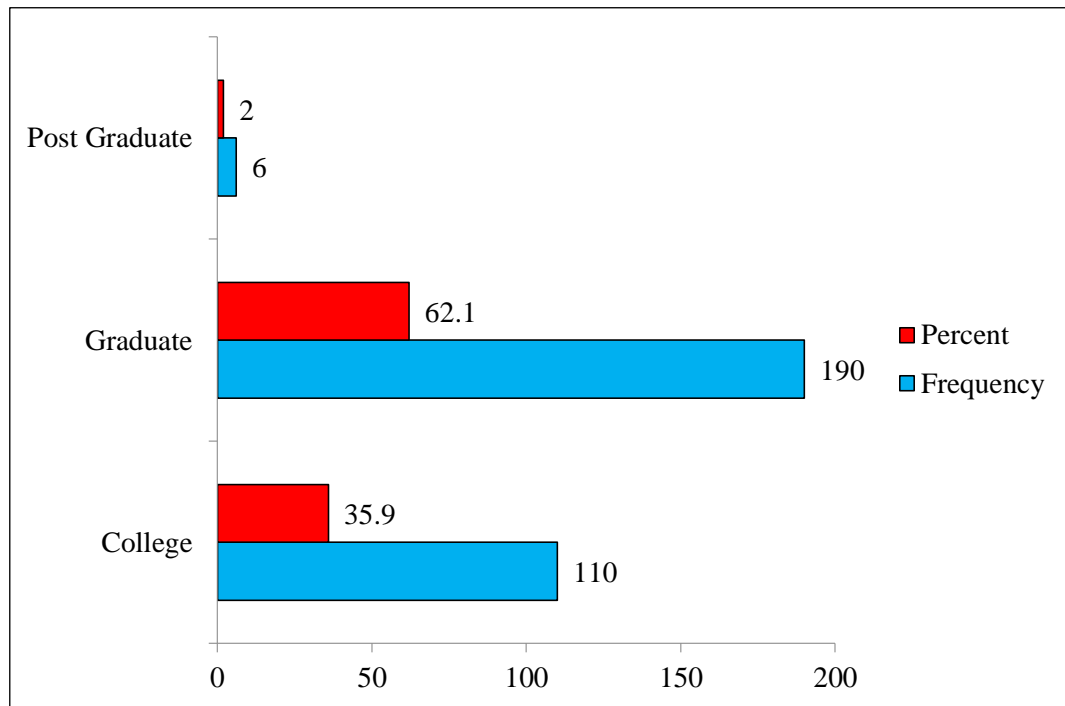
Figure 4.3 Academic Qualifications

The findings show that the majority (62.1%) of the workers had a Bachelor's degree.
35.9% had attained college-level training, and 2 % had postgraduate qualifications, this
finding suggests that the telecommunications professionals possessed adequate
qualifications and were capable of making substantial contributions to the topic being
examined.

4.5.4 Duration of Working in the Telecommunication Firms

The study sought to establish the duration of working in the telecommunication sector
to gain insight into the level of reliance of their responses. The findings are presented
in Figure 4.4.
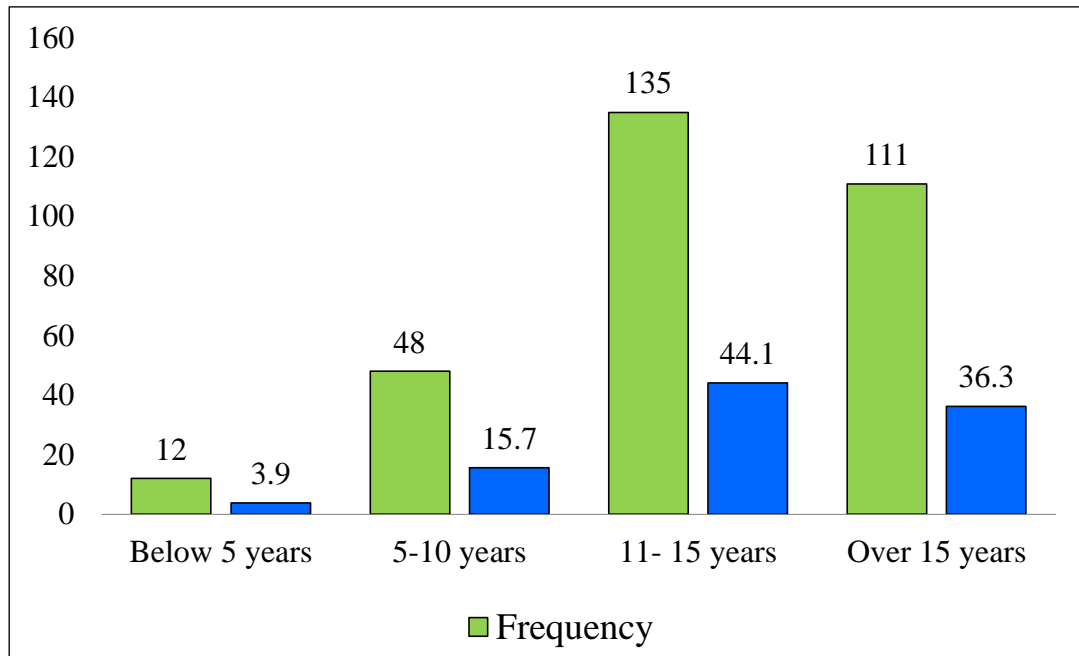
Figure 4.4: Duration of Working in the Telecommunication Firms

The findings show that 44.1 % had worked for between 11-15 years in the sector. 36.3% and 15.7% of the workers had been in the telecommunication field for over 15 years and 5 -10 years, respectively. Of the sampled workers, 3.9% had served for less than five years, showing that the workers had worked long enough in their fields and could make significant contributions to the subject under investigation.

4.6 Descriptive Statistics

This section presents descriptive statistics in line with the study variables.

4.6.1 Knowledge Creation

The study's first objective was to examine the effect of knowledge creation on the competitive advantage of telecommunication firms in Nairobi County.

Table 4.3 Knowledge Creation

	Descriptive Statistics				
	N	Min	Max	Mean	Std. Dev.
(i) The employees obtain a lot of new knowledge from external sources such as seminars and conferences.	306	4	5	4.80	0.40
(ii) The management motivates employees to engage in formal education systems to achieve a higher level of knowledge.	306	4	5	4.85	0.36
(iii) Employees in the company consider their knowledge as an organisational asset.	306	4	5	4.82	0.38
(iv) The employees obtain a lot of new knowledge from business partners (e.g., suppliers, clients)	306	4	5	4.84	0.36
(v) The employees rely on experience, skills and knowledge in their work	306	4	5	4.79	0.41

Table 4.3 provides an overview of how workers in the telecommunications field feel about knowledge creation, using average scores and measures of spread. Most of the surveyed employees concurred with the idea that they gain a substantial amount of new knowledge from outside events like workshops and conferences, with an average score of 4.8. They also largely agreed, with an average score of 4.85, that company leadership encourages them to take part in structured learning programs to enhance their expertise.

When asked whether employees in the company consider their knowledge an organisational asset, they agreed in the affirmative (M=4.82). The employees agreed that they obtain a lot of new knowledge from business partners (e.g., suppliers, clients) (M=4.84). They also agreed that they rely on their work experience, skills and knowledge (M=4.79). These findings show that telecom employees value knowledge creation and put in more effort to access it.

The findings also show a positive association between knowledge creation and firm performance. Most telecommunication firms that have created a conducive environment for employees to create novel inventions are well positioned to improve

their competitiveness and survival and for broader societal, governmental, and international implications. The aforementioned perspective finds confirmation in the research conducted by Mwangi (2021), wherein it was discovered that the practices associated with knowledge production contribute to 32.2% of the competitive advantage observed in telecommunication companies.

4.6.2 Knowledge Transfer

The study's second objective was to determine the effect of knowledge transfer on the competitive advantage of telecommunication firms in Nairobi County. In this light, the study required the respondents to reply to a series of statements to determine how knowledge transfer relates to telecommunication employees, as shown in Table 4.4.

Table 4.4 Knowledge Transfer

Descriptive Statistics					
	N	Min	Max	Mean	Std. Dev.
(i) The management in the company promotes cooperation and the exchange of experience among employees.	306	4	5	4.81	0.39
(ii) The employees in the company share their knowledge through formal procedures.	306	4	5	4.79	0.41
(iii) Successful instances of sharing lessons learned are consistently publicised throughout the company	306	4	5	4.81	0.39
(iv) The employees share their knowledge orally at meetings or informal gatherings.	306	4	5	4.82	0.38
(v) The employees in the organisation exchange knowledge with their co-workers	306	4	5	4.89	0.31

The employees in the telecommunication industry reached a consensus regarding the management's efforts to foster cooperation and facilitate the exchange of expertise among employees, with an average rating of 4.81. Additionally, the employees acknowledged that knowledge sharing among colleagues is facilitated by formal procedures inside the organisation, with an average rating of 4.79. The participants also

reached a consensus that instances of successful sharing of lessons learned are constantly disseminated within the organisation (M=4.81). The participants reached a consensus over their practise of disseminating knowledge through verbal communication at meetings or casual gatherings, as evidenced by a mean rating of 4.82. Additionally, they expressed a high level of engagement in knowledge exchange with their colleagues, as indicated by a mean rating of 4.89. The aforementioned statistics underscore the commitment of telecommunication companies to fostering knowledge transfer within their workforce.

The results of the study also indicate that the facilitation of access to knowledge generated by individuals, its amplification within social contexts, and its integration with pre-existing knowledge are the primary catalysts for knowledge creation inside telecoms companies. The findings of this study are consistent with the research conducted by Osagie and Olajide (2019), which demonstrated that knowledge sharing has a favourable and statistically significant impact on competitive advantage. Knowledge is an organisation's most valuable resource because it is seen as the primary source of competitive advantage and is essential to its long-term viability and success.

This statement agrees with the study by Kinyua (2018), which indicates that knowledge creation involves utilising an organisation's internal and external resources to generate new knowledge to achieve organisational goals. Among the many advantages of knowledge sharing, its impact on organisational creativity and innovation should be of utmost importance because knowledge sharing entails the efficient transfer of knowledge, skills, and information and the development of new knowledge. These findings are, however, in disparity with the study by Khuram (2016) that revealed that the knowledge management strategy does not influence the knowledge management capabilities that lead to organisational creativity and competitive advantage. These

findings underline the pivotal role played by knowledge transfer in telecommunication firms in Kenya.

4.6.3 Knowledge Storage

The third objective of the study was to establish the effect of knowledge storage on the competitive advantage of telecommunication firms in Nairobi County. Initially, the participants were requested to indicate the impact of knowledge storage on the competitive advantage of telecommunication companies, as illustrated in Table 4.5.

Table 4.5 Knowledge Storage.

