INFLUENCE OF STRATEGIC LEADERSHIP AND KNOWLEDGE MANAGEMENT ON THE RELATIONSHIP BETWEEN TECHNOLOGICAL INNOVATION AND COMPETITIVE ADVANTAGE: EVIDENCE FROM LARGE TELECOMMUNICATION FIRMS IN KENYA

BY

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JULY, 2022

DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been submitted for award of any degree in this or any other University.

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DEDICATION

I dedicate this dissertation to my family for their unwavering support.

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ABBREVIATIONS AND ACRONYMS

5G	Fifth Generations
CA	Communication Authority of Kenya
DCT	Dynamic Capabilities Theory
GDP	Gross Domestic Product
GSMA	Global System Mobile Association
ICT	Information Communication and Technology
ICTA	Information, Communication, and Technology Authority
iOS	iPhone Operating System
IoT	Internet of Things
KBV	Knowledge-Based View
KICA	Kenya Information and Communications Act
KM	Knowledge Management
KMS	Knowledge Management Strategies
KPTC	Kenya Posts and Telecommunications Company
KRA	Kenya Revenue Authority
PLC	Public Listed Company
R&D	Research and Development
RBV	Resource based View
SDGs	Sustainable Development Goals
SME	Small Medium Enterprises
SPSS	Statistical Package for Social Sciences
ULF	Unified Licensing Framework

ABSTRACT

With reference to significant telecommunication enterprises in Kenya, the study intended to determine the impact of strategic leadership and knowledge management on the connection between competitiveness and technological advancement. Four theories, including technological networks Porter's sustainable competitive advantage model, theory of innovation, knowledge-based view, and dynamic capability theory as well as previous empirical investigations driven by specific aims, drove the study. The study used a descriptive cross-sectional survey design and utilized the positivist philosophy. A census was performed to determine the target population, which included all 83 significant licensed telecoms service providers in Kenya. The questionnaire was distributed via a variety of tactics, as determined by the respondents. The tools were administered later, but when respondents desired alternative ways of communication, such as email, the investigator arranged and shared the instruments in soft copy with them. Through a pilot study and following data gathering procedures, pretests were conducted to assess instrument validity and internal consistency. The data was then analyzed using both expressive and statistical computations. Statistical techniques comprised statistical tests, which were used to evaluate the presented hypotheses. descriptive analytics comprised frequencies, percentages, averages, and standard deviations. The findings show that technical innovation has a large and beneficial impact on competitive advantage. It was also discovered that leadership that is strategic has a favorable and considerable impact on the connection between technological advancement and competitiveness. Knowledge management was also found to exhibit a full mediating effect on the connections between advancement that is technological and competitiveness. Strategic leadership has a higher impact on competitive advantage than both technological innovation and knowledge management, according to the findings. The study's main disadvantage was its reliance on respondents' desire to participate and limited time available, which made it vulnerable to non-response. To solve this, the researcher used the "drop and pick" method, in which respondents were given adequate time with the questionnaires and were permitted to respond at their leisure before the researcher collected the completed questionnaires. In the telecommunications industry and beyond, the study has significant ramifications for policy model, practice of strategic management, and theory insinuations. The study would benefit the government of Kenya at the policy level by ensuring that policymakers and regulatory authorities in the telecommunications sector come up with coherent policies that encourage knowledge management, strategic leadership, and technological advancement as a strategy for increasing competitive advantage. Managers should consider making innovations a formalized processby establishing the necessary direction and controls to allow for the advent of value creation and innovation for long-term competitive advantage. The implications of the study's findings expanded and reinforced the theories that informed the study.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Firms compete on their ability to innovate by leveraging knowledge-based resources (Kuusisto & Meyer, 2015). If corporate leaders are to attain targeted strategic innovation capabilities and competitive advantage, they ought to effectively and actively monitor resources under their control in the form of knowledge assets, which are becoming increasingly competitive and dynamic (Kuusisto & Meyer, 2015; Miles, 2016). As a result, strategic leadership is critical since it aids in the establishment of organizational growth, vision, and direction (Nastase, 2013). Firms that want to stay competitive in today's fast-changing business environment, which is defined by global integration, rapid technological changes, and newer lifestyles, have to be innovative.

Technological innovation entails not only the incorporation of new technology, but also, in many cases, the development of new business models in the face of a changing, modern, and dynamic environment. It frequently requires strategic leadership altering the game's rules. Modern businesses are constantly engaged in constant struggle with competitors in order to stay afloat on the market; as a result, their strategic leadership ought to develop well-coordinated new plans to suit client expectations and achieve considerable growth. In this regard, the effective management of these businesses evaluates how they might strengthen their competitive advantage by implementing management through the development and implementation of diverse business approaches (Herden, 2020).

The research is based on Rogers' (1983) technological networks theory of innovation, which has been improved by Dankbaar (2003) and Ahuja (2000). The theory asserts that technological innovation is influenced through both internal and external methods. The The technological networks theory of innovation is chosen as the anchoring theory since it encompasses strategic leadership, technological innovation, knowledge management, and competitive advantage which constitute the current study variables. In today's global information economy, technical innovation is more of a societal process than an individual accomplishment. This means that, on the one hand, innovation incorporates both informal and formal relationships between enterprises and organizations. Innovation, on the other hand, necessitates the interaction of various actors within networks. As a result, numerous intangible kinds of social and capital ties interact to produce innovation (Karlsson *et al*., 2013).

Porter's sustained competitive advantage model, the knowledge-based view, and the dynamic capability theory also informed this study. The importance of the technological networks theory of innovation to this study was to inform strategic leadership and policymakers in Kenya's large telecommunication firms. The theory affirms that additional resources as technological innovation actions and market-related networks can be used to enhance financial as well as non-performance for the purpose of maintaining competitiveness by fostering effective management of knowledge, and interactions with customers, distributors, and other stakeholders.

The dynamic capabilities theory (DCT) proposed by Teece and Pisano (1994) recognizes the existence of distinctive capabilities in an organization that create proposals for a competitive position. As regards the DCT, Teece and others (1997) note that the competitive advantage envisioned by resource-based view theorists can only be obtained by companies that are competent and prepared to react to product innovation quickly and flexibly. This means that in international markets, effective organizations are those that can adjust quickly to market dynamics in terms of their business operations, market positions, and routes. In addition, such organizations must simultaneously possess ability to handle unique skills within a company in a manner that enables effective redeployment and coordination of external and internal competencies.

In order to be competitive and survive in the face of increased rivalry, DCT directed the study to discover how large telecommunication enterprises in Kenya consistently utilized their systems of knowledge management to innovate technologically and coordinate other internal resources. The congruence of the firm's service or product to its clients was influenced by technological advancement. The considerations on firm-level strategy, skills and performance would be extremely beneficial to DCT. The findings will aid the Kenyan administration in developing strategies to boost the sector's efficiency and competitiveness.

On the other hand, KBV views knowledge as a strategic resource capable of allowing strategic feedback to technological innovation (De Carolis, 2002; Roos, 1998; Grant, 1996). Transforming inputs to outputs is part of utilizing knowledge to the process of creating value. To do this, organizational strategic leadership should motivate and direct other employees in completing complicated, team-based production of goods and services that need them to combine their individual knowledge. As a result, this shows that knowledge can be combined with repeatable organizational capabilities (Herden, 2020). The importance of KBV in this study was to give policymakers and leaders in Kenya's large telecommunications firms a better understanding of the possibility of gaining a competitive advantage by increasing employee participation in the formation and implementation of operational goals and long-term transformative leadership objectives. Factors such as ever-changing highly competitive environment, periodic deregulations, and technological breakthroughs need the ongoing learning and transmission of information inside commercial organizations.

Porter's sustainable competitive advantage model is based on industrial organizational economic theory, which claims that market failures, such as the presence of transaction costs, determine the structure, degree of competitive nature, and attractiveness of a market, as contrasted to the competitive model's presumption of a perfect world (Coase, 1937). In a study on competitiveness, Porter (1990) affirmed that national wealth is not transmitted but produced. National success is not determined by a country's natural resources, labor pool, currency value, or interest rates as classical economics argue. Instead, the ability of a country's industry to upgrade and innovate determines its competitiveness.

Porter (1990) also claimed that the presence of pressure and obstacles is the driving force behind organizations getting a competitive advantage over the world's greatest competitors. Porter's model of sustained competitive advantage was important to the study because it provided a foundation for the interaction of strategic leadership, management of knowledge and technical innovation. This is so because advancement in technology has such a significant impact on competitive advantage especially in creating new possibilities for competition while also playing a key role in existing competitive strategies due to its pervasive presence in the supply chain. As a result, the theory was useful in understanding how Kenya's main telecommunications corporations deliver value to customers and analyzing competitive positions based on value rather than cost.

Furthermore, in today's increasingly competitive global economy, where the focus of rivalry is increasingly on information production and absorption, competitive advantage is developed and maintained through highly concentrated national processes. This necessitates strong strategic leadership that acknowledges the crucial significance of their home country as essential to their competitiveness and works to improve it. Such a management must be competent of energizing the organizations to drive innovation continuously, and a firm believer in change and the importance of knowledge management.

Kenya's telecommunications business has been steadily expanding since it was liberalized in 1999. The increase in interconnection in terms of network stability and reliability has been one of the most noticeable changes since then. Safaricom, Telkom Kenya and Airtel, among others, have controlled the majority of the country's telecommunications market share over the period. Technology advancements, globalization, and increased competition have all contributed to Kenya's telecommunications industry's growth throughout the years. Safaricom had 68.8 percent of the market as of March 2020, trailed by Airtel with 25.8 percent. With 5.0 percent, Telkom Kenya came in third, followed by Equitel with 0.4 percent (Communications Authority of Kenya, 2020).

1.1.1 Technological Innovation

Technological innovation is frequently linked to both products and company processes. It can either be done incrementally, modestly, or in a radical and revolutionary manner (Katz, 2017). Technology advancement can also be the product of an industry's efforts to adapt to or conform with environmental, safety, or health concerns and requirements, or it can be the result of an industry's main business activity (Tushman & Anderson, 2017). Any of the characteristics of innovation can be influenced by market signals, legislation, and anticipated customer or worker demand (Von Stamm, 2018). Information system adoption, distribution channel, product and process are the most commonly utilized indices of technological innovation (Hajir et. al., 2015).

Schumpeter (1934) observes that new, modified or enhanced products, distribution systems or processes are generated through innovation. Technology, on the other hand, makes use of scientifically created information needed to solve practical problems through the use of machinery and technology created from scientific understanding (Drucker, 1985). Mowery and Rosenberg (2018) defined technology advancement as a collection of technologically focused items and processes that are either new or significantly updated. Organizational and social innovation are two more types of innovation mentioned in the literature (Kuusisto & Meyer, 2015).

Customer relations, research and development (R&D), product creation, advertising, community outreach, labor relations, and environmental and governmental affairs are just a few examples of organizational innovations (Strasser, 2018). On the other hand, social innovation refers to a shift in employee, customer, and citizen choices for products, services, environmental quality and leisure activities (Chege *et al*., 2020). Technology, according to Vergragt and van Grootveld (2017), is a potent tool for attaining targeted organizational innovation, and hence reflects constant improvements to previous inventions. The organization's technological competences aid in the development, integration, and generation of critical resources, as well as their enhancement, resulting in a competitive edge. Furthermore, according to Osborn *et al.* (2015), technology aids in the distribution of information and expertise required for development through supporting social economic transformations

It is critical that strategic leadership pays attention to creating and implementing process technology innovation. It is worth noting that having a diverse process innovation inventory is linked to competitiveness. Process innovation, according to Skinner (1992), increases shareholder value through driving growth and improving earnings. However, in the past, some American companies have shied away from process innovations, putting them at a disadvantage in comparison to their global competitors, who pursue them aggressively. In order to improve company competitiveness, strategic leaders must increase process innovation. Process innovation is crucial in developing and promoting new products because of the pressure for U.S. corporations to bring in new items.