Descriptive Statistics					
	N	Min	Max	Mean	Std. Dev.
(i) There is a structured format, such as a template to follow when documenting lessons learned	306	4	5	4.81	0.39
(ii) It is easy to use the classification scheme for documenting lessons learned	306	4	5	4.84	0.37
(iii) Training on using the structured format for documenting lessons learned is available within the company	306	4	5	4.82	0.39
(iv) Documenting lessons learned from projects is required in my organisation	306	4	5	4.80	0.40
(v) A classification scheme exists for categorising lessons learned by project type, problem type, subject area, etc.	306	4	5	4.84	0.36

The employees strongly agreed, with scores around 4.8 to 4.82, that there is a clear system or template to follow when keeping track of what they've learned. They also found it easy to sort these learnings using an existing method. Training on how to use this system is available, and documenting learnings is a requirement in the organization. However, they were less certain, with a score of 3, about the presence of a system for sorting learning by things like the type of project. These results suggest that the way

information is stored impacts how well telecommunication companies in Nairobi County can compete.

The study also found that storing information involves both modern technology, like up-to-date computers and software, as well as methods that people follow to recognize and organize this information for future use. These outcomes are in line with earlier research by Elfar et al. (2017), which said that having good systems for managing knowledge helps improve a company's overall performance.

A knowledge repository, which comprises documents, reports, and databases, is often used to store knowledge. Specialised software tools are available to arrange this information in a valuable and efficient way to increase the competitiveness of telecommunication firms. This perspective mirrors the conclusion by Novak (2017), which showed that knowledge storage is fundamental in determining organisational performance.

4.6.4 Knowledge Implementation

The fourth objective of the study was to examine the effect of knowledge implementation on the competitive advantage of telecommunication firms in Nairobi County. The employees were asked to indicate how knowledge implementation relates to the competitive advantage of telecom firms. The findings are presented in Table 4.6.

Table 4.6 Knowledge Implementation

		N	Min	Max	Mean	Std. Dev.
	Descriptive Statistics					
(i)	In the company, processes for sharing lessons learned are widely accepted as part of everyday work practices	306	4	5	4.81	0.39
(ii)	Processes for documenting lessons learned are regularly improved and updated in the company	306	4	5	4.83	0.37
(iii)	In the company, processes for searching for lessons learned are regularly improved and updated	306	4	5	4.79	0.41
(iv)	Instructions on incorporating lessons learned into everyday work practices are available to employees	306	4	5	4.81	0.40
(v)	The organisation uses documented lessons learned in decision-making	306	4	5	4.79	0.41

As shown in Table 4.6, employees agreed (M=4.81) that "processes for sharing lessons learned are widely accepted as part of routine work practices in the company". They also agreed (M=4.83) that "processes for documenting lessons learned are regularly improved and updated in the company" and that in the company, "processes for searching for lessons learned are regularly improved and updated" (M=4.79). They further agreed that "instructions on incorporating lessons learned into normal work practices are available to employees" (M=4.81) and that "the organisation uses documented lessons learned in decision-making" (M=4.79).

The study's findings show that knowledge implementation is an embedding process that ensures that knowledge is incorporated into products and services to improve competitive standing. The study also demonstrated that how people perceive a situation and its circumstances affects how successfully knowledge is implemented. People view the advantages of implementing and innovating differently because they interpret the

perceived information based on their motivational factors and prior experiences, as Winkler and Mandl (2007) suggested.

As a result, the study's findings for the innovation's implementation process indicate that people concerned and impacted know its advantages. They may be misled about what is happening. Incentives, for instance, may increase a person's motivation and impression of motivation. Therefore, telecommunication companies need to put more effort into the implementation phase to realise the benefits, which are, in essence, gaining a competitive advantage in the market, as posited by Kinyua (2018).

4.6.5 Technological Innovation

The study also sought to determine the mediating effect of technological innovation on the relationship between knowledge management and the competitive advantage of telecommunication firms in Nairobi County. The study required the respondents to reply to a series of statements to determine how technological innovation relates to knowledge management and the competitive advantage of telecommunication firms. The findings are in Table 4.7.

Table 4.7 Technological Innovation

Descriptive Statistics					
	N	Min	Max	Mean	Std. Dev.
(i) The company has introduced modern technology to automate the delivery of its services	306	4	5	4.80	0.40
(ii) The company has adopted a cost-effective process of operations.	306	4	5	4.82	0.38
(iii) The company has introduced modern technologies that can make bulky transactions a day.	306	4	5	4.89	0.31
(iv) There is a continuous modification of products and services to maximise customer satisfaction and loyalty.	306	4	5	4.81	0.40
(v) The products and services offered by the company are highly differentiated.	306	4	5	4.85	0.36

The employees agreed (M=4.80) that "the company has introduced modern technology to automate the delivery of its services". They also agreed (M=4.82) that "the company has adopted a cost-effective process of operations" and that "the company has introduced the modern technologies that can make bulky transactions a day" (M=4.89). Furthermore, they agreed (M=4.81) that "there is a continuous modification of products and services to maximise customer satisfaction and loyalty" and; that "the products and services offered by the company are highly differentiated" (M=4.85).

The research observed that the connection between knowledge management (the processes of acquiring, sharing, storing, and using knowledge) and cost-related competitive advantage in telecommunication companies is influenced by technological innovation. Based on the research findings, the competitive advantage of telecommunication businesses is contingent upon their willingness to use new knowledge management methods and effectively execute this strategic approach. Moreover, the results indicate a positive correlation between knowledge management practises, specifically information sharing, knowledge application, and storage, and technological innovation, encompassing both product and process innovation. This research suggests that when telecommunication companies comprehend the importance of knowledge management dimensions, there is a strong likelihood that the company will effectively leverage the full value of technological innovation. The results of this study align with the findings of Valmohammadi, Sofiyabadi, and Kolahi (2019), who demonstrated that innovation practises serve as a positive mediator in the association between knowledge management practises and sustainable, balanced performance.

4.6.6 Competitive Advantage

The respondents were asked to indicate how other factors relate to competitive advantage. The findings obtained are presented in Table 4.8.

Table 4.8 Competitive Advantage

	Descriptive Statistics					
		N	Min	Max	Mean	Std. Dev.
(i)	The prices of the products and services in the company have been lower than those of the competitors.	306	1.00	5.00	2.44	1.19
(ii)	The goods and services in the company have been differentiated from those of the competitors.	306	4.00	5.00	4.82	0.38
(iii)	The organisation focuses its energies on a specific market niche	306	4.00	5.00	4.89	0.31
(iv)	The organisation continuously seeks to reduce prices without sacrificing it is quality product essential features	306	4.00	5.00	4.81	0.40
(v)	The quality of products and services offered is better than those offered by competitors.	306	4.00	5.00	4.85	0.36

Table 4.8 shows that the employees disagreed (M=2.44) that "the prices of the products and services in the company have been lower than those of the competitors". They, however, agreed (M=4.82) that "the goods and services in the company have been differentiated from those of the competitors". They also agreed (M=4.89) that "the organisation focuses its energies on a specific market niche"; and that "the organisation continuously seeks to reduce prices without sacrificing it is quality product essential features" (M=4.81). Furthermore, they agreed that "the quality of products and services offered is better than those offered by competitors" (M=4.85). These findings show that the organisations were well positioned to be competitive in the industry. The combined influence of these factors contributed to their success. The research findings indicate that the capacity to generate, retain, distribute, and leverage information and expertise has emerged as a key strategy for telecommunications companies to gain a competitive edge, which is consistent with the findings of the study conducted by Abusweilem and

Abualoush (2019). The acquisition and integration of specialised information from many sources plays a crucial role in overcoming the technical and operational uncertainties that hinder the achievement of success. While the majority of corporate executives acknowledge the strategic significance of knowledge and the need to effectively manage their knowledge assets, the study also uncovered that numerous executives encounter difficulties in observing concrete outcomes from their endeavours. The aforementioned challenge arises from multiple sources, one of which is the persistent impression of knowledge management (KM) as a predicament originating from the supply-side. Additionally, there is a steadfast belief that by obtaining the appropriate information, the ensuing advantages will inevitably ensue.

Several other issues might contribute to the failure of realising advantages. These include a deficiency in prioritising knowledge management (KM) projects, an excessive dependence on technology to achieve both the benefit and the solution, inadequate organisational frameworks for optimising knowledge assets, and a dearth of effective ownership. However, the results of the study provided strong evidence to suggest that telecommunication companies possess a competitive edge in the market as a result of their ability to differentiate their products and establish niche markets, among other factors. This assertion is supported by McIvor's (2009) research, which highlights the presence of both tangible and intangible resources within organisations that should be fully utilised.

4.7 Correlation Analysis

The Pearson's Correlation Coefficient, *r*, was used to establish the degree of relationships between competitive advantage and predictor variables in the study. Correlation coefficients (in absolute value) which are ≤ 0.35 are generally considered to represent low or weak correlations, 0.36 to 0.67 moderate correlations, and 0.68 to

1.0 strong or high correlations with r coefficients > 0.90 very high correlations (Field, 2005). The findings are presented in Table 4.9.

Table 4.9: Correlations between competitive advantage and independent variables

Variable (n = 306)		CA	KC	KT	KS	KI	TI
CA	r	1					
KC	r	0.757**	1				
KT	r	0.704**	0.652**	1			
KS	r	0.717**	0.745**	0.511**	1		
KI	r	0.763**	0.767**	0.742**	0.651**	1	
TI	r	0.771**	0.685**	0.674**	0.640**	0.634**	1

r = Pearson correlation coefficient; CA=competitive advantage; KC=knowledge creation; KT=knowledge transfer; KS=knowledge storage; KI=knowledge implementation; TI=technological innovation. ** = correlation significant at .01 levels (2-tailed)

The study found significant, positive and strong correlation between competitive advantage and knowledge creation (r=0.757, p<0.0001), knowledge transfer (r=0.704, p<0.0001), knowledge storage (r=0.717, p<0.0001), knowledge implementation (r=0.763, p<0.0001), and technological innovation (r=0.757, p<0.0001). This showed that when knowledge creation, knowledge transfer, knowledge storage, knowledge implementation and technological innovation increases competitive advantage also goes up and vice versa. Thus, knowledge management and technological innovation were found to be positively correlated with competitive advantage of telecommunications firms.

Correlations amongst the independent variables were found to be either moderate or strong (the highest was 0.767) but not very strong (none was higher than 0.800), which implied that multicollinearity in the data might not have been a problem, that is, each dependent variable likely measured its own construct independently. The observation of significant positive correlations amongst predictor variables could be explained by the fact that they all measured different aspects of the same concept – knowledge

management – and hence, were expected to be related rather than to be unconnected, discontinuous elements (Ofori et al., 2015). For example, the way knowledge is created is strongly related to how it is stored, transferred and implemented (Wijaya & Suasih, 2020).

4.8 Diagnostic Tests

The study examined the conformity of the dataset with the underlying assumption of regression analysis. The study encompassed a comprehensive analysis, including tests for normality, autocorrelation, multicollinearity, and heteroscedasticity. Linearity was tested before conducting the regression model. On the other hand, other tests, for instance, homoscedasticity, autocorrelation, and normality involved *post-hoc* analyses of residuals/errors.

4.8.1 Normality Test

Normality of the data was assessed by examining the values of skewness and kurtosis. Table 4.10 presents the normality test results.

Table 4.10 Skewness and Kurtosis of study variables

Variable	Skew	SE of skew	Kurtosis	SE of kurtosis
Knowledge creation	-0.984	0.139	-0.402	0.278
Knowledge transfer	-0.973	0.139	-0.487	0.278
Knowledge storage	-0.837	0.139	-0.856	0.278
Knowledge implementation	-1.157	0.139	0.265	0.278
Technological innovation Competitive advantage	-0.897	0.139	-0.816	0.278
	-0.868	0.139	-1.041	0.278

The skewness for all the variables were negative, indicating a skew to the left, that is, most respondents answered 'agreed' or 'strongly agreed' on the test items. Kurtosis for all the variables except for knowledge implementation were negative, indicating slight

platykurtosis, that is, fewer items at the mean and at tails but more in intermediate regions. Nonetheless, the highest values for skewness and kurtosis were -1.157 (knowledge implementation) and -1.041 (competitive advantage), which were within the $\pm$ 2.0 bounds (Norusis, 2010). This suggested that the data did not radically depart from normality.

The study also analysed the plots of residuals versus fitted values to determine the normality of the residuals. These results are presented in Section 4.8.4 together with results for tests for heteroscedasticity.

4.8.2 Test for Linearity

The research conducted the linearity test in IBM SPSS (Version 27) to examine whether there was a linear association between the variables and also inspected scatterplots of the dependent and independent variables. Table 4.11 presents results from the linearity tests.

Table 4.11 Linearity Test

ANOVA Table			Sum of Squares	df	Mean Square	F	Sig.
Competitive advantage * Knowledge Storage	Between Groups	(Combined)	7.839	5	1.568	23.252	0.009
		Linearity	6.033	1	6.033	89.488	0.000
		Dev. from Linearity	1.805	4	0.451	6.693	0.642
	Within Groups		20.226	300	0.067		
	Total		**28.065**	**305**			
Competitive advantage * Knowledge Implementation	Between Groups	(Combined)	10.284	3	3.428	58.225	0.006
		Linearity	9.422	1	9.422	160.028	0.000
		Dev. from Linearity	0.862	2	0.431	7.323	0.121
	Within Groups		17.781	302	0.059		
	Total		**28.065**	**305**			
Competitive advantage * Technological Innovation	Between Groups	(Combined)	10.529	7	1.504	25.561	0.001
		Linearity	7.511	1	7.511	127.638	0.000
		Dev. from Linearity	3.018	6	0.503	8.548	0.397
	Within Groups		17.536	298	0.059		
	Total		**28.065**	**305**			
Competitive advantage * Knowledge Transfer	Between Groups	(Combined)	8.314	5	1.663	25.257	0.007
		Linearity	4.461	1	4.461	67.76	0.000
		Dev. from Linearity	3.853	4	0.963	14.632	0.335
	Within Groups		19.751	300	0.066		
	Total		**28.065**	**305**			
Competitive advantage * Knowledge Creation	Between Groups	(Combined)	9.652	5	1.93	31.452	0.012
		Linearity	7.704	1	7.704	125.523	0.000
		Dev. from Linearity	1.948	4	0.487	7.934	0.212
	Within Groups		18.413	300	0.061		
	Total		**28.065**	**305**			

Key: Dev.=Deviation

The linearity test for all the variables had significance values smaller than 0.05 (Knowledge Creation, $p<0.0001$; Knowledge Transfer, $p<0.0001$; Knowledge Storage, $p<0.0001$; Knowledge Implementation, $p<0.0001$; Technological Innovation, $p<0.0001$), indicating a linear relationship between each predictor variable and competitive advantage. On the other hand, tests for deviation from linearity had significance values greater than 0.05 for all the variables (Knowledge Creation, $p=0.212$; Knowledge Transfer, $p=0.335$; Knowledge Storage, $p=0.642$; Knowledge

Implementation, *p*=0.121; Technological Innovation, *p*=0.397), which showed that there was no nonlinear relationship between the predictors and competitive advantage in addition to the linear component. Consequently, the data most likely came from a population in which linear relationships between comparative advantage and the predictors existed.

To observe the nature of the linear relationships, scatterplots predicting comparative advantage from the independent variables were plotted. Figure 4.5 presents a scatterplot predicting comparative advantage from knowledge creation and a lowess smoother.
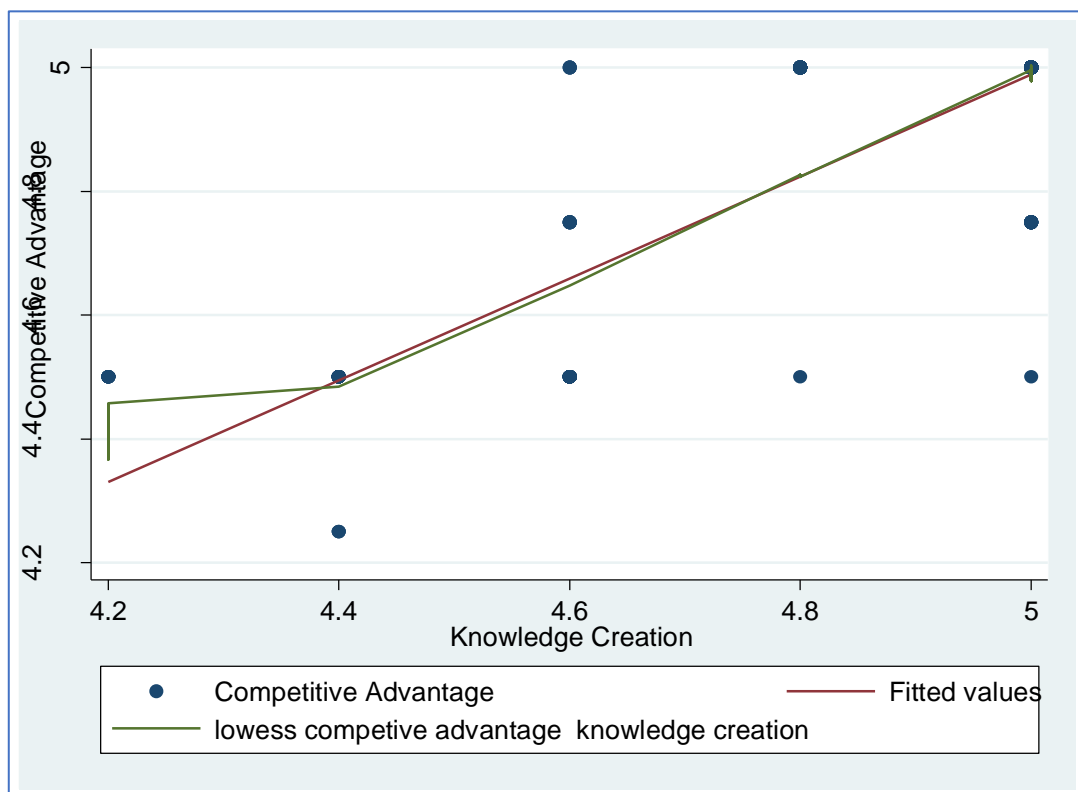
Figure 4.5 Scatterplot of competitive advantage and knowledge creation

Although the curve for the loess values had a slight kink at the lower values of knowledge creation, the curve and the one for fitted values were relatively straight, suggesting linearity in the data.

The scatterplot predicting competitive advantage from knowledge storage and a lowess smoother is shown in the Figure 4.6.
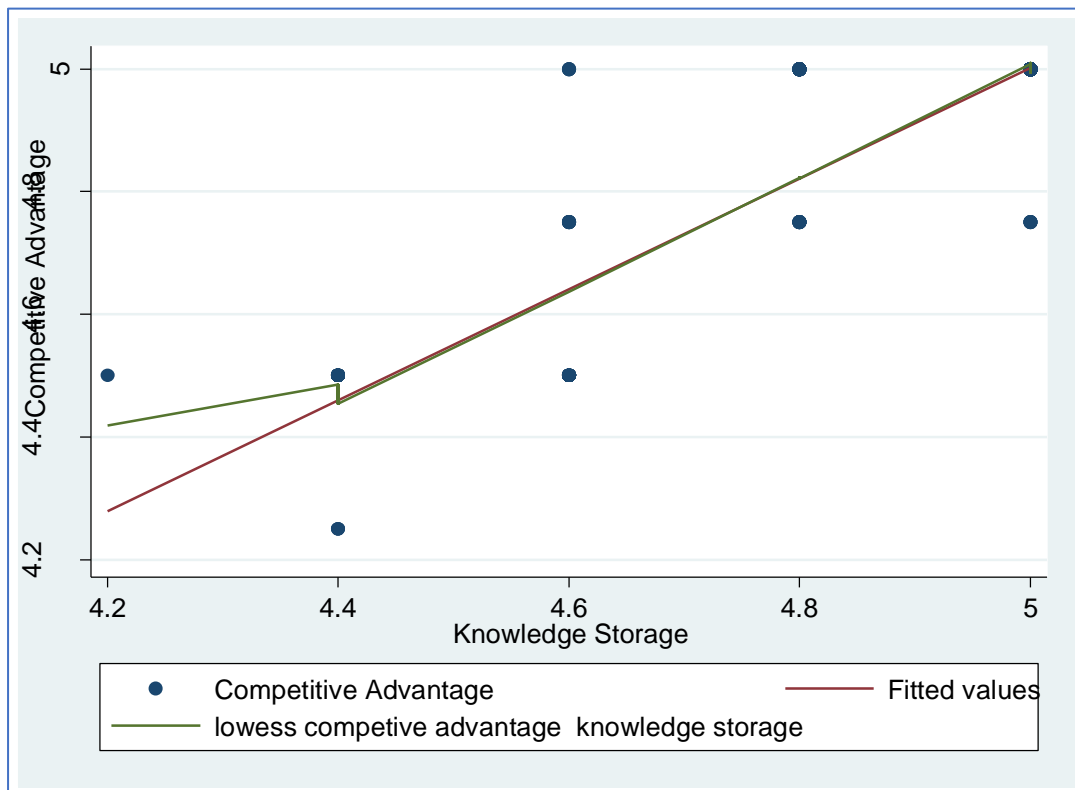
Figure 4.6 Scatterplot of competitive advantage and knowledge creation

There was a slight kink at the lower values of knowledge storage and comparative advantage. However, for the most part, the lowess and fitted values curves were straight, showing a linear relationship between competitive advantage and knowledge storage.