The technology portfolio's content reveals a company's focus on process and product technological advancements. Product innovations are commodities that meet the needs of customers (Zahra & Covin, 1994b; Zahra, 1993b). Process improvements allow a corporation to produce items more efficiently and cost-effectively. For success in the market, both process and product innovation are required (McCann, 1991). While strategic leadership recognizes the necessity of new product creation (Ali, 1994), others do not see the benefit of process innovations. Nevertheless, this is changing (Zahra & Covin, 1994). Over time, process innovations have become increasingly important in achieving competitive competency. Companies must excel at process innovation in order to cut costs, increase efficiency and quality, and market and new product development (Skinner, 1992). To keep up with their global competitors, US corporations have expanded their focus on process innovation, overcome a shortcoming in their previous resource allocation decisions, which have typically emphasized product developments.

Process and product innovations can be either revolutionary or gradual. Incremental technologies are expansions of extant processes and products, whereas revolutionary technologies are substantial industry advancements. The usage of the expression ‘operating system’, which has software roots, is deliberate. Organizations must become more software-like if they are to adopt and use software. An organization's structures, processes, and fabric are actually just a system to help employees meet customer needs, not the other way around. Individuals use the process to get things accomplished. The fast development of the software engineering field in the last two decades has taught businesses a lot, from notions like interface, distributed processing, data processing, micro services, as well as the cloud to strategies like rapid.

Like many businesses today, software used to be vertically linked and brittle, but it has evolved into a series of multiple tiered products that develop separately, and expand on one other to speed up innovation. It is much simpler to imagine a future with more independence, mechanisation, intelligent devices, and adaptive frameworks when you think of a company in order of component services, configured into systems and platforms to endorse the expectations of staff, rather than a set of processes run by supervisors in an upper section. The key to solving this shift is to educate today's managers, as well as to encourage tomorrow's future leaders, to seize this once-in-a-generation chance to re-calibrate the key managerial system that leaves behind a stronger firm than one which they left (Lee, 2019).

Digital technology, namely the concept of the company as a system, may help us streamline, regulate, and choreograph all of the tedious process compliance and organisational 'wiring' in order to free up more time and space for value addition, and innovation. To accommodate considerable variation at the app level, the Android platforms and iPhone Operating System (iOS) rigorously define and control the rules, security, and shared services like identification, alerts, and so on. This means that fundamental processes and customer service procedures are vulnerable to automation, and standardised at the platform level, allowing people and teams to combine and utilize these products much more flexibly than they can today (Lee, 2019).

Inventing a fresh idea may well be the simplest step toward a successful innovation. The correct creation, installation, and exploitation of digital age may be some of the most difficult challenges. The issue that needs answering is how information management engineers and designers may successfully implement a change at the processor or coding level as a result of novel ideas. Information management development is all about this process. Innovations in information and communication technology (ICT) still hold a lot of potential for a company's development, position in the market, and future growth. Recent innovations in enterprise information systems include new technology (for example, grafen), innovative business models (for example, cloud services), and new information functions of the system (for example, based on online social networking sites Like Twitter or Facebook) (Moller & Chaudhry, 2012).

Worth noting are the advantages presented by innovation activities that are technology based, and business incentives for distribution network innovation. Innovation activities are equallu influenced by both deman-based and market-based factors. Demand-based factors are mainly related to differences in the composition and behaviour patterns of consumers that organizations utilize to conform with while market-based factors are those which relate to distinction and fast reaction to the final requirement changes approach. This approach is frequently based on time-based competition ideas, which emphasize the importance of the time variable in obtaining competitive advantage and developing marketing programs from the point of view of rivals, rather than the end demand (Musso, 2010).

Firms have acknowledged the necessity to offer distinctive products that help them build a niche and control it as a result of greater competition brought on by globalization and advancements in Information and Communication Technology (ICT) (Chan-Olmsted & Jamison, 2016). High-speed internet connectivity, innovative mobile apps, and greater network access and availability have altered the competitive landscape in the telecommunications industry (Von Stamm, 2018). Firms must now invest in technology advances in order to generate ideas and processes that will increase efficiency while also matching interests of client (Wellenius, Stem, Nulty & Stem, 2017). Research by Andrei (2019) underlined the relevance of technical breakthroughs as a foundation of industrial growth while focusing on performance and competitive advantage among Romanian enterprises.

The survey highlighted the reality that every business is concerned with both external and internal innovation. Every technical advancement has the underlying purpose of lowering production costs and increasing the likelihood of obtaining optimal profitability. Asheim (2019) observed that given a decent innovation system, smart specialization can assist boost a competitive edge in the industry in developing and underdeveloped countries, world over. A study by Mugo & Macharia (2020) that examined the effects of technological innovation and competitive advantage in Kenyan telecommunication businesses concluded that development and technological abilities continue to play a critical role in a firm's growth path. However, according to the study, little is known about how an institution's innovation strategy influences technology advancement. The technological strategy of a company is the plan that directs how the company acquires and employs its technology, skills and resources.

According to Gachigo and others, (2019), a research of the Kenyan telecoms industry showed that many businesses have not completely assimilated in terms of innovation and hence keep performing below their potential. As a result, a number of previous industry studies, such as (Rajapathirana & Hui, 2018; Letangule & Letting, 2012; Mathenge, 2013), have advised that enterprises should implement strategic innovation. Gachigo and others (2019) found out that, despite adopting sound innovation in their processes, telecoms businesses in Kenya still struggle to translate those strategies into long-term competitiveness in today’s economic environment. As a result, this study examined the impact of technological innovation, strategic leadership, and knowledge management on competitive advantage as a whole.

1.1.2 Strategic Leadership

Strategic leadership entails planning ahead by establishing goals and providing direction to the company so that the specified objectives may be readily met (Nastase, 2010). Strategic leadership is also defined as the capacity to establish a strategic vision for the company or a strategic business unit, as well as the ability to persuade people reporting to them to believe in it and strive toward it (Nastase, 2013). According to Burgelman (2014), strategic leaders must be able to focus on getting things done well the first time. They accomplish this by providing their subordinates with a clear vision and direction, which encourages the attainment of organizational goals. Strategic leadership is exhibited through the contextualization of corporate achievement and the mindset of out-of-the-box thinking (Nastase, 2013). It refers to a company's ability to ensure that transactions are carried out in a modular fashion by concentrating on the foreseeable (Kjelin, 2009).

Strategic leadership, according to Hitt *et al*. (2007), includes the capacity of leaders to demonstrate flexibility, envision and anticipate while allowing others to participate actively in bringing about the desired strategic change. This means that strategic leadership can take many forms, including leading through subordinates in a way that helps the corporation manage with the fast-changing globalized economy. As a result, strategic leaders must be able to combine various business environment aspects while allowing for complex data processing.

Strategic leadership is only functional if it allows upper management to obtain and maintain control of the business by meeting, if not exceeding, key stakeholders' expectations (Burgelman, 2014). Leaders should provide group members with enough flexibility to take advantage of developing competitive opportunities (Ireland & Hitt, 2015). There is no precise skill set or scope for ideal strategic leadership. Leadership competency, ethical adherence, strategic direction, organizational culture, and organizational controls are the most often used markers of strategic leadership. The first two were used in this study, which summarized the others. Proper use of these signals has been demonstrated to result in a company's competitive stance.

Hitt and others (2007) propose a strategic leadership model with five main characteristics. The strategic leader must first determine the strategic course to go. Second, the leader ought to establish and implement organizational panels. Third, the leadership necessitates excellent resource management inside the company. Fourth, an organizational culture that is effective must be maintained. Finally, the leader must emphasize the importance of ethical behavior. Strategic leaders greatly contribute to effective competitiveness strategy execution in their organizations by implementing these actions. Steve Jobs, Apple's previous CEO, may be an excellent example of strategic leadership because he became famous for inspiring his engineers to attain great levels of accomplishment at Apple (Kahney, 2008).

Indeed, Apple's performance plummeted in the years after Steve Jobs' dismissal as CEO in 1985. However, after Jobs made a comeback to Apple in 1997, the company began to perform admirably. Steve Jobs not only played a personal role in Apple's invention, but he also recognized that the company's normal abilities were dependent on both regular innovation activities and non-routine thinking and entrepreneurial ventures (Teece, 2012). Being a leader, who is a strategic, Jobs had a great awareness of the marketplace and constantly pushed on simplicity of use and beautiful product design. As a result, Steve Jobs' innovation and intelligence in the strategic vision of the implementation of novel electronic devices with a global market appeal helped Apple.

The situation with Apple indicates that relying on a single talented individual is a perilous enterprise for any firm. Jobs, as a strong manager, was cognizant of this issue and, prior to his second medical absence in 2008, he tactically addressed it by creating internal business schools. Academics were to be invited in to prepare cases regarding how major historical Apple judgments were reached. The strategic leaders would then teach these situations to Apple's managers in order to ensure that the company's high-level procedures and top leadership procedures are passed down through the generations (Lashinsky, 2011). When the learning functions, seizing, sensing and interpreting are delegated to a few persons, the company is susceptible and doomed to fail. For example, O'Reilly *et al*., (2009) found that IBM had purposefully formal structures its exploitation, evaluation, and selection of 'new business prospects,' ensuing in billions of dollars going to IBM as additional income.

In a study to analyze the impact of strategic leadership for long-term competitiveness in Kenyan private and public universities, Kising'u (2017) discovered that strategic leadership played a substantial role in long-term competitive advantage in both private and public universities. The research also contained particular findings. First, the study discovered that corporate culture plays an important role in achieving long-term competitive advantage. Second, the study discovered that knowledge management plays an important role in achieving long-term competitiveness. Third, the study discovered that organizational innovation plays an important role in achieving long-term competitiveness.

High-performing leaders' primary role is to deliver strategic direction for the organisation, its different divisions and departments, and the individuals, who will ultimately execute strategic leadership. The most important aspect of strategic leadership is identifying the company's mission or vision. Strategic leaders must make a clear and accurate statement about why their organisation operates and what makes it unique. Strategic leaders provide strategic direction and a feeling of purpose for the development and performance of an organization's creative strategy (Jabar & Hussein, 2017). The formal procedures employed in companies to impact and steer work are referred to as organization regulations. Employees' abilities and limitations are set by these controls. Internal controls are divided into two categories: strategic and financial.

Whereas financial controls are implemented through the establishment of objective criteria such as performance targets, strategic controls are implemented through information exchanges that aid in the progress of strategies. Financial controls mainly focus on outcomes, while strategic controls focus on activities. Financial regulations are particularly restrictive and can hinder innovation in businesses. To allow employees to stay reliable and agile, strategic leaders must design balanced organizational rules that incorporate both financial and strategic controls (Rowe & Guerrero, 2012).

1.1.3 Knowledge Management

The use and advancement of an organization's knowledge assets to fulfill organizational goals is known as knowledge management. This information is made up of explicit and implicit information (Theriou & Chatzoglou, 2008). Knowledge management entails the collection, development, storage, implementation and sharing of information amongst individuals in the community of practice. Management of knowledge oversees the flow of information inside a company (Hislop, 2013). Methods of management of knowledge must be included and applied to improve organizational performance and give the company a competitive advantage. Knowledge management experts view knowledge as an essential human asset, and they have built organizational principles and expectations to encourage knowledge creation and sharing (Metaxiotis et. al., 2005; Chiu & Chen, 2016).

Knowledge, according to Awad and Ghaziri (2007), is "understanding earned via experiences or study." A person's ability to accomplish a specific work is determined by their know-how or experience on how to do something. Knowledge is defined as a dynamic combination of framed expertise, values, context cues, and expert opinion that offers a method for assessing and assimilating new skills and methods (Davenport and Prusak, 1998). Knowledge begins and is accessible in the brains of knowers, (Davenport and Prusak, 1998), while it is embedded in organisational processes, procedures, practices, records and conventions. There are two sorts of knowledge, according to Nonaka (1998): tacit and explicit knowledge. The mind of an individual contains both tacit and explicit knowledge.

Explicit knowledge is codified, recorded and accessible, (O'Dell & Hubert, 2011), and is stored in property rights portfolios, books, databases, journal articles, and corporate intranets. Manuals, process diagrams, formulas, documents and contracts are used to capture explicit information. This kind of knowledge is useless without the perspective that experience provides. Implicit information can be expressed, but it has yet to be expressed, and that can only be inferred or assumed from observed behavior or performance. The halfway ground between tacit and explicit knowledge is implicit knowledge (Nickols, 2000). Knowledge is considered a fundamental benefit in any business in today's commercial environment, and it is still recognized as a substantial technological investment (Abuaddous *et al*., 2018).

Many businesses are implementing knowledge management (KM), which has become a phenomenon in many ways as businesses use it to improve their organizational performance. Knowledge management has existed in businesses on a more informal basis than in a formal manner. Organizations have been obliged to adopt competitiveness measures in order to compete effectively than their competitors as a result of increased globalization and competitiveness (Bharadwaj *et al*., 2015). The use and advancement of a firm's intellectual capital to fulfill organisational objectives is known as knowledge management. This information is made up of explicit and implicit information (Theriou & Chatzoglou, 2008). Knowledge management methods must be included and applied to improve organizational performance and give the company a competitive advantage.

Knowledge management experts view information to be human capital, and they have built organizational principles and expectations to encourage knowledge creation and sharing (Metaxiotis *et al.*, 2005; Chiu & Chen, 2016). Today, more than ever, there is a stronger need to control corporate information in order to maximize its value (Holtshouse, 2013). The well-organized administration of knowledge resources for establishing and maintaining strategic and tactical concerns is known as knowledge management (Hislop, 2013). Companies must successfully effect change in this ever-operational environment by proactively examining their information skills and resources to develop their knowledge strategies (Wiig, 2012). The key to organisational success and effectiveness is the utilization of management of knowledge through the management of knowledge property within companies.

Knowledge, according to Hislop (2013), is just a condition of familiarity obtained through ability and connection. Knowledge management comprises a range of well-known and unique approaches for generating, exploiting, and reusing information, which,

when effectively managed, can create and produce new possibilities (Holtshouse, 2013). Sharing, identification, application, creation, and storage are all common knowledge management metrics (Holtshouse, 2013). In the recent decade, knowledge management has evolved into a critical tactical requirement for businesses to succeed in local, regional and worldwide markets (Sarkindaji *et al.*, 2016). Information management is now one of the most important areas wherein businesses have gained an edge over its competitors in terms of how they obtain new knowledge, generate it, communicate it, apply it, and protect it from being accessed by their competitors (Hislop, Bosua & Helms, 2018).

Despite the fact that management of knowledge has been identified as critical to an organization's performance, Donate and de Pablo (2015) contend that administrators are dissatisfied with the implementation of information managerial skills and the results of their implementation. Furthermore, the researchers point out that knowledge management planning and implementation is a difficult task for strategic leadership. To address these issues, experts such as Omotayo (2016) have proposed that one of a firm's creative competitive tactics should be efficient knowledge management. Acquisition of knowledge can be defined as the process through which organisations regularly obtain important knowledge or capabilities that are specific to their interests (Toyama & Nonaka, 2015). A pragmatic involvement in operations or simply an experiment in a particular field or a revelation acquired from a given study are all part of the process (Amah, 2016).

As the requirement for enterprises to participate in open inventions grows, organisations are likely to face strains and opportunities, resulting in a shift in human resource management (Papa *et al.*, 2018). When new information is obtained from outside of the company, it is necessary to disseminate it within the company in order to raise awareness among important personnel. Huang (2018) claims that acquiring knowledge is a key step toward remaining competitive in a crowded industry. Following the acquisition of knowledge, it must be categorised and transferred to other divisions within the firm, where it will be used to provide a financial benefit for the company (Sarkindaji *et al*., 2016). When it comes to the sustainability and viability of a business entity, knowledge creation is critical (Gasik, 2011).

Knowledge protection and storage entails ensuring that acquired information is kept safe within the company and is not squandered or lost (Estrada *et al*., 2016). The method of protecting data is essential to an organisation for the purposes of improving fully operational and significant restrictions in the firm. Some of the measures include the use of patents and copyrights, with the information system allowing operators to access their practice's rights via file names, usernames, logins, and shared procedures (Matin & Sabagh, 2015). In a shared network, file name protection requires assigning users specific files from which to operate. In this situation, users are granted access to only certain documents whereas others are restricted. A user must login with his privileges in order to see or work on a file protected by user name encryption. Password protection refers to the locking of files with credentials that require the user to enter the password in order to open the file.

This guarantees that only those who are authorized have entry to a certain data file (Fraihat & Samadi, 2017). Copyright is when a creator of a creative work grants an organization exclusive legal right to duplicate the work for a set period of time. No other company is expected to duplicate this work during that time frame, giving the company a competitive advantage. A patent is a provision of security for an innovation for a certain period of time that authorizes an organization to keep it safe from illegal usage (Fraihat & Samadi, 2017). The use of information acquired to further corporate objectives and goals is referred to as knowledge deployment (Gonzalez & Martins, 2017). Knowledge application, according to Matin and Sabagh (2015), is a collection of methods in which gained knowledge is put to appropriate use in the company with the goal of generating a quality and superior product than the competition.

The acts that reflect a firm's usage of its resources are referred to as information use (Chiu & Chen, 2016). Knowledge application can also be defined as the methods for stimulating knowledge in order to develop value in the company, which can be demonstrated by inventions, creations, and new goods (Estrada, Faems & de Faria, 2016). Knowledge application aims to stimulate information to generate value in the organization, as evidenced through inventions and the development of new products (Wakhu & Bett, 2019). According to Gareth and White (2017), an organization will be successful in creating economic advantage over a particular period if it generates knowledge with the least effort and the highest speed in comparison to to its competitors, and uses it sufficiently and competently.

The application of knowledge leads to technological innovation. An organization can build new capacity through innovation, making it more competitive over other players in the market. The many establishments, formations, or designs that an organization will come up with when it uses the new knowledge that it has learned to its benefit are known as original concepts (Wakhu & Bett, 2019). Knowledge application also includes activities that demonstrate how the company is using its knowledge. Application of knowledge refers to using knowledge to add value to a business through innovations, creations, and product innovations (Miils & Smith, 2011). Companies will succeed in gaining a competitiveness in the long term, as per Dröge *et al*. (2003), if they develop knowledge at a cheaper cost, and faster rate than rivals, and utilize it efficiently and effectively.

Sharing knowledge and transfer are important aspects of knowledge management because they make information more accessible and useable (Pirkkalainen & Pawlowski, 2013). Information conversion is a notable process of KM in organizations, and it refers to the movement or sharing of information to places where it is required and usable (Titi, 2013). Knowledge transmission is the process of exchanging personal or organizational knowledge (Hanif, Bahauddin & Hamid, 2018). Sharing knowledge or transference is a process in which information is passed from one party to another, from one individual to a group, or from one business to another (Waribugo, Ofoegbu & Akpan, 2016). Transfer of knowledge cannot be successful unless the knowledge receiver engages with and uses the knowledge as a foundation for achievement.

Engagement between personnel of different departments within the business and learning from one another is a reliable way of knowledge transfer. It is the most cost-effective technique to ensure that information is effectively transmitted inside the company. Knowledge transmission inside the organization and between the two departments will be ensured through the participation of two departments (Bharadwaj *et al*., 2015). Firms can share knowledge via comparing with other companies, where new methods and operating processes are learned and implemented in order to enhance efficiency (Chiu & Chen, 2016).

1.1.4 Competitive Advantage

The capacity to stay up with present or possible competition is known as competitive advantage. Because this is a multifaceted phenomenon, financial initiatives should be supplemented with other market-related metrics such as constant innovation of products, process the order, cost leadership, supply chain efficiency, and/or customer satisfaction (Bharadwaj, Tuli, & Bonfrer, 2011). As rivalry is becoming fiercer and sustaining competitive advantage becomes more important, a business that maintains competitive advantage should be unable to replicate the source of the edge or if no one hides a superior offer (Kim *et al.*, 2011). Porter (1985) defines competitive advantage as the ability to continuously create returns from an initial capital that is substantially greater than the industry's average. That distinguishing advantage is derived from the organization's core strengths, which may be its abilities (Sigalas & Economou, 2018). When a company can outperform its competitors on multiple dimensions, such as market share, it is said to have competitiveness (Ritala & Ellonen, 2019).

There has been a significant amount of research recently focused on flexible skills. Dynamic talents are seen as the catalysts for the development, synthesis, and formation of new competitiveness (Henderson & Cockburn, 2014). Competitive advantage is not only gained through attaining access to different possibilities, but also by maximizing the value of existing resources. For example, a corporation could gain a measurable business value by improving its business procedures. As a result, an organization that can create more with fewer resources than its competitors have a competitiveness over them. Moreover, studies have demonstrated that firms gain a competitive edge from their cognitive and other resources, with the intellectual abilities of the organization making it tough for competitors to duplicate (Chilton, 2013).

According to Lewis (2016), an organization that provides unique and differentiated services or products compared to its rivals has a competitive edge in providing such products or services. Within the chosen scope, competitive advantage refers to how a business aims to achieve its long-term goals. Because the company is up against potential and present competitors, it needs a compelling reason to compete effectively (Porter, 1980). A high-performing company must get an advantage over its competitors. However, there are several points of view on what constitutes competitiveness. While some researchers, like Frohberg and Hartmann (2017), believe that competitiveness is a precursor to organizational performance, others, such as Farole, Guilherme, and Wagle (2016), believe that the opposite is true: organizational performance leads to competitiveness. The previous school of thinking believes that competitiveness is achieved through organisational success, whereas the latter believes that competitiveness is achieved through organisational success.

Competitive advantage, according to Ritala and Ellonen (2019), is only tenable if the firm's capacity to achieve its goals across longer time frames is informed by its being better at that activity than its competitors. Financial metrics such as product price, liquidity, cost per unit, net revenues generated, and gross margin and non-financial performance such as customer happiness, market share, efficiency, and benchmarks are all identified in the literature as indications of competitiveness (Frohberg & Hartmann, 1997; Farole, Guilherme & Wagle, 2016).

Because competitiveness and performance are indistinguishable, market share, costs and productivity are frequently employed measures when assessing firm level competitiveness (Kortelainen & Karkkainen, 2015; Kiel, Smith & Ubbels, 2016). Cost, differentiation, and focus advantage, according to Porter (1980), are the three basic types of competitive advantage. A competitive advantage exists when a company can provide the same benefits as its competitors at a lower cost (cost advantage), or when a company can differentiate itself from its competitors (advantage of differentiation). When a company adapts its strategy to serve a specific group or portion, excluding its rivals (approach) it gives it competitive advantage.

The three advantages are referred to as positioning advantages since they describe the firm's market position as a cost, differentiation, or focus leader (Porter, 1980). Companies that would survive in the coming decades would be those that respond quickly and effectively to changes in environmental conditions. An organization must ascertain what the consumer wants, understands, and appreciates. The firm would be lucky enough to detect several potential competitive advantages, and should be able to determine which ones are worth pursuing. Some differences are very subtle, easily imitated by competitors and many are very expensive.

A competitive advantage can make or break an organization, so it is critical to have the strategic leadership capacity, technological innovation capacity, and knowledgeable human resources for an organization to benefit from competitive advantage. In the past, the market environment tended to be stable so that the product designs and new product development techniques did not change rapidly. Today, product life cycle is perceived to be faster than ever before. Innovative product has, therefore, become a crucial point in the industry where customers regain benefits from the reengineered feature, design, or function. Competitive companies no longer keep offering similar products or only competing based on traditional reasons such as price and quality. Particularly for technical companies, the inevitable trend is to differentiate product offering and innovation in gaining competitive advantage over competitors (Nuryakin, 2018).