The scatterplot predicting competitive advantage from knowledge transfer and a lowess smoother is shown in the Figure 4.7.
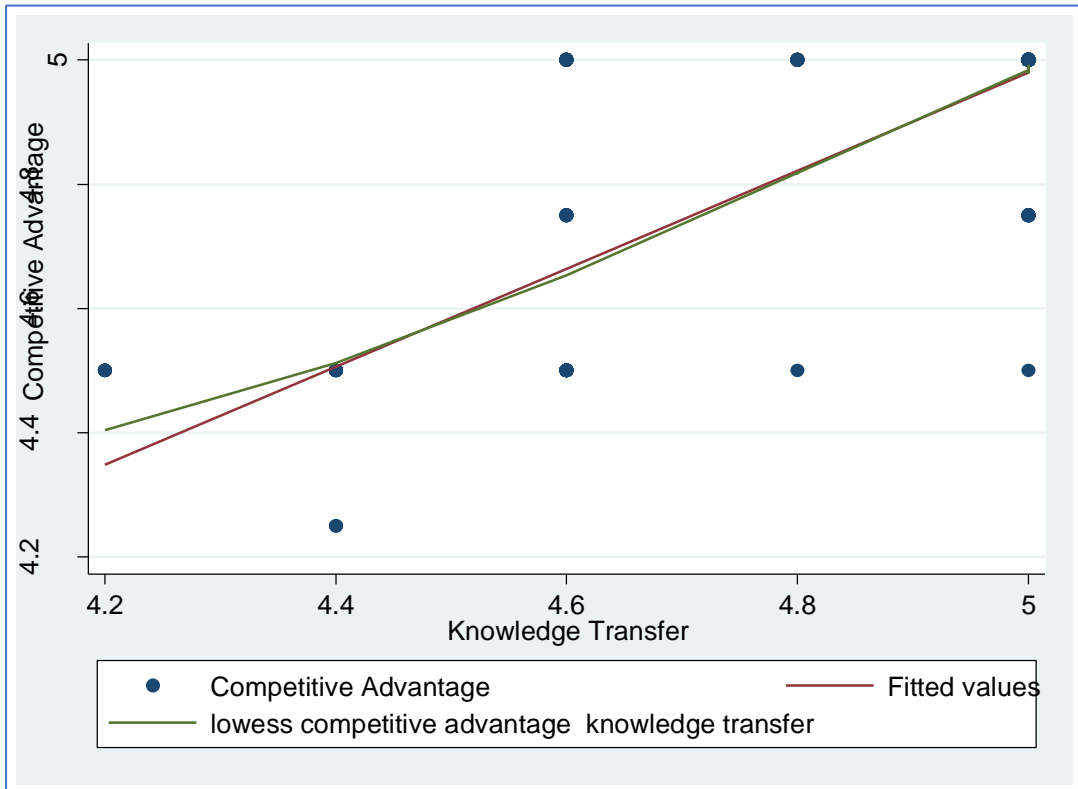
Figure 4.7 Scatterplot of competitive advantage and knowledge transfer

Both the fitted values and the loess curve generally exhibited a linear relationship, suggesting linearity in the data.

The scatterplot predicting competitive advantage from knowledge implementation and a lowess smoother is shown in the Figure 4.8.
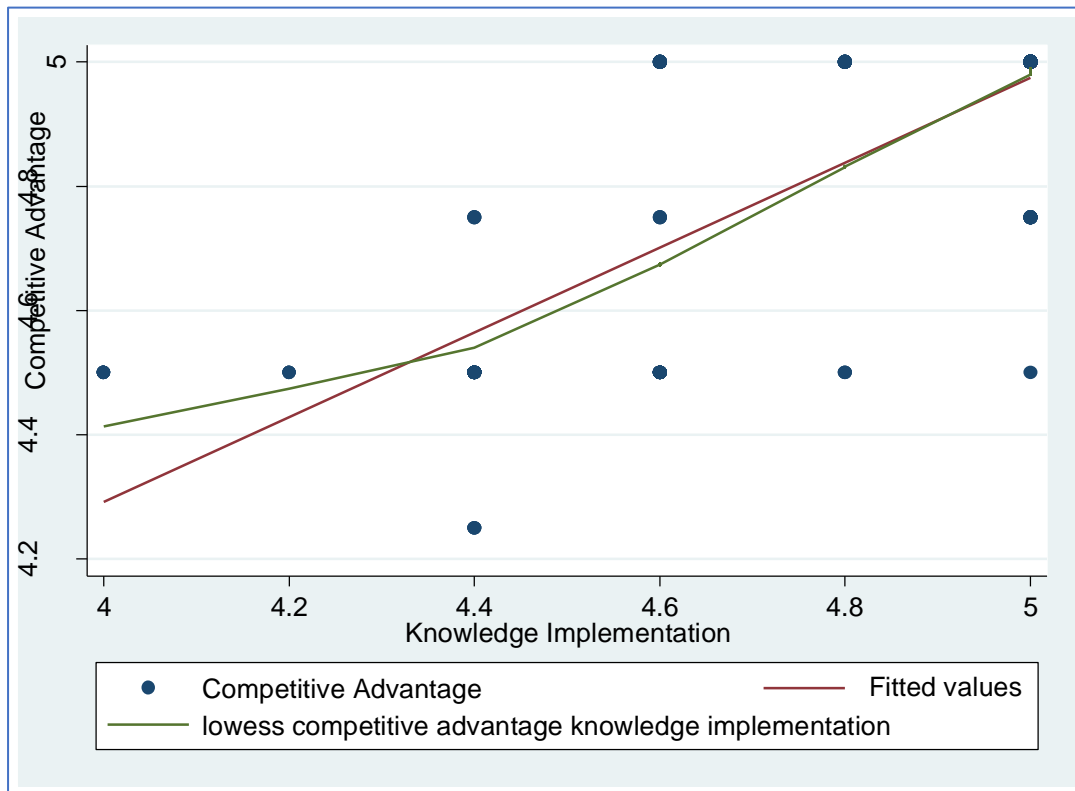
Figure 4.8 Scatterplot of competitive advantage and knowledge implementation

The curves of predicted values and loess values were relatively straight, suggesting linearity in the data.

The scatterplot predicting competitive advantage from technological innovation and a lowess smoother is shown in the Figure 4.9.
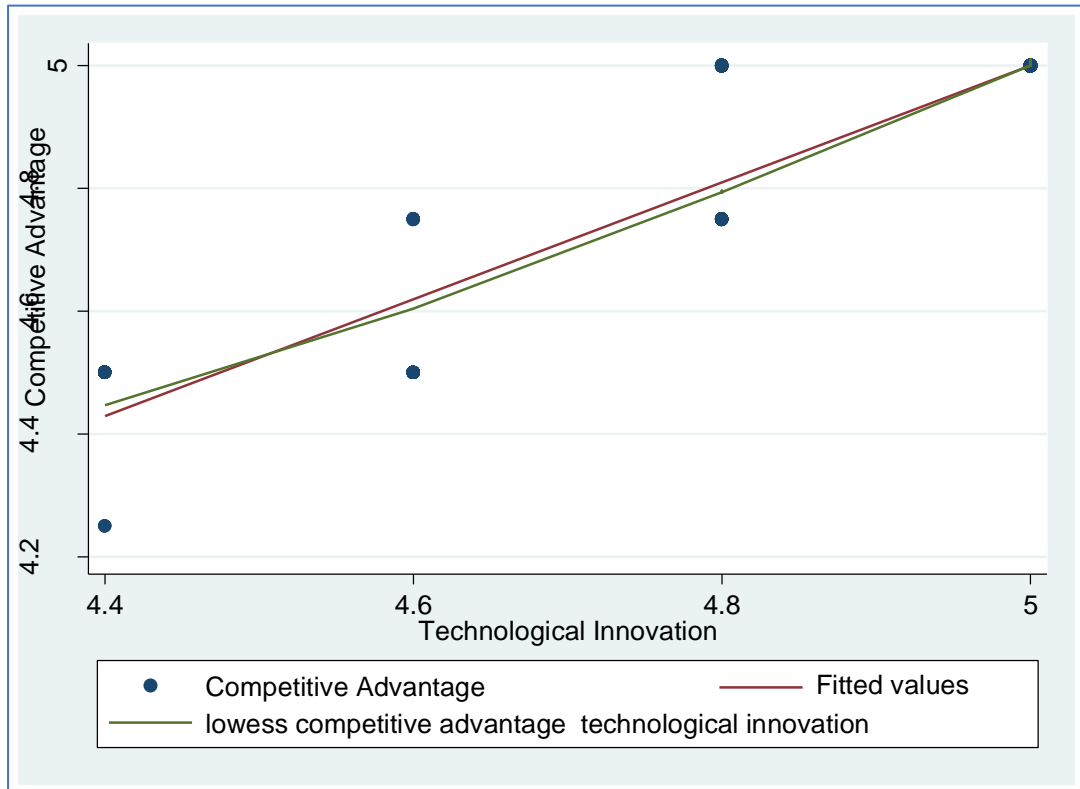
Figure 4.9 Scatterplot of competitive advantage and technological innovation

Both the fitted values and the loess curves were exhibited a clear linear relationship, suggesting linearity in the data.

4.8.3 Heteroscedasticity Test

Figure 4.10 shows a plot of the residuals versus fitted (predicted) values.
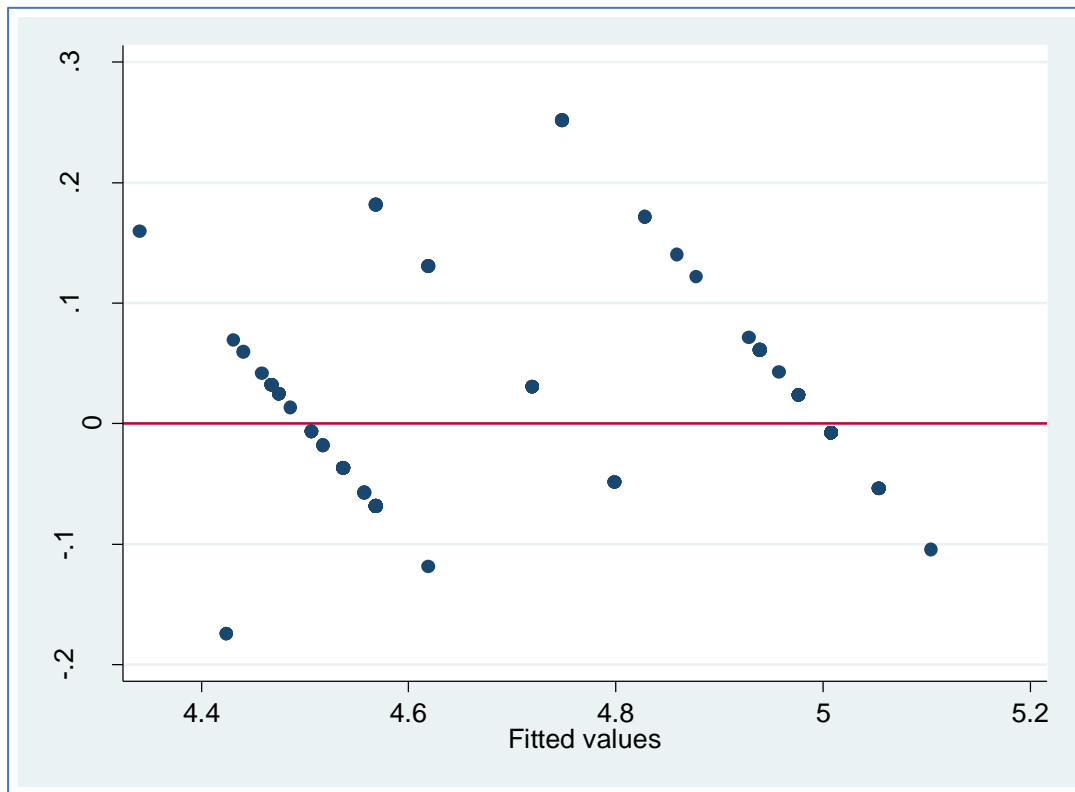
Figure 4.10 Plot of residuals versus fitted values for independent variables

The residuals for the MLR were randomly scattered around the centre line of zero, with no discernible pattern. This suggested that the residuals or errors had a constant variance (homoscedasticity), were approximately normally distributed, and independent of another (non-autocorrelated). Consequently, the assumptions of homoscedasticity, approximate normal distribution of residuals and their non-correlation were satisfied.