Khin *et al*. (2010) state that innovation is related to strategy and resource. On strategy approach, innovation is a differentiator to the competitors (Porter, 1985). According to Pehrsson (2019), good managerial understanding of the mechanisms underlying the effectiveness of entrepreneurial and market orientation in dynamic foreign markets enhances the international competitiveness of the entire firm. Innovativeness and responsiveness are crucial to firm performance because they manifest the firms' strategies in foreign markets and are actionable. Accordingly, the other components of entrepreneurial orientation and market orientation operate through innovativeness and responsiveness.

Innovativeness represents a firm's entrepreneurial and market-driving behavior to get ahead of competitors by, for example, launching innovations and creating and entering new markets. On the other hand, responsiveness is a market-driven firm behavior; for example, by customizing products and building customer relationships, the firm may respond to the needs of target customers. A strategy of cost leadership is a coordinated effort to create services or goods with desirable attributes at the cheapest price in comparison to competitors. (Sirmon *et al.*, 2011). Some of the ways to realize low-cost strategy and achieve the requisite performance are: economies of scale, control and reduction of administrative costs, the curve of experience, and technology. Cost leadership strategy takes place through experience, investment in production facilities, conservation, and careful monitoring on the total operating costs (through programmes such as reducing the size and quality management).

The purpose for applying the strategy of cost leadership is to obtain the competitive advantage by reducing the economic costs among its competitors. The firm should search and explore all sources of potential cost advantage. While the product may be relatively unsophisticated, the company must meet industry standards, for example, the product and/or service must be perceived as acceptable and comparable to those of its competitor (Porter, 1985; Barney, 2002; Huggins & Izushi, 2011). Competitiveness of a company is its strategic position in the market, which is the outcome of operational efficiency using an efficient logistics system in place. It is the management of the flow of products.

The competitive advantage of supply chain lies in the superior value delivery to customers by managing the material flow from suppliers to the end customer by developing and sustaining the upstream and downstream relationships with the whole supply chain partners and actors. The overall supply chain strategy should be developed and adopted by integrating supply chain objectives, processes of supply chain, and management commitment towards the supply chain activities. The supply chain competitive advantage can be achieved by the coordinating, synergizing, and collaborating to integrate these three dimensions (Mukhtar, 2015).

1.1.5 Large Telecommunication Firms in Kenya

Information and communication technology is expected to continue playing a key role in shaping trends in the global economy. Artificial Intelligence (AI), Cloud Computing, Mobile Fifth Generation (5G), Cyber Security, Block Chain and the Internet of Things (IoT) are the primary technologies expected to play a significant role in shaping trends in various sectors of the economy. Global System Mobile Association (GSMA) and the Mobile Economy (2019), proposes that AI is key to future business and digital transformation. It would increasingly drive autonomous and intelligent networks as well as improve customer experience through greater learning of customer behavior. Operators across the globe are therefore expected to focus on AI with various AI-based applications such as network operation/planning, chatbots, digital assistants, customer care and advertising as well as AI as a service with a view to earn competitive advantage.

According to the World Economic Outlook Report (2019), the global Gross Domestic Product (GDP) growth rate declined to 3.6 percent in 2018 from 3.8 per cent recorded in 2017. The decelerated growth is mainly attributed to trade tensions between the United States of America (USA) and China, uncertainty surrounding British exit (Brexit) from the European Union (EU), decline in business confidence, tightening of financial and trade conditions as well as policy uncertainties across several economies. In addition, a combination of country- and sector-specific factors further exacerbated the slowed growth. In Africa, some countries experienced improved economic conditions resulting in the continent's overall GDP growth rate remaining fairly stable in 2018 at 3.5 per cent. While non-resource-rich countries— supported by higher agricultural production, increasing consumer demand, and rising public investment—grew fastest (Senegal, 7 percent; Rwanda, 7.2 percent;

Côte d'Ivoire, 7.4 percent), the two largest economies slowed down Africa's average growth (Nigeria 1.9 per cent and South Africa 1.2 per cent). According to the Africa Economic Outlook Report (2019), East Africa was the fastest growing region in Africa with an estimated GDP growth rate of 5.7 percent in 2018. This was attributed to the recovery of agriculture, services and industrial sectors as well as investment in public infrastructure in Kenya, Uganda and Rwanda respectively. The Kenya Economic Survey (2019) estimated that East African Community (EAC) inflation rate decreased from 6.5 per cent in 2017 to 4.2 per cent in 2018.

Kenya's macroeconomic environment remained fairly stable with real GDP estimated to have expanded by 6.3 per cent in 2018 compared to 5.9 per cent in 2017 (Economic Survey, 2019). This growth was attributed to sustained development in the transport sector, accelerated manufacturing activities as well as the increased agricultural production. The agriculture, forestry, and fishing sub-sector recorded an accelerated growth rate of 6.4 per cent from 1.9 per cent recorded in 2017 while the manufacturing sector recorded a growth of 4.2 per cent from 0.5 per cent reported in the previous year. Similarly, electricity supply, transportation and storage, ICT, accommodation and food services showed remarkable growth of 10.5 per cent, 8.8 per cent, 11.4 per cent and 16.6 per cent, respectively.

The growth of the telecommunications sector has been on an upward trend for the fourth year running while its contribution to Kenya's GDP remained at 1.3 per cent. This growth is attributed to increased digitization of private business and government services, continuous increase in uptake of ICT services by Kenyans, increased roll out of services to un-served and under-served areas. The telecommunications sector in Kenya has grown exponentially since it was liberalized back in 1999. This was achieved through firstly, the Telecommunications and Postal Sector Policy Statement of February 1997, which was subsequently followed by the enactment of the Kenya Information and Communications Act, 1998 – more commonly referred to as KICA (Institute of Economic Affairs, 2018).

Liberalization of the telecommunications sector brought about an end to the monopoly that Kenya Posts and Telecommunications Company (KPTC), had enjoyed since independence. It led to entry of new players into the telecommunications sector in Kenya and as such, consumers were able to reap many positive benefits. The historic journey has been demarcated in four distinct phases as; Phase 1: Liberalization (1999-2000); Phase 2: Mobile Phone (2001-2007); Phase 3: Mobile Money Platform (2007-2015), and Phase 4: Digitization (from 2016). In the same vein, technological change and advancements have given rise to more innovations that have made positive contributions to individuals and the country at large. Telecommunication firms in Kenya are organizations in the Kenyan territory that offer diverse products and services ranging from telecommunication infrastructure which enables them to offer voice, short message services, data, radio frequencies among others (ICTA, 2018).

Telecommunication firms are classified as large, small and medium (Plehn-Dujowich, 2013). As per the definition of large organizations according to the Government of Kenya (2016), large telecommunication firms have been considered in this study as those with more than 100 employees, exceeding Kshs. 800 million in annual turnover and exceeding Kshs. 100 million in machinery and plants. In order to enhance industry competitiveness, the Communication Authority of Kenya (CA) adopted a Unified Licensing Framework (ULF) that promotes neutrality in technology (ICTA, 2018). Communication Authority licenses operators and service providers in different market segments as international gateway systems, submarine cable landing rights, firms providing network facilities, those providing content and other contractors in the telecommunication industry (CA, 2018).

In consonance with ICTA (2018) there are a total of 266 registered telecommunication firms in Kenya. In the context of the present study, telecommunication firms, being in a knowledge intensive industry, can use knowledge management for identification as well as creation of relatively new products. Furthermore, they can use knowledge management to improve services and establish new niches in the market while ensuring there are radical changes in the way the operations of the business are conducted through technological innovation (Chui & Fleming, 2013). This presupposes strategic leadership, capable of anticipating changes in the external environment and determining strategic direction (Ireland & Hitt, 2015). The Kenyan government has identified telecommunications sector as a key enabler to aid in economic growth. The sector has not only been vibrant but also constantly evolving due to the new technologies and infrastructure.

The global outbreak of the Corona Virus 2019 (COVID-19) pandemic, and its being reported in Kenya in March 2020, has continued to have a significant impact in the country in various sectors. As a result, the government encouraged use of ICTs through: provisions of e-government services, e-health programs, and e-education as part of efforts to contain the spread of the pandemic. As at 30th June 2020, the number of mobile subscriptions stood at 57 million, an increase of 9.2 percent from 52.2 million subscriptions registered in comparison to the preceding reporting period. Consequently, mobile SIM penetration in the country stood at 119.9 percent during the period (CA, 2020).

During the quarter under review, there were 1.8 million net additions in mobile SIM subscriptions. The significant growth is attributed to consumers taking advantage of various products such as SMS and data promotion/tariffs. Moreover, the directive by the Government on the use of cashless payment systems to contain COVID-19 pandemic and the attendant waiver of transaction costs for amounts equal to or less than KSh. 1,000 played a key role. Total net additions for the fiscal year stood at 4.8 million. Active mobile money subscriptions stood at 30.5 million, whereas active mobile money agents stood at 223,184. M-Pesa continued to dominate the mobile money service with a market share of 98.9 percent. During the fourth quarter, Safaricom PLC lost 0.3 percentage points in market shares to post 64.2 percent share in mobile subscriptions. Airtel Networks Ltd and Telkom Kenya Ltd on the other hand gained by an equal margin of 0.2 percentage points to record 26.8 percent and 6.0 percent shares respectively. Equitel registered the least market share of 3.0 percent after losing 0.1 percentage points (CA, 2020).

Kenya's telecommunications sector's growth is supported mainly by growth in the digital economy, mobile telephony, and internet penetration. Access to the internet is mostly obtained through mobile phones that have become increasingly available and affordable. The Kenyan government identified the telecommunications industry as a key sector to aid rapid economic growth. The industry is riding a wave of digital advancement that is expected to affect the telecommunications, digital services, internet of things, and cybersecurity markets in particular (CA, 2018).

Kenya's telecommunications sector is expected to play a critical role in propelling the economy to a 10 per cent growth rate, in line with the aspirations of Vision 2030. The sector is fundamental in supporting the country's social development agenda through the creation of jobs and the generation of foreign exchange. Telecommunication is identified in Vision 2030 as critical in addressing incidences of high poverty levels and unemployment. To meet these goals, the sector has to become more efficiency-driven, raising productivity per unit of input closer to those of Kenya's external competitors. One of the strategies according to (GoK, 2007) is to build knowledge, technology and innovation through training, and research and development (R&D).

The Vision 2030 recognizes the role of science, technology and innovation (STI) in a modern economy, in which new knowledge plays a central role in boosting wealth creation, social welfare and international competiveness. One of the elements that allow effective exploitation of knowledge is an economic and institutional regime that provides incentives for the efficient use of existing knowledge and creation of new knowledge (Cheruiyot, Jagongo & Owino, 2012). Vision 2030 was based on the creation of international competitiveness through more efficient productivity at the firm and household level, with government support.

However, all the strategies and flagship projects were to exploit knowledge in STI in order to function more efficiently, improve social welfare, and also promote democratic governance. STI could and would be applied in all the lead sectors, especially the telecommunication sector. The education and training curricula in the country would, therefore, be modified to ensure that the acquisition, creation, storage, sharing, and application of knowledge becomes part of formal instruction and are provided for strategic leadership of firms. A new incentive structure would be developed to support the use of STI in specialised research centres, universities as well as in telecommunication firms (GoK, 2007).

1.2 Research Problem

The concept of strategic leadership has been linked to notable organizational outcomes, key among them, competitive advantage (Mugo & Macharia, 2020). This owes to the ability of strategic leaders to determine a firm's strategic direction, develop a long-term vision for the firm, and devise as well as implement action plans towards actualizing the vision (Jing *et al.*, 2019). The present information age particularly affords strategic leaders, the opportunity to tap into information to generate and manage industry knowledge, and leverage the fast-advancing technological innovations to improve their business processes and customer experience in order to earn their firms, a sustained competitive advantage (Asheim, 2019; Hamilton & Philbin, 2020).

Accordingly, the concepts of strategic leadership, knowledge management, technological innovation and competitive advantage have been widely explored in extant empirical literature. Studies have to larger extent focused on the concept of competitive advantage and its direct linkage to strategic leadership (Gathi, 2018; Kising'u, 2017; Mbithi, Kibera & Awino, 2016); knowledge management (Gathi, 2018; Mucai *et. al.,* 2018); and technological innovation (Kiptui, 2017; Nyawade, 2015; Yalla, 2015).

Few studies have, however, examined both the direct and indirect associations among the concepts of technological innovation, leadership that is strategic, competitive advantage and management of knowledge in one conceptual model (López-Nicolás & Mero˜no-Cerdán, 2020). This poses a conceptual gap, which formed the basis for this study. The telecommunication industry is knowledge intensive, largely driven by technological innovations and characterized by the need to manage knowledge, and the vast amounts of data generated on a daily basis (Bodo, 2021). It follows then, that competitive advantage in the industry is hinged on corporate leaders to strategically harness technological innovation and knowledge management capabilities. It, however, remains largely undocumented in the Kenyan body of knowledge, how telecommunication firms in the country employ strategic leadership to realize competitive advantage through technological innovation and knowledge management (Chumba *et al.,* 2019; Mugo & Macharia, 2020).

Further, the telecommunication industry in Kenya has been termed uncompetitive, with one player controlling nearly 70% of the industry's share and value (CA, 2020; Bodo, 2021). This brings to question, the strategies employed by the large telecommunication firms to realize competitive advantage. The foregoing presented the contextual gap motivating the present study. The study was also occasioned by a number of methodological gaps in extant literature pertinent to strategic leadership, technological innovation, knowledge management and competitive advantage. On a global perspective, a study in Britain on telecommunications forecasting by Oughton *et al.* (2018) that zeroed-in on fast-evolving technologies found that demand, supply, and the market scenario in Britain were affected by technological innovation.

The methodology involved the use of an open-source modelling framework that could forecast technology diffusion in Britain between the years 2016 and 2030 whereas the current study adopted cross sectional survey and multiple regression presenting a methodological gap. The study did not take into account all the concepts in the current study and was done in Britain. Mardani, Nikoosokhan, and Moradi (2018) assessed the relationship between knowledge management and innovation and organizational performance with reference to the Iranian power syndicate. The study did not employ all the study variables in the current study hence leading to a conceptual gap. The study was carried out in Iran and findings could not be generalized to the telecommunication firms in Kenya thus a contextual gap. The study however relied only on secondary data whose validity is not assured. It also lacked the primary first-hand information from the practitioners of strategic leadership like the current study, thus a methodological gap.

In a study of the industrial market that focused on the relationship between innovation strategy and other aspects of firm performance, Jajja *et. al.,* (2017) contended that buyer-seller relationships do not moderate between innovation strategy and performance. However, the study only used a descriptive study design and had two sample frames, one in India targeting 450 firms, and the other in Pakistan targeting 850 firms compared to the current study, which adopted census hence a methodological gap. The concepts studied did not include strategic leadership, knowledge management, and competitive advantage hence a conceptual gap. Contextually, the research was also done in India and Pakistan whereas the current research was done in Kenya.

From a regional perspective, Abdi and Ali (2013) examined the association between technical innovation and business performance in Sub-Sahara Africa with reference to the telecommunication industry in Somalia. The study, however, did not employ all the study variables carried out in the current study hence a conceptual gap. The study was done in Somalia whereas the present research was carried out in Kenya presenting a contextual gap. The study only focused on the financial measures of business performance which only accounted for the quantitative aspects of business performance at the expense of the equally important qualitative aspects. The current study employed fundamentally different qualitative measures of competitive advantage, accounting for Porter's five forces model of competitive advantage, particularly product differentiation and innovation and cost leadership thus a methodological gap.

Locally in Kenya, a study by Mucai (2018) examined tacit knowledge, social networks, organizational learning, and competitive advantage of information and communication technology (ICT) content service providers in Nairobi. The study, however, did not use strategic leadership as a variable of study hence a conceptual gap. The study concentrated ICT content service providers in Nairobi whereas the current study was done on large telecommunication firms in Kenya hence a contextual gap. The study adopted both linear regression and structural equation modelling techniques whereas the current study adopted linear, step-wise, path, and multiple regression models thus a methodological gap.

Gathi (2018) sought to study transformational leadership, knowledge management, organizational structure, reward systems, and organizational performance of telecommunication firms in Kenya. Compared to the current study, competitive advantage was considered as well as specifically studying large telecommunication firms in Kenya hence conceptual and contextual gaps respectively. The study adopted sampling technique for telecommunication firms whereas the current study adopted census technique for large telecommunication firms thus posing a methodological gap. Nyawade (2015) researched on the effect of leadership style and organizational culture on the relationship between innovation and performance of firms listed on the Nairobi Securities Exchange. The current study has explored strategic leadership, knowledge management, and competitive advantage as variables hence conceptual gaps.

As compared to the current study that was done on large telecommunication firms in Kenya, the research was carried out on firms listed on Nairobi Securities Exchange thus a contextual gap. Yalla (2015) examined how strategy that is competitive and corporate political activity influence the connection between innovative capability and performance of large manufacturing firms in Kenya. Strategic leadership and knowledge management concepts were not considered in the study and the study was not done in large telecommunication firms in Kenya hence conceptual and contextual gaps respectively. The study adopted stratified sampling whereas the current study employed census technique resulting to a methodological gap.

A study by Kiptui (2017) examined innovation, structure, environment, competitive advantage and Kenyan commercial banks' performance. The investigation did not factor other variables such as strategic leadership and knowledge management and was not carried out in large telecommunication firms culminating into conceptual and contextual gaps respectively. In order to address these identified methodological, contextual as well as conceptual gaps, the study adopted a combination of simple linear, step-wise, path analysis/Baron and Kenny (1986), and multiple regression analyses. The adoption of this methodology is informed by the need to test for the direct effects, moderation, mediation and joint associations among the variables respectively in seeking to offer answers to the following research question: what is the influence of strategic leadership and knowledge management on the relationship between technological innovation and competitive advantage among large telecommunication firms in Kenya?

1.3 Research Objectives

The main objective of the study was to establish the influence of strategic leadership and KM on the relationship between technological innovation and competitive advantage: evidence from large telecommunication firms in Kenya. The specific objectives of the study were to:

i. Ascertain the influence of technological innovation on competitive advantage of large telecommunication firms in Kenya
ii. Determine the moderating role of strategic leadership on the relationship between technological innovation and competitive advantage of large telecommunication firms in Kenya
iii. Assess the mediating influence of knowledge management on the relationship between technological innovation and competitive advantage of large telecommunication firms in Kenya
iv. Establish the joint influence of technological innovation, strategic leadership and knowledge management on the competitive advantage of large telecommunication firms in Kenya.

1.4 Value of the Study

This investigation aimed at making several contributions to theory as it delved into how both the anchoring theory that is the technological networks theory of innovation and support theories including dynamic capability theory, knowledge-based theory and Porter model of sustainable competitive advantage underpins the present study variables. The study findings have articulated how the theories help explain the extent to which knowledge possessed by a firm may be utilized to generate competitive edge and superior performance.

The study was also of significant contribution to the existing empirical knowledge with regard to the direct, moderating and mediating factors affecting competitive advantage among telecommunication firms in the country. This was important to future researchers by acting as an empirical source of literature for their studies besides suggesting further areas for their research. In addition, the study has recommended areas for further research after establishing the prevailing gaps.

Practitioners in the telecommunication industry would also benefit from the study as it provides guidance on how to leverage technological innovation, strategic leadership and knowledge management with a view to drive up competitive advantage. Managers would also be informed of the importance of predicting the changes in the operational environment and building capacity so as to be able to accordingly respond and remain competitive.

This investigation has also contributed to policy formulation, improvement, and implementation in Kenya with regard to competition in the country's telecommunication sector. In this regard, the Government of Kenya through the CA, and other relevant departments on regulation of innovations in technology and knowledge would be well informed. Some of the policies that might require review in light of the findings of the study included: intellectual property management, governance of the ICT firms, and regulation of the competition in the ICT sector.

1.5 Organization of the Thesis

This thesis is subdivided into six chapters. **Chapter one** provides the introduction to the thesis. It gives a brief synopsis of all the concepts of this study which include: technological innovation, strategic leadership, knowledge management and competitive advantage. The chapter also describes the context of the study starting with the broader context - global perspective of large telecommunication firms, regional perspective of large telecommunication firms followed by a general review of large telecommunication firms in Kenya. The chapter then describes the research problem and explains on the conceptual, contextual and methodological gaps.

The main objective of the study which was to establish the influence of strategic leadership and KM on the relationship between technological innovation and competitive advantage: evidence from large telecommunication firms in Kenya was presented together with the four specific objectives. Finally, the value of the study was discussed. **Chapter two** of this thesis presents a thorough review of theoretical, conceptual, and empirical literature. Theories underpinning this thesis are discussed followed by a pairwise review of the concepts under study. The chapter also presents a table on previous studies and the gaps this study sought to fill. The chapter also contains a conceptual framework together with the conceptual hypotheses.

Chapter three of the study describes research methodology. It outlines the philosophy guiding the study, the research design, population of the study, and data collection method. The chapter also elaborates the operationalization and measurement of study variables together with the data analysis techniques used in the study. **Chapter four** gives an account of the data examination and comprehension of the findings. It commences with the descriptive statistics, then diagnostic tests and finally test of hypotheses outlined. **Chapter five** presents the discussions of the results in line with the objectives, hypotheses, theory, and previous conceptual as well as empirical studies. Finally, **chapter six** contains the summary, conclusion, and recommendations of the research. In the chapter, implications of the research to policy, practice, theory, and methodology; as well as constraints of the research are discussed alongside recommendations for future study. The next chapter covers a comprehensive review of literature.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter concentrates on the work of other scholars in regard to the study variables. It specifically presents theories that supported the study, empirical literature, and the conceptual framework. It first identified key theories on which the study was anchored on including the technological networks theory of innovations, dynamic capabilities theory, the knowledge-based view, and the Porter's model of sustainable competitive advantage. It then summarizes what has been presented so as to inform the researcher on what other scholars have presented. This helps in growing the literature by contextualizing theories whose application in the Kenyan body of knowledge remains scanty.

There are several studies conducted in the recent times to assess the conflation between technologically oriented innovations and the ability of firms to remain competitive as well as the role of leadership that is strategic on management of knowledge. A lot of the investigations were conducted in industrialized countries whose economies are advanced and socio- economically different from Kenya. The empirical literature further assessed previous research with relevance to the objectives of the present study. The main variables in the study were explored with regard to previous scholars' contribution as the gaps are explored. Finally, the chapter went further to present a diagrammatic depiction of the association among the study concepts.

2.2 Theoretical Foundation, Models and Typologies

Theories referred to different schools of thought which provided a reasoned thinking on how things unfold in society. They gave meaning and explanations as to how and why things happened the way that they did. Models can be defined as depictions of actual realities. In the present study, the conceptual model depicted how the study variables are interrelated both directly and indirectly. On the other hand, the term typologies relates to the different categories given to the participants of the study, based on the findings, particularly the dependent variable.

The theories underpinning the study were the technological networks theory of innovation, dynamic capabilities theory as well as the knowledge-based view of the firm. The study was also based on the Porter's sustainable competitive advantage model. Technological networks theory of innovation held that technological innovation is driven both internally and externally. It further argued that innovation is driven by leadership and knowledge-intensive functions (Grant, 1996; Roos, 1998; De Carolis, 2002).