4.8.4 Multicollinearity Test

Multicollinearity test was examined to determine if the independent variable in the study were strongly correlated. In this study, VIF values above ten were taken to

indicate the presence of multicollinearity. Table 4.12 presents Variance inflation factor (VIF) and tolerance (1/VIF) values from the multiple linear regression model.

Table 4.12 Collinearity statistics from MLR

Variable	VIF	1/VIF
Knowledge creation	3.53	0.283
Knowledge storage	2.52	0.397
Knowledge transfer	2.70	0.371
Knowledge implementation	3.35	0.299
Technological innovation	2.45	0.408
Mean VIF	2.91	

Key: VIF=variance inflation   factor.

Tolerance values for all the predictor variables in the study were greater than 0.1 (ranging from 0.283 for knowledge creation to 0.408 for technological innovation), indicating that multicollinearity might not have been a problem. No variable had a VIF greater than 10 (the highest was 3.53 for knowledge creation), with the mean VIF value of 2.91. Consequently, the results suggest that no variable was a linear combination of other predictor variables.

Tolerance merely expresses VIF in a mathematically different way, as it is its inverse. For instance, tolerance for knowledge creation is $1/3.53 = 0.283$.

In addition, correlations amongst the independents (Table 4.10) were positive but moderate or strong (minimum = 0.511, maximum 0.4767) but not very strong, which indicated that multicollinearity was unlikely to be a problem.

4.8.5 Autocorrelation

The Durbin-Watson statistic shows whether the assumption of independent errors is tenable. In this model, it was 1.964, meaning that the errors were independent.

4.9 Regression Analyses

This section presents the various regression analyses that were used to test the study's null hypotheses.

4.9.1 Regression Analysis for Null Hypotheses One to Four

Multiple linear regression (MLR) was employed to help determine which of the four knowledge management variables [Competitive Advantage (Y), and various independent variables, including Knowledge Creation (X1), Knowledge Transfer (X2), Knowledge Storage (X3), and Knowledge Implementation (X4)] could be used to predict the firm's competitive advantage. The results for the MLR of competitive advantage and knowledge management (Model 3.1 in Chapter 3) are displayed in Table 4.13.

Table 4.13: Results of MLR for competitive advantage and knowledge management

Predictor variables (*n*=306)	Model 3.1				
	B	*SE*	*β*	*t*	*p*
(Constant)	0.889	0.147		6.055	*p*<0.0001
Knowledge creation	0.174	0.050	0.196	3.453	0.001
Knowledge transfer	0.212	0.039	0.253	5.382	*p*<0.0001
Knowledge storage	0.246	0.041	0.286	6.071	*p*<0.0001
Knowledge implementation	0.193	0.046	0.239	4.242	*p*<0.0001
R	0.845				
*R*²	0.714				
Adjusted R2	0.710				
*R*² **Change**	0.714				
F **Change**	187.857				
p	*p*<0.0001				

Key: *B*= b coefficient (unstandardized), *β* = Beta (standardized coefficient)

The raw correlation between competitive advantage and knowledge management variables was 0.845. R square measures how much variability in the dependent variable the predictors account for. In the model, the R^2 was 0.714, which means that knowledge creation, knowledge transfer, knowledge storage, and knowledge implementation could explain about 71% of the variation in competitive advantage of telecommunications firms. Since R^2 values above 40% are considered high (Field, 2009), this model could therefore explain considerable variation in the dependent variable. Consequently, knowledge management could predict, most of the times, competitive advantage. The remaining unexplained variation in competitive advantage could partly be attributed to other factors not specified in the model and partly to the error term in the regression equation.

Adjusted R Square provides information on how well a model can be generalized in the population. If the model had been derived from the population rather than the sample, then it would have accounted for approximately 71% of the variance in the dependent variable, which is just about 0.4% less than what the model explains.

The change statistics show the effect of adding or removing independent variables from the regression model. Since all the four independent variables were at once, the R square change (0.714) was equal to R square. The effect of entry of these variables was significant, F (4, 301) = 187.857, $p<0.0001$, suggesting that the four variables were significant predictors of competitive advantage.

The partial regression coefficient (B coefficient) indicates the individual contribution of a predictor to a model. The partial coefficient for a variable shows how much the value of the dependent variable changes when the value of that independent variable increases by one, when other independent variables are held constant. A positive coefficient means that the predicted value of the dependent variable increases when the

value of the independent variable increases. In the model, the partial regression coefficients for knowledge creation (b=0.174, t=3.453, p=0.001), knowledge transfer (b=0.212, t=5.382, p<0.0001), knowledge storage (b=0.246, t=6.071, p<0.0001), and knowledge implementation (b=0.193, t=4.242, p<0.0001) were all statistically significant. Thus, knowledge management is a significant predictor of competitive advantage.

The coefficients for all the knowledge management variables were positive, which showed that when each of them increases, competitive advantage also goes up and vice versa. For example, the coefficient for knowledge creation was 0.174, which means that when knowledge creation increases by one unit, a firm's competitive advantage goes up by 0.174 or by 3.02% (coefficient of determination = r^2 = 0.174^2), *ceteris paribus*. Likewise, the coefficient of 0.212 for knowledge transfer implied that when knowledge transfer increases by one unit, a firm's competitive advantage improves by 4.49%, *ceteris paribus*.

The predicted regression equation may then be written as:

Predicted Y = 0.889 + .174*Knowledge creation + 0.212*Knowledge transfer + .246*Knowledge storage + .193*Knowledge implementation + εY

The standard partial regression coefficients, also known as *b*-primes, beta coefficients, or beta weights are all measured in standard deviation units and are therefore not dependent on the units of measurement of the variables. The advantage of the standard partial regression coefficients then is that their magnitudes can be compared directly to show the relative standardized strengths of the effects of several independent variables on the same dependent variable.

The standardized coefficients were knowledge creation (β=0.196), knowledge transfer (β= 0.253), knowledge storage (β=0.286), and knowledge implementation (β= 0.239). Since, the beta coefficient for knowledge storage (β=0.286), is the greatest in magnitude, it was found to have the greatest effect on competitive advantage, followed by knowledge transfer (β= 0.253), knowledge implementation (β= 0.239), and lastly, knowledge creation (β=0.196). The results show that generation of knowledge per se, though crucial, is not the most important. Far more important are the storage, transfer, and implementation (in that order) of that knowledge.

A standardized partial regression coefficient gives the rate of change in standard deviation units of Y per one standard deviation unit of X (when all other X variables are kept constant). For example, for an increase of one standard deviation in knowledge creation, there will be an increase in competitive advantage by roughly 0.196 of its standard deviation, when other independents are kept constant.

4.9.2 Tests of the Research hypotheses One to Four

The research hypotheses one to four of the study were tested using t-tests provided in Table 4.13 above.

Ho$_1$: There is no statistically significant effect of knowledge creation on the competitive advantage of telecommunication firms in Kenya.

The B coefficient for knowledge creation in Table 4.13 was 0.174 and it was statistically significant at $p<.05$ (t= 3.453, p=0.001).   It was therefore highly unlikely that the population B coefficient for this variable was zero. Thus, the null hypothesis that there is no statistically significant effect of knowledge creation on the competitive advantage of telecommunication firms in Kenya was rejected.

Ho2: There is no statistically significant effect of knowledge transfer on the competitive advantage of telecommunication firms in Kenya

The *B* coefficient for knowledge transfer in Table 4.13 above was 0.212, and it was found to be statistically significant at $p<.05$ (t= 5.382, $p < 0.0001$). The population *B* coefficient for knowledge transfer was, therefore, highly unlikely to be zero. Thus, a change in knowledge transfer likely influences competitive advantage. Thus, the null hypothesis that there is no statistically significant effect of knowledge transfer on the competitive advantage of telecommunication firms in Kenya was rejected.

Ho3: There is no statistically significant effect of knowledge storage on the competitive advantage of telecommunication firms in Kenya

The *B* coefficient for knowledge storage in Table 4.13 was 0.246, and it was found to be statistically significant at $p<.05$ (*t*= 6.071, $p <0.0001$). Thus, it was highly unlikely that the population coefficient for knowledge storage was zero. Hence, the null hypothesis that there is no statistically significant effect of knowledge storage on the competitive advantage of telecommunication firms in Kenya was rejected.

Ho4: There is no statistically significant effect of knowledge implementation on the competitive advantage of telecommunication firms in Kenya

The *B* coefficient for knowledge implementation in Table 4.13 was 0.193 and it was statistically significant at $p<.05$ (*t*= 4.242, $p<0.0001$). The population *B* coefficient for knowledge implementation was, therefore, highly unlikely to be zero. Thus, the null hypotheses that there is no statistically significant effect of knowledge implementation on the competitive advantage of telecommunication firms in Kenya was rejected.

4.9.3 Results for the Mediating effect of Technological Innovation

Table 4.14 presents the results for models 3.2 and 3.3 (in Chapter 3) for determining the mediating effect of technological innovation on the relationship between knowledge management and competitive advantage of telecommunications firms in Kenya.

Table 4.14 Model Coefficients for the Mediation Analysis of Technological Innovation on the Relationship between Competitive Advantage and Knowledge Management

	Consequent									
	Technological Innovation (Model 3.2)					Competitive Advantage (Model 3.3)				
Antecedent **(n=306)**	*B*	*SE*	*β*	*t*	*p*	*B*	*SE*	*β*	*t*	*p*
(Constant)	0.699	0.197		3.539	0.0005	0.689	0.139		4.973	p<0.0001
KC	0.242	0.067	0.243	3.575	0.0004	0.104	0.047	0.118	2.199	0.028
KT	0.371	0.053	0.393	7.006	p<0.000	0.106	0.039	0.126	2.693	0.007
KS	0.263	0.054	0.272	4.833	1	0.171	0.039	0.198	4.387	p<0.0001
KI	-	0.061	-0.021	-	p<0.000	0.199	0.042	0.246	4.716	p<0.0001
TI	0.019	-	-	0.308	1	0.286	0.039	0.322	7.222	p<0.0001
	-			-	0.758					
					-					
R	0.769					0.869				
R²	0.592					0.756				
F Change	109.150					186.268				
p	p<0.0001					p<0.0001				

Key: CA=competitive advantage; KC=knowledge creation; KT=knowledge transfer; KS=knowledge storage; KI=knowledge implementation; TI=technological innovation.

In model 3.2, the partial regression coefficients for knowledge creation (b=0.242, t=3.575, p=0.0004), knowledge transfer (b=0.371, t=7.006, p<0.0001), and knowledge storage (b=0.263, t=4.833, p<0.0001) were all statistically significant and positive. This showed that an increase in knowledge creation by one unit results in an improvement in technological innovation by 0.242, *ceteris paribus*. Similarly, when knowledge transfer and storage go up by one unit, technological innovation increases

by 0.371 and 0.263, respectively, *ceteris paribus*. On the other hand, knowledge implementation was not found to have a significant effect on technological innovation ($b = -0.019$, $t = -0.308$, $p = 0.758$).