Each of the theories had been reviewed in light of its major postulations with respect to the key study variables. The strengths and limitations of each theory had also been considered and presented, this being the import of the use of multiple theories in the study. This, therefore, demonstrates the critical importance of understanding the contribution of the theories in order to effectively manage the operations of the networks. Key among the limitations of the theories was the fact that they lacked contextual precision. For example, dynamic capability theory did not provide guidance on what constituted an optimal mix of dynamic capabilities.

2.2.1 Technological Networks Theory of Innovation

This school of thought was formulated by Rogers (1983) and advanced by Ahuja (2000) and Dankbaar (2003). According to Rogers (1983), technological innovation occurred as a result of both internal and external drivers. Internally, innovation is driven by both organizational leadership and knowledge-intensive departments such as information technology and the human resource itself; while externally, innovation is driven by the way organizations respond to changes in processes that are necessary for value addition.

This was thus the anchoring theory as it underpins the various sets of relationship among the four key variables including technological innovation, strategic leadership, knowledge management, and the firm's ability to remain competitive. The technological networks theory of innovation was of the assumption that knowledge is an important determinant of innovation. This is largely attributed to its characteristic of buildup of technical knowledge, as well as by developments in technologies necessary for communication that made the knowledge readily available on a large scale (Rogers, 1983).

Technological innovation has two distinct characteristics: novelty and value. Novelty represents new technology and its new achievements, and value is manifested by the realization of market commercial value and the transformation from commercial value to social benefit. These two characteristics reflect the bridge function of the market throughout the whole process of technological innovation (Jin *et al.*, 2019). The important role of the market indicates that technological innovation needs to focus on market orientation, and new energy vehicle enterprises need to connect all kinds of entities in the market to broaden their own advantages.

It can be said that the close relationship between market orientation and multi-entity collaboration is the main driving factor for technological innovation. Actually, entities have developed innovation networks comprising formal and informal links, and taken advantage of the network effect to lead and drive the sustainable development, transformation and upgrading of the industry (Jin *et al*., 2019). Market orientation theory is the cornerstone of strategic marketing and strategic management. The theory is also a prerequisite for realizing competitive advantage and providing unique value to customers. According to Jaworski, & Kohli (1996), market orientation was a form of innovative behaviour, and it included the generation and internalization of market information coming from customers and competitors, as well as active and passive responses to market information. It can be seen that market orientation is a guidance incentive that is based on the market demand and transformation efficiency.

The driving effect of technological innovation is produced by the combination of customers, competitors, and other entities (Jaworski, Kohli, & Sahay, 2000). Therefore, combining market orientation and multi-entity collaboration can form the basis of a "multi- entity collaboration– technological innovation" paradigm that is based on market orientation. Moreover, technological innovation is not static in this paradigm, rather a dynamic process that conforms with the changes in the collaborative relationship among the main entities. Social network analysis is a theoretical framework that integrates multiple disciplines to study the relationship between actors. By focusing on the overall structural and functional interactions between actors and the process of change, social network analysis reveals the influence of a network structure on individuals and groups (Stephen & Pacey, 2003).

After decades of development, social network analysis has become the theory that underpins network structures, as well as the hypotheses of weak relationship strength and strong relationship theory, embeddedness theory, structural hole theory, and social capital theory. In addition, compared with other theories, the significance of social network analysis lies in its definition of the " connection". The theory not only explains the process of social mechanisms, but also emphasizes the interaction between nodes from the perspective of the overall network (Otte & Rousseau, 2002). It is very suitable for research into innovation and the solving of technical difficulties. An entity's network position is an important variable in network embedding theory, which refers to an individual's position in the social network. This is the result of the relationship between an individual and other network members, and can be used to describe an individual's access to resources (Tsai, 2001).

Two forms of this variable have been widely studied by the academic community—central position and brokerage position— because they best reflect the impact of network position on innovation performance (Zaheer & Bell, 2005). Central positions refer to individuals with many relationships to others in the network. The more connected their network nodes, the stronger their centrality. Brokerage positions describe the diversity of the network connections, which serve as a bridge between two disconnected nodes. The crossing and integration of market orientation theory and social network analysis has opened up research perspectives on the relationship between innovation and technological innovation. Market orientation theory broadens the perspective for the purposes of analyzing technological innovation. Social network analysis provides a tool for understanding the location of new products within the innovation network (Jin *et al*., 2019).

Recently, firms have increasingly been carrying out innovation with their network partners as opposed to doing the same with in-house R & D. According to Rampersad *et al*., (2010), the firms also relate with other firms, beyond their organizational borders, including universities, research organizations as well as government agencies. Furthermore, a French community innovation survey by Aissaoui (2014) aimed at studying how collaborations with public research organizations affects innovative performance of the firm found a favourable connection between an organization's innovative performance and collaboration with universities and other public research organizations. It is important to note that most innovative companies often interact and create establishing connections with other players and gaining access to foreign information with a view to tap into the benefits deriving from the dynamic effects of the interactive process (Torok *et al*., 2018).

Indarti and Postma (2013) aver that both the quality and intensity of the interactive process are products of the knowledge absorbed by the various external parties and together, they predict product innovation better compared to the diversity of the interaction. This, therefore, demonstrates the critical importance of understanding the contribution of external networks to innovation in order to effectively manage the operations of the networks. The limitation of technological networks theory of innovation is that it assumes that knowledge is the only central driver of innovation, overlooking other contributing internal and external factors such as marketing and research and development (Chesbrough, 2003). Knowledge could provide competitive edge as it may not be easily accessed by the competition.

The relevance of technological networks theory of innovation to the present study is to inform policy makers and strategic leadership in Kenya's large telecommunication firms that they can exploit complementary assets such as market- related networks and technological innovation activities to stimulate financial and non- financial performances. This way, they can achieve competitive advantage by fostering effective interactions of knowledge management with customers, suppliers and competitors.

2.2.2 Dynamic Capability Theory

This school of thought puts into account the unique resources owned by an organization which if well utilized can lead to a competitive position. Teece *et al*., (1997) acknowledged that the dynamic capability approach described an organization's capability of incorporating, reconfiguring as well as building key internal and external competences to address speedily fluctuating environments. Regarding processes, they described the way organizational plans and systems operated. Processes, therefore, involve coordination, learning and reconfiguring of organizational systems. Positions on the other hand, refer to specific organizational endowments, including intellectual property, technology, client base, external relations with suppliers, and complementary assets. Paths or opportunities simply described the organizations strategic alternatives and are usually modelled along technological opportunities and path dependencies (Adner & Helfat, 2003; Teece *et al*., 1997). As stated by Wang and Ahmed (2007), there are three essential component features common in dynamic capabilities across firms. These include adaptive capability, absorptive capability and innovative capability.

The firm's ability to identify and apply external information for commercial purposes is what adaptive capability is all about. On the other hand, companies that are capable of learning from their partners and then transform the acquired knowledge into competencies are said to have high absorptive capabilities. Finally, a firm's capacity to develop either new products or markets is the firm's innovative capability. Conforming to Eriksson (2014), creation of dynamic capabilities rests on internal (for instance, structural and social), and external antecedents (for instance, environment, networks, and relationships). The theory holds the assumption that in order for enterprises to create responsive capabilities, intangible firm resources like skills and knowledge ought to be constantly adapted and reconfigured to the ever-turbulent environmental forces (Jaskyte, 2011).

The major critique of dynamic capability theory is that it believes that differences in capabilities are due to management choices and vary across firms (Zahra, 2008). In line with Felin *et al*. (2015), dynamic capabilities play the important role of mediating and underpinning organizational performance such that those organizations with more dynamic capabilities are able to perform better than those with less dynamic capabilities. This is likely to occur in the organizational set ups where changing technology, competition structure, and political orientations present dynamic environments and the need for organizations to respond to different circumstances. With a view to sustain dynamic capabilities, Teece (2012) argued that strategic leadership would need to have entrepreneurial and leadership skills comprising of the sensing, seizing and transforming elements. This implied that achieving semi-continuous asset orchestration and renewal, including the redesign of routines remains, perhaps the most important managerial function.

Though related to other managerial activity, entrepreneurial management required for business to possess dynamic capabilities was different in that it had nothing in relation to optimization and standardized analysis. Entrepreneurial management had more to do with figuring out the next big opportunity or challenge and how to address it. Entrepreneurial management was, therefore, not just about maintaining and refining procedures. Dynamic capabilities theory (DCT) would immensely benefit from the arguments on firm-level strategy, capabilities and performance. The results would assist the Kenyan government in formulating policies for the sector meant to multiply its performance and competitiveness. This would increase revenue and generate occupations that reduced national unemployment index and aided in the fulfillment of Vision 2030 goal of transforming Kenya into an industrialized second world status. Dynamic capabilities theory was rooted in the Resource Based View (RBV), which postulated that capabilities are company's capacity and abilities to assign resources (Wernerfelt, 1984).

The exercise was usually in a fabrication of company's processes, procedures, and demands. DCT viewpoint on performance often aimed to comprehend firm development and survival abilities (Pearce, Robinson & Mital, 2012). The value created pivoted on how resources were combined within the company. Capabilities emerged due to firm's repeated practices and routines captured in venture models that went back decades and are hard to imitate (Rugami, 2013). Teece, Piano & Shuen (1997) extended RBV to formulate dynamic capabilities viewpoint that emphasized on organizational processes which employed firm resources. DCT approach to strategy evolved from resource application in generation of firm's core competencies (Lopez, 2005).

Dynamic capabilities are intangible internal resources which are idiosyncratic: unique to every company, inimitable and grounded in the company history (Rothaermel, 2008). Dynamic capabilities are strategic routines through which firms procured new resource arrangements as markets evolved, split, collided and died (Johnson & Scholes, 2005). It was observed that repeated practices detonated to the gradual development of dynamic capabilities, the categorization of that experience into technology. In addition, formal procedures reduced the difficulties to apply and accelerate in building routines and systems of effective capabilities but dependent on market dynamism (Eisenhardt & Martin, 2000). The mphases of DCT is on firm's ability to appropriately adapt, integrate and rearrange internal skills, resources, and operational competences to equal the needs of a dynamic surrounding (Rugami, 2013). Thus, company differentiation in performance is dependent on how it maximizes its critical capabilities and not mere ownership of resources.

The bottom-line of DCT is output which is enhanced when companies are keen to recombine, co- evolve, reconfigur, and reallocate resources as their wants change (Aosa, Bagire & Awino, 2012). Critics of the theory contended that dynamic capabilities are crucial but not enough in themselves for performance improvement (Eisenhardt & Martin, 2000). Apart from recognizing the theory's contribution, the scholars argued that by combining resources on learned processes and activities, the theory had nothing different from RBV preposition. Nevertheless, the theory guided the conceptualization of the moderation role of firm capabilities. Dynamic capabilities helped to deal with rapidly changing environments, considering the evolving nature of firms' resources and capabilities to adapt to changes in their environment (Lavie, 2006; Teece *et al*., 1997).

While there is a general consensus on the theoretical importance of dynamic capabilities in this landscape, this aroused several challenges for the firms, especially for small large telecommunication firms, affected by the lack of resources to compete in areas such as marketing, production, technological innovation, and international strategy. Dynamic capabilities in internationalization had been recently addressed by scholars since the foundation of the international ambidexterity literature (Hsu et al., 2013). Dynamic capabilities represented a firm's capacity to adapt its base of processes and resources, including knowledge, in response to changes in the environment (Helfat *et al*., 2007). The DCT is relevant as it guided the study in understanding how in the face of the increasing competition, large telecommunication firms in the country continually harnessed their knowledge management systems to technologically innovate and align other internal resources in order to remain competitive and thrive. Technological innovation was relevant in the alignment of firm product or service offering to its customers.