The predicted regression equation could then be written as:

Predicted M = 0.699 + .242*Knowledge creation + 0.371*Knowledge transfer + .263*Knowledge storage - .019*Knowledge implementation + εM

The R square for Model 3.2 was 0.59, which showed that knowledge management could account for a considerable 59% of the variation in technological innovation. The results suggested that knowledge management is a very pertinent antecedent in technological innovation by a firm.

In Model 3.3, the coefficients for all the five independent variables were positive and statistically significant at $p < .05$: knowledge creation ($b = 0.104$, $t = 2.199$, $p = 0.028$, knowledge transfer ($b = 0.106$, $t = 2.693$, $p = 0.007$), knowledge storage ($b = 0.171$, $t = 4.387$, $p < 0.0001$), knowledge implementation ($b = 0.199$, $t = 4.716$, $p < 0.0001$), and technological innovation ($b = 0.286$, $t = 7.222$, $p < 0.0001$). This suggested that the five independent variables were significant predictors of competitive advantage. For instance, the coefficient for knowledge creation was 0.104, which means that when knowledge creation increases by one unit, competitive advantage goes up by 0.104, *ceteris paribus*. Likewise, a unit increase in knowledge implementation causes a 4% increase in competitive advantage.

The predicted regression equation could then be written as:

Predicted Y = 0.689 + .104*Knowledge creation + 0.106*Knowledge transfer + .171*Knowledge storage + .199*Knowledge implementation +.286*Technological innovation + εY

In terms of relative importance, the standardized β coefficients showed that technological innovation had the greatest effect on competitive advantage (β=0.286), followed by knowledge implementation (β= 0.246), knowledge storage (β=0.171), knowledge transfer (β= 0.126), and lastly, knowledge creation (β=0.118).

In model 3.3, the R^2 was 0.756, which was greater than Model 3.1 (0.714). This showed that variation in competitive advantage could be better accounted for when both knowledge management and technological innovation were included in the model than when the former was alone in the model. The results suggests that the specification of the model was reasonable. The remaining unexplained variation in competitive advantage could partly be attributed to other factors not specified in the model and partly to the error term in the regression equation.

Table 4.15 summarizes explicitly the total, direct, and indirect effects in the mediation analysis.

Table 4.15 Total, direct and indirect effects in mediation analysis

	Total effect			Direct effect			Indirect Effects		
	Effect	*SE*	Boot LLCI - ULCI	Effect	*SE*	Boot LLCI - ULCI	Effect	*SE*	Boot LLCI - ULCI
KC	0.174	0.050	0.075 – 0.273	0.104	0.047	0.011 – 0.198	0.069	0.052	0.018 – 0.190
KT	0.212	0.039	0.134 – 0.289	0.106	0.039	0.029 – 0.183	0.106	0.045	0.039 – 0.216
KS	0.246	0.0411	0.166 – 0.326	0.171	0.039	0.094 – 0.247	0.075	0.042	0.009 – 0.172
KI	0.193	0.046	0.104 – 0.283	0.199	0.042	0.116 – 0.282	-0.005	0.035	-0.059 – 0.081

Key: SE=standard error; LLCI=Lower limit of confidence interval; ULCI=Upper limit of confidence interval

The indirect effect of knowledge creation was 0.069, which means that when knowledge creation increases by one unit, a firm's competitive advantage goes up by 0.069 units, as a result of improvement in technological innovation. This indirect effect was statistically different from zero, as revealed by a 95% bootstrap confidence interval

that was entirely above zero (0.018 to 0.190) in the PROCESS output. The results also showed that when technological innovation is kept constant, a unit increase in knowledge creation causes competitive advantage to go up by 0.104. This direct effect was statistically different from zero, with a 95% confidence interval from 0.011 to 0.198, which did not include a value of zero.

The study also found that when knowledge transfer increases by one unit, a firm's competitive advantage increases by 0.106 units as a result of technological innovation. This indirect effect was statistically different from zero, as shown by a 95% bootstrap confidence interval that did not include a value of zero (0.039 to 0.216). On the other hand, when technological innovation remains constant, a unit increase in knowledge transfer causes competitive advantage to improve by 0.106 and this direct effect was also statistically different from zero, as the 95% confidence interval (0.029 to 0.183) did not include a value of zero.

The mediation analysis also showed that knowledge storage indirectly influences a firm's competitive advantage through its effect on technological innovation. Findings showed that when knowledge storage goes up by one unit, a firm's competitive advantage increases by 0.075 units as a result of technological innovation. This indirect effect was statistically different from zero, as shown by a 95% bootstrap confidence interval that did not include a value of zero (0.009 to 0.172). On the other hand, when technological innovation remains constant, a unit increase in knowledge storage causes competitive advantage to increase by 0.171 and this direct effect was also statistically different from zero, as the 95% confidence interval (0.094 to 0.247) did not include a value of zero.

For all the above three significant indirect effects, the direct effects are also significant. This suggested that the mediation by technological innovation on the relationship between knowledge management and competitive advantage was partial.

On the other hand, knowledge implementation was found to have no significant indirect effect on competitive advantage, with the 95% confidence interval spanning a value of zero (-0.059 to 0.081). Nonetheless, when knowledge implementation increases by one unit, a firm's competitive advantage goes up by 0.199 units, when technological innovation is kept constant. The direct effect was statistically different from zero, as the 95% confidence interval (0.116 to 0.282) did not include a value of zero.

Findings showed that knowledge creation, transfer, and storage were found to have significant and positive indirect effects on a firm's competitive advantage. Thus, the null hypothesis that technological innovation does not mediate the relationship between knowledge management and the competitive advantage of telecommunication firms in Kenya was rejected.

Based on the analysis of the regression output and significance levels, all the null hypotheses (Ho1 to Ho5) are rejected because the coefficients associated with the independent variables and the mediating variable are statistically significant at the 0.05 significance level. This indicates that these variables have statistically significant effects on Competitive Advantage, and Technological Innovation mediates the relationship between knowledge management and Competitive Advantage in telecommunication firms in Kenya.

Knowledge creation was found to significantly and positively predict a firm's competitive advantage ($b=0.174$, $t=3.453$, $p=0.001$), with the model predicting that an increase in knowledge creation by a unit result in a firm's competitive advantage to

increase by 3.02%. This finding was in concert with a corpus of studies by Mwangi (2021), Jyoti et al. (2015) Mehralian et al. (2018), Kelechi et al. (2020), Yen et al. (2021), Wijaya and Suasih (2020), Asaolu (2018), and Kiseli and Senaji (2016). For instance, Mwangi (2021) found that the integration of knowledge creation practices was associated with roughly 32.2% of the observed competitive advantage in communications firms. Jyoti et al. (2015) presented evidence suggesting that the implementation of knowledge management practices, such as knowledge production, storage, and transfer procedures, has a positive impact on achieving competitive advantage. Mehralian et al. (2018) found a strong and statistically significant relationship between the process of acquiring knowledge and the achievement of organisational prosperity.

According to the knowledge-based view theory, acquisition of potential resources may not provide favourable outcomes unless it establishes a strong knowledge base. The establishment of a solid knowledge base is essential in attaining enduring distinctiveness within the market, leading to a lasting competitive edge (Blome, Schoenherr & Eckstein, 2014). To create resources in the firm that are truly inimitable, knowledge creation is requisite. Knowledge creation is the cradle for reproducing entities that have the distinctive characteristic of being difficult to reproduce, as they encompass individuals' talents (Gassmann & Keupp, 2007). Since the possession of unique and inimitable resources is a source of comparative advantage to a firm, knowledge creation, as a progenitor of these resources is a necessary antecedent of comparative advantage. This could explain why this study found that knowledge creation significantly and positively affects a firm's comparative advantage.

Knowledge creation (and other aspects of knowledge management) could be a crucial tool in succeeding in the fiercely competitive telecommunications *milieu* in Kenya

(Mugo & Macharia, 2020). Safaricom Plc has come to dominate the telecommunication industry in Kenya, largely because of knowledge management. According to Muthee (2014), through knowledge management, Safaricom has developed a range of products and services, which include roaming services, data messaging, M-pesa, voice services, information and security services, video conferencing telepresence, and virtual computing.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter provides a concise overview of the research outcomes, conclusions, and suggestions. This action is carried out in accordance with the stated aim of the research. The research findings serve as the basis for a full discussion of each part.

5.2 Summary of Findings

The main objective of this study was to assess the mediating effect of Technological Innovation on the relationship between knowledge management and competitive advantage in the telecommunications industry in Kenya. The findings of the study indicate that the variables pertaining to knowledge creation, knowledge transfer, knowledge storage, and knowledge implementation are adequate in elucidating the concept of competitive advantage. The study found significant, positive and strong correlation between competitive advantage and knowledge creation (r=0.757, p<0.0001), knowledge transfer (r=0.704, p<0.0001), knowledge storage (r=0.717, p<0.0001), knowledge implementation (r=0.763, p<0.0001), and technological innovation (r=0.757, p<0.0001).

5.2.1 Knowledge Creation

Knowledge creation was found to significantly and positively predict a firm's competitive advantage (b=0.174, t=3.453, p=0.001), with the model predicting that an increase in knowledge creation by a unit result in a firm's competitive advantage to increase by 3.02%. This finding was in concert with a corpus of studies by Mwangi (2021), Jyoti et al. (2015) Mehralian et al. (2018), Kelechi et al. (2020), Yen et al. (2021), Wijaya and Suasih (2020), Asaolu (2018), and Kiseli and Senaji (2016). For

instance, Mwangi (2021) found that the integration of knowledge creation practices was associated with roughly 32.2% of the observed competitive advantage in communications firms. Jyoti et al. (2015) presented evidence suggesting that the implementation of knowledge management practices, such as knowledge production, storage, and transfer procedures, has a positive impact on achieving competitive advantage. Mehralian et al. (2018) found a strong and statistically significant relationship between the process of acquiring knowledge and the achievement of organisational prosperity.

According to the knowledge-based view theory, acquisition of potential resources may not provide favourable outcomes unless it establishes a strong knowledge base. The establishment of a solid knowledge base is essential in attaining enduring distinctiveness within the market, leading to a lasting competitive edge (Blome, Schoenherr & Eckstein, 2014). To create resources in the firm that are truly inimitable, knowledge creation is requisite. Knowledge creation is the cradle for reproducing entities that have the distinctive characteristic of being difficult to reproduce, as they encompass individuals' talents (Gassmann & Keupp, 2007). Since the possession of unique and inimitable resources is a source of comparative advantage to a firm, knowledge creation, as a progenitor of these resources is a necessary antecedent of comparative advantage. This could explain why this study found that knowledge creation significantly and positively affects a firm's comparative advantage.

Knowledge creation (and other aspects of knowledge management) could be a crucial tool in succeeding in the fiercely competitive telecommunications *milieu* in Kenya (Mugo & Macharia, 2020). Safaricom Plc has come to dominate the telecommunication industry in Kenya, largely because of knowledge management. According to Muthee (2014), through knowledge management, Safaricom has developed a range of products

and services, which include roaming services, data messaging, M-pesa, voice services, information and security services, video conferencing telepresence, and virtual computing. According to Ettlie and Pavlou (2010), the likelihood of successfully developing a new product or service is increased by effective knowledge management.

5.2.2 Knowledge Transfer

Regression analysis showed that knowledge transfer significantly and positively predicts a firm's competitive advantage (b=0.212, t=5.382, p<0.0001), with the model predicting that an increase in knowledge transfer by a unit result in a firm's competitive advantage to increase by 4.5%. This finding is congruent to findings from other studies, for instance, Meihami (2020), Osagie and Olajide (2019), Al-Nawafah et al. (2019), Ongus et al. (2016), Khuram (2016), and Cumari (2018). For example, according to a study conducted by Ofori et al. (2015) in Ghana, it was found that information sharing had a favourable impact on the competitive advantage of enterprises operating in the mobile telephony market. Osagie and Olajide (2019) in an exploration of the influence of knowledge sharing on the competitive advantage of telecommunication businesses operating within the Nigerian market found a robust and statistically significant correlation between the implementation of information sharing practices and the attainment of a competitive advantage. Similar findings were reported by Al-Nawafah et al. (2019) in a study of manufacturing companies in Jordan.

Nevertheless, this study's findings are in contrast to those by North and Kumta (2018) who found an equivocal relationship between knowledge transfer and competitive advantage.

The process of knowledge transfer has also played a significant role in enhancing the competitive advantage of communications companies. Both employees and

management are crucial in facilitating the process of knowledge transfer. The results of the study indicate that the facilitation of access to individual-generated knowledge, its amplification within social contexts, and its integration with pre-existing knowledge are the primary catalysts for knowledge creation within the telecommunications sector. The results align with Osagie and Olajide (2019)'s study, which demonstrated that the act of sharing knowledge has a beneficial impact on competitive advantage, and this effect is statistically significant. These findings highlight that telecommunication firms are serious about promoting knowledge transfer among their employees.

Creating knowledge cannot be an end to itself. For it to be useful, knowledge must flow from the creators to all other employees in the company who need it. For instance, knowledge must be transferred from the research and development department to production, marketing, administration for it to be useful. This could explain why knowledge transfer significantly and positively affected competitive advantage. As Hörisch et al. (2015) postulated, the effective implementation of a knowledge management scheme necessitates both the presence of substantial knowledge-based resources and the seamless transfer of knowledge throughout the entire operational system, hence facilitating the appropriate dissemination of acquired knowledge. Moreover, knowledge transfer could also mitigate the potential loss of critical knowledge resulting from staff attrition, by ensuring that knowledge is disseminated widely in the company (Hayter, 2016).

5.2.3 Knowledge Storage

Regression analysis showed that knowledge transfer significantly and positively predicts a firm's competitive advantage (b=0.246, t=6.071, p<0.0001), with the model predicting that an increase in knowledge storage by one unit result in a firm's competitive advantage to go up by 6%, *ceteris paribus*. This finding was in line with

those by Mwangangi (2018), Dickson (2019), Novak (2017), Riungu (2017), and Abusweilem and Abualoush (2019). `

According to Hayter (2016), the knowledge of an organisation can be stored in several repositories, such as the cognitive faculties and perspectives of individuals on the organization's everyday operations, processes, or structure, as well as in external social networks formed with other institutions or companies. Knowledge storage acts as a repository for all the knowledge acquired by a company, which can then form a well spring of ideas, innovations and creations. This could explain why knowledge storage significantly and positively influenced competitive advantage.

Standardized coefficients showed that knowledge storage had the greatest effect on competitive advantage, followed by knowledge transfer, implementation, and lastly, creation. This could be logical. Knowledge creation is germane because it generates new knowledge; nonetheless, it is not the only means for coming up with novel knowledge. New knowledge can be acquired from rivals through transfer, purchases, and even business espionage. Thus, knowledge creation is a necessary but not sufficient condition for competitive advantage. Knowledge storage on the other hand is a repository for all the extant knowledge, created by the firm or acquired by it. Consequently, stored knowledge has greater potential for generating new innovations and inventions than knowledge creation. This could account for the greater effect of knowledge storage on competitive advantage. The potency of knowledge transfer in influencing competitive advantage could result from the fact that regardless of the method of knowledge acquisition, its wide dissemination in the firm is required for it to be acted on and used.

There are various methods of knowledge storage. Key among them include structured format and classification scheme. Among the many storage strategies, the classification

scheme stands out as the most prominent (M=4.84) due to its user-friendly nature in capturing lessons learnt. The study additionally highlights that the process of knowledge storage involves the use of technical infrastructure, encompassing modern informational hardware and software, as well as human methods aimed at identifying, encoding, and indexing organisational knowledge for subsequent retrieval. According to Novak (2017), the utilisation of a knowledge repository, which encompasses various forms of information such as documents, reports, and databases, is a common practise in knowledge management. This repository plays a crucial role in influencing the performance of organisations.

5.2.4 Knowledge Implementation

The study also examined the effect of knowledge implementation on the competitive advantage of telecommunication firms. Regression analysis showed that knowledge implementation significantly and positively predicts a firm's competitive advantage (b=0.193, t=4.242, p<0.0001), with the model predicting that an increase in knowledge implementation by one unit result in a firm's competitive advantage to go up by 6%, *ceteris paribus*. This finding was in concert with those by Wijaya and Suasih (2020), Mtswenem (2020), Mungai (2019), Kinyua (2018), Chebii (2018), Elfar et al. (2017), and Nzongi (2018). The acquisition and dissemination of knowledge have been identified as significant factors in determining the competitive advantage of businesses, as evidenced by a study conducted in Sudan by Abker et al. (2019). An organisation's precise application of unique insights and information can earn a sustainable competitive advantage and higher performance (North & Kumta, 2018; Dickson, 2019).

Knowledge acquired, transferred, and stored is useless unless translated into actionable practices. The concept of knowledge implementation involves the practical use of knowledge and the application of existing knowledge to enhance decision-making

processes (Mtswenem (2020). This could explain why knowledge implementation had a significant effect on competitive advantage. With respect to relative importance, knowledge implementation ranked higher than knowledge creation but lower than knowledge storage and transfer. This could be because knowledge implementation only acts on available knowledge while knowledge storage and transfer can generate more novel ideas.

This study showed that some of the strategies adopted by firms included processes for sharing (M=4.81), processes for documenting (M=4.83), processes for searching (M=4.79), and instructions on incorporating (M=4.81) as well as documenting (M=4.79) to embed implementation process by incorporating into products and services. Although perception affects implementation, telecom company employees and leaders know its advantages. Therefore, telecommunication companies need to put more effort into the implementation phase to realize the benefits, which are, in essence, gaining a competitive advantage in the market, as posited by Kinyua (2018).

5.2.5 Mediating Effect of Technological Innovation on the relationship between Knowledge Management and Competitive Advantage

The mediation analysis showed that knowledge creation, transfer, and storage indirectly influence a firm's competitive advantage through its effect on technological innovation. The study found that when knowledge creation, transfer, and storage increases, technological innovation also improves, which in turn leads to an increase in a firm's competitive advantage. This study is therefore one of the first that demonstrates empirically the mediating effect of technological innovation on the relationship between knowledge management and competitive advantage in the telecommunications sector in Kenya. The study by Mohamed et al. (2019) and Nawaz and Shaukat (2017) examined the mediating role of innovation on the relationship between knowledge

management and firm performance among manufacturing enterprises in Sudan and Pakistan, respectively. Shafia et al. (2016) investigated the mediating effect of technical innovation on the association between dynamic capacity and competitiveness of research and technology organisations.

According to Von Stamm (2008) and Chell (2001), innovation refers to the development and implementation of novel offerings, ideas, methods, or products within the market, resulting in a modification of the equilibrium between supply and demand. The novel creations result from manipulating extant knowledge, that would have been created, stored, transferred and implemented. For example, Ettlie and Pavlou (2010) argued that the likelihood of successfully developing a new product or service is increased by effective knowledge management. This could therefore explain why knowledge management had a positive and significant effect on technological innovation. Once an innovation is developed that is perfectly inimitable, valuable, and rare, the innovation can become a source of sustained competitive advantage (Barney & Clark, 2007). This could therefore explain the indirect relationship between knowledge management and competitive advantage through technological innovation.

This study found partial mediation of technological innovation on the relationship between knowledge management and competitive advantage. This could be because properly managed knowledge in a firm could be a source of competitive advantage on its own right, explaining the significant direct effects of knowledge management on competitive advantage. For example, studies by Mulhim, 2017; Mehralian, Nazari & Ghasemzadeh, 2018; Wanyama, 2018; Kiseli & Senaji, 2016; Chuma, 2019; Ongus, Aming'a, Nyamboga & Okello, 2016; Cumari, 2018; Novak, 2017; Riungu, 2017; Abusweilem & Abualoush, 2019; Mtswenem, 2020; Elfar, Elsaid & Elsaid, 2017; Kinyua, 2018; Mungai, 2019) all found positive correlation between knowledge

management (knowledge creation, knowledge sharing, knowledge storage, knowledge implementation) and competitive advantage.

The study established a robust correlation between the various aspects of knowledge management (namely, acquisition, sharing, storing, and application) and the attainment of a competitive advantage within the telecommunications industry. Based on the research findings, the telecom industry's capacity to get a competitive edge in the market is contingent upon their inclination to use new knowledge management practises and effectively execute this strategic approach. According to Valmohammadi, Sofiyabadi, and Kolahi (2019), it has been found that innovation practises play a significant role in mediating the relationship between knowledge management practises and sustainable, balanced performance. Several solutions have been described in the literature, such as the implementation of contemporary technology to automate service delivery, the adoption of cost-effective operational processes, and the ongoing updating of products and services to optimise customer pleasure and foster loyalty.

5.2.6 Competitive Advantage

Table 4.7 demonstrates additional elements that are associated with the competitive advantage of telecommunications enterprises, namely product and service pricing, product differentiation, market niche, and the quality of products and services provided. Despite the widespread acknowledgement among corporate leaders of the strategic significance of knowledge and the imperative to effectively manage their knowledge assets, the survey also unveiled the prevalent challenge faced by many in realizing meaningful outcomes from their endeavours. This phenomenon can be attributed to multiple variables, one of which is the persistent impression of knowledge management (KM) as a predicament originating from the supply side. Additionally, individuals hold a strong belief that by obtaining the appropriate information, benefits will naturally

ensue. Nevertheless, the finding strongly indicated that telecom firms have a competitive advantage in the market due to what McIvor (2009) calls tangible and intangible resources available within an organization that must be utilized fully. These findings show that telecom firms are well positioned to be competitive in the industry. The combined influence of these factors contributes to their success.

5.3 Conclusion

The study's findings indicate a statistically significant and favourable relationship between knowledge management and the competitive advantage of telecommunication companies operating in Kenya. The study found significant, positive and strong correlation between competitive advantage and knowledge creation (r=0.757, p<0.0001), knowledge transfer (r=0.704, p<0.0001), knowledge storage (r=0.717, p<0.0001), knowledge implementation (r=0.763, p<0.0001), and technological innovation (r=0.757, p<0.0001). The results suggest that the selected independent factors had a positive and statistically significant impact on the competitive advantage of telecommunication firms in Kenya. Regression analysis revealed that all components of knowledge management (Creation, Transfer, Storage, and Implementation) have statistically significant positive effects on the competitive advantage of telecommunication firms in Kenya. Additionally, Technological Innovation was found to mediate this relationship. These findings suggest that enhancing knowledge management practices and fostering technological innovation can significantly contribute to improving the competitive advantage of telecommunication firms in the Kenyan market.