2.2.3 Knowledge-Based View

Various theoretical frameworks, including the knowledge-based view, are frequently used inside the discourse on management that is strategic to discuss the concept of competitiveness. For instance, the resource-based view (RBV) model provides that competitive advantage derives from a firm’s resources such as attributes, assets, capabilities, and knowledge, on condition that these resources are non-substitutable, rare, and imperfectly imitable (Barney, 1991). Another theory commonly utilized in literature on management that is strategic is the capability-based view that associate’s competitiveness with the resources defined to imply capabilities of the firm that require strategic leadership vision to develop and cannot be purchased in the market (Amit & Schoemaker, 1993).

Further, there is the relational view which holds that a single firm's resources are of limited value in the process of creating competitive advantage, hence, the need to adopt the combined resources of a network of firms to generate competitive advantage (Dyer & Singh, 1998). Therefore, according to Herden (2020), the knowledge-based view framers highlighted only one item as comprising the resource required to generate competitive advantage. The single resource is knowledge held by individuals of the firm and fulfills all the necessary characteristics (Grant, 1996a). The knowledge-based view clearly underlines the role of individuals (Herden, 2020). Essentially, the process of integrating and applying the knowledge is a responsibility of the organization's strategic leadership. However, the other members of the organization play a crucial role to carry, generate and preserve the knowledge.

This is important because according to Grant (1996b), competitive advantage cannot be attained simply by holding knowledge without integration. Furthermore, competitive advantage cannot be achieved by simply attempting to integrate non-existing knowledge. Therefore, the knowledge- based view also addresses issues related to organizational coordination and structure (Grant, 1996a). As reported by Teece (1998), the degree to which knowledge can be transferred is quite an important aspect determining integration and application of knowledge. The transferability of knowledge on the other hand depends on its form elements (for example, explicit form or tacit form). On the one hand, perfectly tacit knowledge is considered to be tied to skills and experience-based intuition, making it difficult to articulate, costly to transfer, and in terms of structure and purpose, not totally transportable.

Knowledge is conversely perfectly explicit in form is observable, usable and learnable. It is also easy to articulate and communicate. Perfectly explicit knowledge can also be transmitted without loss of integrity (Nonaka & von Krogh, 2009). Therefore, organizations need to understand this distinction in order to implement various actions necessary to exploit the knowledge. Grant (1996a) came up with four mechanisms used in incorporating information into the process of value generation. The first three mechanisms include rules and directives, sequencing and routines. The fourth mechanism involves group problem-solving and decision-making (Canonico *et al*., 2012). Since different organizations have different processes and characteristics, it is important that the mechanisms are suitable for application to varying complexity, uncertainty or importance of the specific tasks (Hurnonen *et al*., 2016).

An important aspect to underline is the fact that competitive knowledge will depend largely on organization's efficiency of knowledge integration. This is where the current study becomes important in assessing the link between strategic leadership and knowledge management in creating competitive advantage. A key contribution by Nickerson and Zenger (2004) was the extending of the concept of comparative logic of transaction cost economics to the knowledge-based view by introducing the problem- solving aspect of the theory of the firm. Later, Kapoor and Adner (2012) further extended this theory when they suggested that firms derive gains from investments in the knowledge acquired from outsourced activities. Furthermore, they also established a correlation between problem complexity and the nature of technological change informing product innovation (Hamilton & Philbin, 2020).

Scholars and practitioners increasingly emphasize knowledge as a key source of competitive advantage (Huarng, 2010). However, in today's turbulent market environments, firms are increasingly facing challenges to keep their knowledge base up- to-date. With no reconfiguration of the knowledge base, a firm's knowledge can become obsolete and advantageous competitive positions can erode (Leonard-Barton, 1992). To sustain the strategic value of knowledge in changing environments, firms require a set of capabilities to alter their knowledge base (Romme *et al.*, 2010). A better understanding of these capabilities is a key concern for both scholars and practitioners alike. The firm's knowledge-based view argued that the existence of the firms was justified by the need to ensure that there is creation, transfer and transformation of knowledge into their competitive positioning within the industry of operation (Barney, 2001). In the present study, KBV was employed to elucidate the mediating role of knowledge management on the relationship between technological innovation and competitive advantage among large telecommunication firms in the country.

A key assumption of KBV was that knowledge is deemed to be a crucial strategic asset and resource and, hence, the knowledge intensive firms ought to consider knowledge as a unique asset that can be used for strategic responses to technological disruption (Grant, 1996). Knowledge resources according to Wiklund and Shepherd (2003) are predominantly significant to guarantee sustainable competitive advantages. The limitation of KBV was that it was very descriptive and limited in its scope of variables (Priem & Butler, 2001). It was also argued that KBV overemphasised knowledge-based competition, and did not acknowledge other drivers of competition such as supplier and customer bargaining power (Barney, 2001).

This was contrary to the views held by the RBV which gave a more prescriptive model to competitive position. It argued that the resources could comprise assets, experience, culture, structure among other variables that if well utilized gave an organization an upper hand. The KBV theory makes an important contribution to the current study as it emphasizes how knowledge is an important tool for change management that strategic leadership can use to respond to issues of staff retention. Furthermore, the theory highlights how large telecommunications companies can gain a competitiveness in the business by combining explicit and tacit knowledge. Explicit knowledge defines industry trends that are generally practised by competing firms rather as response to market demands and requirements than specific strategies for achieving competitive advantage. As such, the market value of explicit knowledge within a firm is more or less equivalent to its market value.

Firms utilize tacit knowledge to draw competitive advantage from the individual or firm-specific capabilities that are difficult to transmit or encapsulate. Firms apply tacit knowledge whenever responding to changes in market structures (such as the launch of new products by a competitor) or changes in market regulations that open up the market to competitors. The relevance of KBV to this study is to provide understanding to policy makers and leaders in Kenya's large telecommunication firms regarding the possibility of achieving competitive advantage through increased employee involvement in the formulation and administration of the operational goals and long-term transformational objectives. The continuous acquisition and transfer of knowledge within business organizations is necessitated by such factors as ever-changing competitive conditions in markets initiated by globalization, frequent deregulations, and technical advancements.

2.2.4 Porters Model of Sustainable Competitive Advantage

Porter's model of sustainable competitive advantage is derived from the industrial organization economic theory which opines that the structure, the degree of competitiveness as well as industry attractiveness is a product of imperfections in the market for instance existence of the costs of transaction as opposed to the assumption of perfect world as per the competitive model (Coase, 1937). In the industrial organization theory, the key features of the oligopolistic industry structure are manifested in the exit (or entry) market power and barriers and is required to stem from the presence of behavioral or structural barriers to new entry (Bain, 1956). Porter (1985) argued that every generic strategy from the three (for example, cost leadership, differentiation and focus) can be applied independently as organizations strive to achieve a competitive position. This means that firms have to make a choice on which of the three generic strategies they seek to apply to gain a competitive edge (Peteraf, 2013).

This if further supported by Grant (2012) who established that application of one of the strategies is sufficient as opposed to mixing all the three strategies. As contended by Porter (1985), application of these strategies contributes to sustainable competitive position through accomplishment of high resource turnover, efficient investment, better and timely innovations. It is important that a firm decides whether it seeks to achieve a competitive position through cost advantage or differentiation advantage to achieve strategic focus. Each of these strategies can be applied in both defensive and offensive actions to come up with a position which can be defended in the industry (Grant, 2012).

Rajesh & Makhmoor (2017) contend that a firm's resources and capabilities together form its distinctive competencies. These competencies enable innovation, efficiency, quality, and customer responsiveness, all of which can be leveraged to create a cost advantage or a differentiation advantage. Competitive advantage is created by using resources and capabilities to achieve either a lower cost structure or a differentiated product. A firm positions itself in the industry through its choice of low cost or differentiation. This decision is a central component of the firm's competitive strategy. The firm creates value by performing a series of activities that Porter identified as the value chain. The firm operates in a value system of vertical activities including those of upstream suppliers and downstream channel members. To achieve a competitive advantage, the firm must perform one or more value creating activities in a way that creates more overall value than competitors do.

Superior value is created through lower costs or superior benefits to the consumer (differentiation). In a critical review on business strategy, internal resources, national culture, and competitive advantage, Awino (2015), observed that businesses thrive in the market by utilizing available internal resources by developing and implementing strategies that give them a competitive edge over and above their competitors. Organizations acquire competitive advantage over its competitors by offering customers greater value, either by lower prices or by producing additional benefits and services that justify similar benefit or possibly higher prices as compared to other market players. Achieving sustainable competitive advantage assures the maintenance and improvement of the business competitive position in the market.

The critical review also concluded that in a global and liberalized economy, without incorporating the national culture as an intervening variable in the framework. Therefore, irrespective of the classical theoretical view for competitive advantage a researcher may take, be it of Porter's firm positioning through five forces analysis or Prahalad and Hamel of operational efficiency through proper utilization of the firm's internal resources for competitive advantage, still the influence of national culture cannot be ignored. Accordingly, Porter (1980) opined that competitive advantage can be viewed as the ability gained through attributes and resources to perform at a higher level than others in the same industry. He postulated that a firm must decide whether to attempt to gain competitive advantage or differentiate its products and services and raise prices.

Competitive advantage occurs when an organization acquires or develops an attribute or combination of attributes that allows it to outperform its competitors. In a service-oriented business, competitive edge is well achieved through innovation strategies, which are value creating, and are not simultaneously being implemented by any current or potential player. Clulow *et al*. (2003), reckons that successfully implemented innovation strategies would lift a firm to superior performance by facilitating the firm with competitive advantage to outperform current or potential players. To gain competitive advantage through innovativeness and value addition, the business strategy of a firm has to be formulated in a way that optimally manipulates the various resources over which it has direct control.

They often consider adopting innovative strategic tools to address the challenge of improving service quality, increasing productivity and competitive advantage (Kamakura *et al*., 2003). The relevance of Porter's model of sustainable competitive advantage to the current study is that it develops the basis of interaction between strategic leadership, knowledge management, and technological innovation. It achieves this by suggesting that technological change is such an important influence on competitive advantage both because it creates new opportunities for competition and because it plays a fundamental role in the existing competitive strategy through its ubiquitous presence in the value chain. Secondly, that change in the way office functions can be performed is one of the most important types of technological trends occurring today for many firms, though few are devoting substantial resources to it.

2.3 Empirical and Conceptual Studies

This section reviewed the empirical and conceptual literature pertaining to the research problem. An empirical study is verifiable by experience or observation as opposed to pure logic or theory. Empirical literature is reported in such a way that helps other researchers to understand what was done and what was found out in a specific study whereas a conceptual study is conducted by observing and analyzing existing information on a particular subject, it is in relation to abstract concepts, the mind, or imaginary ideas. A conceptual framework could be developed from the concepts.

Conceptual studies could be employed to develop new theories or interpret prevailing theories in a different manner. Tashakkori and Teddlie (2008) defined empirical literature as the measured and observed phenomena and derive information from real experiences. It highlights the research works carried out by previous scholars, methodologies adopted, and their findings. Often, empirical evidence was guided by some philosophical underpinning. Both empirical and conceptual reviews aided in answering the research question.

The section helped bring out what previous scholars had found out so as to give direction to the current study. The empirical literature further reviewed scholarly pieces of work as undertaken by researchers that helped inform the direction that the current study was to assume with regard to the objectives. The analytical methods used by an empirical study are normally informed by the set of objectives. Attention and emphasis in this section was given to the main study variables in terms of previous scholars' contribution, methodology adopted, scope so as to develop the gaps that the current study set out to fill.

2.3.1 Technological Innovation and Competitive Advantage

Academic interest on the association between innovations that are technologically oriented and competitive positioning continues to grow. Pulgarín-Molina and Guerrero (2021) conducted an assessment of the research on innovation and performance that has been published in several of Colombia's most prestigious journals. The study was however not specific to the telecommunication sector, and thus the outcomes might not be generalized to the present study context.

Wilburn and Wilburn (2021) assessed in a desktop review, the interrelationships of artificial intelligence, big data, and the Internet of things on the ability to help businesses do more with less and provide better results. While this new structure of work may allow some people the work/life balance to pursue their creative goals, for others it may mean a life with no stability or future. The result may be a two-tiered society where the rich can afford expensive products and services, and the poor require governmental assistance because although products can be produced more cheaply, they cannot afford them and so they are not produced. The study design was however desktop, hence not context-specific, and therefore, findings may not be generalizable to the present context.