The findings indicated that Telecommunication firms should continue strengthening the acquisition of knowledge. They should cooperate with other firms locally and abroad to strengthen knowledge exchange.

Knowledge transfer should be enhanced within and without telecommunication firms. In this light, there should be an effort to ensure that employees understand the importance of knowledge transfer in their working processes. There should also be strong policies to guide knowledge transfer.

Telecommunication firms should strengthen their knowledge storage infrastructure. In this regard, the firms should invest in technical infrastructure such as informational hardware and software. There should also be enhanced training for personnel handling knowledge.

The departments involved with learning and information implementation should be well funded. Telecommunication companies need to put more effort into implementing knowledge by bringing on board all stakeholders.

Telecommunication firms should invest more in learning processes to enhance innovativeness. They should also be ready to adopt innovations in knowledge management in areas such as acquiring, sharing, storing, and applying knowledge. This can be done through the employment of competent officials as well as sufficient funding for innovations.

This study focused on the effect of knowledge management on the competitive advantage of telecommunication firms in Kenya. Further studies are recommended in other parts of Kenya for comparative purposes. Knowledge management in different sectors of the economy would also suffice. It is also imperative to conduct a focused study on one firm to provide in-depth information.

5.4 Recommendations

5.4.1 Implication to the Policy and Practice

The results of the study demonstrate a positive and significant correlation between knowledge generation, knowledge transfer, information storage, and knowledge implementation with competitive advantage. Therefore, it is recommended that all organisations prioritise knowledge development, knowledge transmission, knowledge storage, and knowledge implementation. The establishment of a knowledge management process within organisations is recommended, which may be delineated into five distinct steps. The process commences with the exploration of important knowledge, followed by its identification, organisation, analysis, dissemination, and ultimately, its accessibility to employees. Effective knowledge management techniques facilitate cooperation, expedite decision-making processes, harness existing expertise, enhance preparedness for crises, and facilitate the digital transformation of information within organisations.

The study further suggests that enterprises should consistently assess their degrees of commitment and positioning in order to effectively meet consumer needs. The strategies employed to achieve competitiveness should be founded upon a comprehensive comprehension of customer demands. It is imperative for organisations to allocate greater focus towards after-sales services. It is imperative for the firms to effectively resolve computer-related issues. It is imperative for enterprises to prioritise low-cost production as a means to mitigate the prices of goods and services within the market. The organisation should prioritise the cultivation of its brand image as a means of differentiating itself from competitors. It is imperative for enterprises to engage in constant monitoring of their competitors' skills. Policy makers at all levels of

government should formulate appropriate and effective rules and regulations that provide a favourable environment for businesses.

5.4.2 Implication to Theory

The findings indicate a significant relationship between knowledge management and performance. Therefore, the findings of this study provide confirmation for the ideas of Michael Porter's Five Forces Model and the knowledge-based view model. The primary contention underlying the Michael Porter's Five Forces Model is that organisations must comprehend the prevailing competition among themselves, the purchasing influence wielded by customers, and the presence of alternative products. Furthermore, the theory of the knowledge-based view recognises the significance of a strong knowledge base in attaining sustained distinctiveness within the market, hence leading to long-term competitive advantage.

The research, by means of its discoveries, makes a valuable contribution to knowledge base on competitive advantage and knowledge management. The present study has successfully shown a correlation between technological innovation, knowledge management, and competitive advantage, which can be attributed to the implementation of efficient internal strategies. This finding lends weight to existing arguments and theories in the field.

5.4.3 Implication to Further Study

This study aimed to investigate the mediating influence of technical innovation on the link between knowledge management and performance in the telecoms industry in Kenya. Furthermore, it is advisable to do future research to explore additional determinants of competitive advantage in the communications industry, beyond knowledge management. These aspects may include capacity building, leadership styles, and regulatory framework. The implementation of studies across a range of

organisations will enhance the ability to compare and analyse data, hence facilitating more effective decision-making processes.

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APPENDICES

Appendix I: Introduction Letter

Moi University

February 2022

Dear participant,

My name is Margaret Wanjiku Chege, and I am conducting a study titled; **"mediating effect of technological innovation on the relationship between knowledge management and competitive advantage of telecommunication firms in Kenya."** This research is conducted at Moi University to meet the criteria for obtaining a Master of Business Administration degree. I would greatly appreciate it if you could kindly allocate some of your time to contribute to this study by responding to the questionnaire designed to gather your thoughts and perspectives on the research subject. The collected data will not be utilized for any other purposes and will be maintained with utmost confidentiality. I express my gratitude for the allocation of your time and willingness to collaborate.

Yours Sincerely,

Margaret Wanjiku Chege.

Appendix II: Questionnaire

The questions intend to collect data about the **effect of technological innovation on the relationship between knowledge management and the competitive advantage of telecommunication firms in Kenya**. Other studies (Mulhim, 2017; Wanyama, 2018; Ongus, Aming'a, Nyamboga & Okello, 2016; Dickson, 2019; Elfar, Elsaid & Elsaid, 2017; Kinyua, 2018; Mwangi, 2016) used questionnaires in similar research.

<u>**SECTION A: DEMOGRAPHIC DATA**</u>

1. Gender

   a) Male ( )

   b) Female ( )

2. What is your age bracket?

   a) Below 25 years   ( )

   b) 26-35 years ( )

   c) 36-45 years ( )

   D) 46-55 years( )

   e) Above 55 years   ( )

3. What is your highest academic qualification?

   a) College   ( )

   c) Graduate   ( )

   d) Post Graduate ( )

4. How many years have you worked in the company?

   a) Below 5 years ( )

   b) 5-10 years ( )

   c) 10- 15 years   ( )

   d) over 15 years ( )

SECTION B: KNOWLEDGE CREATION

By using a tick, indicate your extent of agreement or disagreement on the following statements regarding knowledge creation in the company; Where 1=strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree.

Statement	1	2	3	4	5
1. The employees obtain a lot of new knowledge from external sources such as seminars, conferences, etc.					
2. The management motivates employees to engage in formal education systems to achieve a higher level of knowledge.					
3. Employees in the company consider their knowledge as an organizational asset.					
4. The employees obtain a lot of new knowledge from business partners (e.g., suppliers, clients)					
5. The employees rely on experience, skills and knowledge in their work					

SECTION C: KNOWLEDGE TRANSFER

By using a tick, indicate your extent of agreement or disagreement on the following statements regarding knowledge transfer in the company.

Statement	1	2	3	4	5
1. The management in the company promotes cooperation and the exchange of experience among employees.					
2. The employees in the company share their knowledge through formal procedures.					
3. Successful instances of sharing lessons learned are consistently publicized throughout the company					
4. The employees share their knowledge orally at meetings or informal gatherings.					
5. The employees in the organization exchange knowledge with their co-workers					

SECTION D: KNOWLEDGE STORAGE

By using a tick, indicate your extent of agreement or disagreement on the following statements regarding knowledge storage in the company.

Statement	1	2	3	4	5
1. There is a structured format, such as a template to follow when documenting lessons learned					
2. It is easy to use the classification scheme for documenting lessons learned					
3. Training on using the structured format for documenting lessons learned is available within the company					
4. Documenting lessons learned from projects is required in my organization					
5. There exists a classification scheme for categorizing lessons learned by project type, problem type, subject area, etc.					

SECTION E: KNOWLEDGE IMPLEMENTATION

By using a tick, indicate your extent of agreement or disagreement on the following statements regarding knowledge implementation in the company.

Statement	1	2	3	4	5
1. In the company, processes for sharing lessons learned are widely accepted as part of everyday work practices					
2. Processes for documenting lessons learned are regularly improved and updated in the company					
3. In the company, processes for searching for lessons learned are regularly improved and updated					
4. Instructions on incorporating lessons learned into everyday work practices are available to employees					
5. The organization uses documented lessons learned in decision-making					

SECTION F: TECHNOLOGICAL INNOVATION

By using a tick, indicate your extent of agreement or disagreement on the following statements regarding technological innovation in the company.

Statement	1	2	3	4	5
1. The company has introduced modern technology to automate the delivery of its services					
2. The company has adopted a cost-effective process of operations.					
3. The company has introduced modern technologies that can make bulky transactions a day.					
4. There is a continuous modification of products and services to maximize customer satisfaction and loyalty.					
5. The products and services offered by the company are highly differentiated.					

SECTION G: COMPETITIVE ADVANTAGE

By using a tick, indicate your extent of agreement or disagreement on the following statements regarding competitive advantage in the company.

Statement	1	2	3	4	5
The prices of the products and services in the company have been lower than those of the competitors.					
The goods and services in the company have been differentiated from those of the competitors.					
The organization focuses its energies on specific market niche					
The organization continuously seeks to reduce prices without sacrificing it is quality product essential features					
The quality of products and services offered is better than those offered by competitors.					

Appendix III: Data Collection Letter

MOI UNIVERSITY
ISO 9001:2015 CERTIFIED
SCHOOL OF BUSINESS AND ECONOMICS

Tel:	(053) 43153	P.O Box 63056-00200
		NAIROBI
Fax:	(053) 43153	**KENYA**

===

MU/NRB/MBA/SA/01   13th July 2022

National Commission for Science, Technology and Innovation
Upper Kabete
P.O. Box 30623 00100
NAIROBI

Dear Sir/Madam,

RE: **REQUEST FOR RESEARCH PERMIT**
          MARGARET WANJIKU CHEGE – REG. NO. MBA/2011/18

This is to confirm that the above named is a Postgraduate student of Moi University, School of Business and Economics. Ms. Chege is pursuing a Master of Business Administration offered at our Nairobi campus.

The student successfully defended her proposal and is due to proceed for the research data collection.

The research Title is – **"Effect of Technological Innovation on the Relationship between Knowledge Management and Competitive Advantage of Telecommunications Firms in Nairobi County"**

The student is in the process of obtaining a research permit to enable her visit the identified research center.

The University shall highly appreciate any assistance accorded to her.

Yours faithfully,

DR. ROBERT ODUNGA
COORDINATOR, POSGRADUATE STUDIES

Appendix IV: NACOSTI Permit

REPUBLIC OF KENYA

**NATIONAL COMMISSION FOR
SCIENCE,TECHNOLOGY & INNOVATION**

Ref No: **451516**

Date of Issue: **17/August/2022**

RESEARCH LICENSE

This is to Certify that Ms.. MARGARET WANJIKU CHEGE of Moi University, has been licensed to conduct research in Nairobi on the topic: EFFECT OF TEHCNOLOGICAL INNOVATION ON THE RELATIONSHIP BETWEEN KNOWLEDGE MANAGEMENT AND COMPETITIVE ADVANTAGE OF TELECOMMUNICATIONS FIRMS IN INAIROBI COUNTY for the period ending : 17/August/2023.

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Appendix V: Plagiarism Report

MEDIATING EFFECT OF TECHNOLOGICAL INNOVATION ON THE RELATIONSHIP BETWEEN KNOWLEDGE MANAGEMENT AND COMPETITIVE ADVANTAGE OF TELECOMMUNICATION FIRMS IN, KENYA

ORIGINALITY REPORT

19%	16%	11%	7%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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2	ebin.pub Internet Source	1%
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