Asa *et al.* (2021) analysed the effectiveness of technological innovation as a strategy for driving competitive advantage and increasing market share in the Namibian banking sector. A comprehensive literature review was done with the collaboration of a quantitative research approach to draw data relating to technological innovations and their impact on competitive advantage. Employees at Nedbank and FNB in Windhoek were selected as respondents representing the entire Namibian banking sector population. The findings revealed a positive correlation between technological innovations as a strategy and competitive advantage and increased market share. The study, however, only focused the direct linkage, overlooking any indirect association between technological innovation and competitive advantage. The study context was also the banking industry which is operationally different from the telecommunication sector.

Ibrahim (2020) studied the impact of technology advancements on a firm 's success with reference to an Irish food retail company. Employing a descriptive design, the findings revealed that there is a link between technical competitiveness and innovativeness. Among others, firm success has been influenced by technological innovations in this regard including online app, website and point of sale machines. It was thus concluded that in the Irish food retail company, competitiveness is positively influenced by technological innovation. The study however only focused the direct linkage, overlooking any indirect association between technological innovation and competitive advantage. Laban and Deya (2019) investigated the effect of strategic innovations on organizational performance of information communication technology sector firms in Nairobi County in terms of product innovation, market innovation, process innovation and organizational innovation.

A descriptive survey design was adopted, findings establishing that market innovation was the most common and the highest predictor of organizational performance followed by product innovation then process innovation while organizational innovation had the lowest impact since it was only moderately used. The study, however, only focused on the direct linkage, overlooking any indirect association between technological innovation and competitive advantage. In a study to investigate the influence of strategic innovation on performance of telecommunication firms, Kanyuga (2019) investigated the case of Kenya's Safaricom Company. The study concluded that, companies' ability to introduce new improved product to facilitate their entry and creation of new markets.

The study was however a single case study of Safaricom, results of which may not be applicable to the entire telecommunication industry. A study in Britain on telecommunications forecasting by Oughton *et al*. (2018) that zeroed-in on fast-evolving technologies found that demand, supply, and the market scenario in Britain were affected by technological innovation. The authors ultimately foresaw a rise in the cost of acquiring new technologies, and that the less wealthy regions that cannot install such technology will be left out of the market bracket. The methodology involved the use of an open- source modelling framework that could forecast technology diffusion in Britain between the years 2016 and 2030.

Nafula (2017) studied the effect of innovation on firm competitiveness with a focus on small and medium enterprises in the manufacturing sector in Nairobi City County, Kenya. Findings from descriptive and inferential statistics reveal that all the four types of innovation including product, process, marketing and organizational had positive effect on competitiveness. However, product innovation had insignificant effect. The study, however, focused on small and medium enterprises, which operate differently from large telecommunication firms. In a study of the industrial market that focused on the relationship between innovation strategy and other aspects of firm performance, Jajja *et al*. (2017) opined that buyer-seller relationships do not moderate between innovation strategy and innovation performance. This study made a specific observation that in order to achieve technological innovation, firms must align themselves with suppliers that pursue strategic innovations.

However, the study only used a descriptive study design and had two sample frames, one in India targeting 450 firms, and the other in Pakistan targeting 850 firms. In studies on science, technology, and innovation for competitive advantage Krammer (2017) suggested the need for smart specialization in developing countries in which equipment and software acquisition is paramount. The study pointed out that smart specializations in developing countries in Eastern Europe, such as Bulgaria, and other parts of the world are sustainable if approached in a block. Such a smart specialization approach is best suited to economies that practice the exportation of goods, as this enables them to balance their exports with the expense of purchasing new equipment and software.

Jaskyte (2013), explored the association between technological association and competitive association and came to the conclusion that the antecedents of technological innovation include activities such as research and development, technique for developing a new product/service, or the advancement of an existing product. The study, however, focused only on the direct link between technological innovation and firms' competitiveness and failed to account for any indirect moderating or mediating factors that may affect the direct association, prompting the present study. Abdi and Ali (2013) examined the association between technical innovation and business performance in Sub-Sahara Africa with reference to the telecommunication industry in Somalia, and found that administrative innovation and technical innovation significantly and positively influence business performance.

The study, however, only focused on the financial measures of business performance which only accounted for the quantitative aspects of business performance at the expense of the equally important qualitative aspects. This study employed fundamentally different measures of competitive advantage, accounting for Porters' five forces model of competitive advantage, particularly product differentiation and innovation and cost leadership. Letangule and Letting (2012) explored how the performance of companies in the telecommunication industry in Kenya were affected by innovation strategies and found that the adoption of innovation strategies had a positive and significant effect on the performance of telecommunication firms. The study, however, focused on the profitability of firms as a measure of organizational performance. Profitability only accounted for the financial measures of performance and did not assess the non-financial measures.

In a study to investigate the relationship between firms' innovativeness, strategic orientations and performance, Rubera and Kirca (2012) agreed that process innovation leads to an organization's ultimate performance outcomes such as financial position and firm value. The pursuit of efficiency, operational excellence, cost advantage in raw material procurement and economies of scale are critical ingredients to the performance of a firm when coupled up with strategic innovative processes. The study held that consumers would prefer products and services that are processed using superior technological advancements.

2.3.2 Technological Innovation, Strategic Leadership, and Competitive Advantage

Intellectual interest on the association between technological innovation, strategic leadership, and competitive positioning has developed in the recent past. Kurzhals *et al.* (2021) conducted a comprehensive review of the effect of strategic leadership on technological innovation. The review reveals a need to better understand the impact of innovation on strategic leadership. The study also suggests that scholars exploit novel research settings in order to illuminate additional facets of the relationship between strategic leaders and innovation, and they need to ensure consistency and care in the measurement of innovation. In keeping with the suggestion, the present study set out the influence of strategic leadership and knowledge management on the relationship between technological innovation and competitive advantage.

Dodgson (2021) conducted a desktop review of the strategic management of technology and innovation. The study found that the strategic management of technology and innovation is hurdled by the pressing need for greater environmental sustainability, increased focus on the social consequences of innovation, and the impact of new digital and data-rich technologies. To address this, the study suggests that attention to physical and intellectual capital needs to be supplemented by greater concern for natural, social, and human capital, and to organizational behavior and culture. The study however adopted a desktop design, which is not context-specific and the findings may therefore not be applicable in the present context.

Elenkov *et al.* (2020) explored the strategic leadership and executive innovation influence, adopting an international multi-cluster comparative study approach. Using survey data from six countries comprising three social cultures, strategic leadership behaviors were found to have a strong positive relationship with executive influence on both product–market and administrative innovations. In addition, top management team tenure heterogeneity moderated the relationship of strategic leadership behaviors and executive innovation influence for both types of innovation, while social culture moderated that relationship only in the case of administrative innovation. The study was however focused on only product–market and administrative innovations as measures of innovation, while in this investigation innovation was indexed using the full spectrum of process innovation, product innovation, operation system innovation, information system innovation and distribution channel innovation.

Subin *et al.* (2020) also found evidence pointing to new market pioneering suggesting that new product creativity and channel outcomes serve as mediators. This enabled the researchers to integrate the new product development and channel management perspectives to gain a comprehensive understanding of the ambidextrous routes through which channel innovation knowledge management capabilities can drive competitive advantage in cross-functional new product development teams. Finally, the study found that there was evidence indicating that there are specific knowledge management capabilities that allow new product development teams to deploy innovation-related knowledge from channel members, for example, collaboration with external partners to generate competitive advantage.

As stated by Mostafa (2020), strategic leaders enhance innovation and new idea generation through intellectual stimulation. Strategic leadership can contribute to overall organizational performance through implementing information technology to increase knowledge management performance and help close the gap between success and possible failure. Strategic leadership has a crucial role in developing and nurturing new ideas, and this is essential for strategic development in the organization. Memarpour and Leeratanarak (2019) studied the influence of leadership on innovation in technological industries with a focus on two Swedish multinational manufacturing companies. Utilizing SEM and multiple equations modeling techniques (employing both multiple regression and factor analysis), the research findings revealed that Swedish-founded international manufacturing firms with manufacturing facilities around the globe strengthen their technological incremental innovation ability. The study was however focused on the association between innovation and leadership that is strategic, with no linkage to competitive advantage.

According to Witjara, Herwany and Santosa (2019), strategic innovation is a future-focused business development framework that identifies breakthrough growth opportunities, accelerates business decisions, and creates near-term, measurable impact within the context of a longer-term vision for sustainable competitive advantage. Strategic innovation challenges an organization to look beyond its established business. It is an important factor for organization's sustainable competitive advantage and financial performance. Innovations provide firms a strategic orientation to overcome the problems they encounter while striving to achieve sustainable competitive advantage (Kuratko, Hornsby & Hayton, 2015).

Gikunju *et al.* (2018) assessed technology innovation as a strategic management practice and a determinant of performance of tea industry in Mount Kenya Region. Employing a mixed methods research design, it was established in the study that technological innovation and strategy implementation have a strong positive relationship with financial performance of the tea industry in Mount Kenya region. Based on the findings of the study, it was concluded that strategic management practices influence performance of tea industry. The study however explored technology innovation in relation to the broader strategic management concept, while the present study explored the same, in relation to strategic leadership.

A study by Mohammad (2018) sought to investigate the effects embedded in a model comprised of four constructs: strategic leadership, strategic thinking, strategic planning and competitive advantage. The findings of this study confirmed that strategic leadership was significantly and positively related to strategic planning, strategic thinking, and competitive advantage. The effect of strategic leadership on competitive advantage was mediated by strategic planning, and strategic thinking.

In a different study, Zuraik (2017) sought in their study, to propose a strategic model for innovation leadership with evidence from transformational leadership practitioners in a supportive climate for fostering innovation. The study showed that transformational leadership behaviors of organizational leaders can aid in enabling and championing innovation in their organizations. The study also found that the ambidextrous behavior of team leadership can impact innovation outcomes at the team level.

Kisingú (2017) studied the role of leadership that is strategic in the attainment of a competitiveness that is sustainable among Kenyan private and public universities. The study established a significant linkage between leadership that is strategic and competitiveness among private and public universities in Kenya. The study, however, only assessed the direct linkage between strategic leadership and competitive advantage not accounting for technological innovation. Also, in the study, competitive advantage was only indexed by qualitative measures including organizational excellence, organizational effectiveness and organizational responsiveness. This failed to account for Porters' five forces model of competitive advantage such as innovation and differentiation of products and leadership of cost, hence, the present study.

Detelin *et al.* (2015) conducted an international multi-cluster comparative study on the relationship between strategic leadership and executive innovation and found that strategic leadership behaviors had a strong positive relationship with executive influence on both product-market and administrative innovations. The study, however, adopted a desktop review design which relied on secondary data whose validity cannot be ascertained and, therefore, lacked the primary, first-hand information from the practitioners of strategic leadership and their perspectives informed by actual experience. To address this gap, the present study set out to obtain responses from strategic leaders across large telecommunication firms in the country for their first-hand information informed by actual experience.

Strategic leadership enhances knowledge acquisition through facilitating knowledge transfer and simultaneously exploring more innovative solutions for organizational problems. Thus, executives that embrace strategic leadership have a positive impact on knowledge accumulation process. Furthermore, these strategic leadership help improve knowledge integration by facilitating knowledge sharing throughout the various organizational ranks. More importantly, strategic leadership develops relationships and interactions within companies, sets desired expectations, and inspires followers to identify further opportunities in their business environment. Mahdi and Almsafir (2014) investigated the role of strategic leadership in the academic environment using a sample of academic leaders and revealed that strategic leadership significantly and positively predicted organizations' sustainable competitive advantage.

According to a study by Hughes and Beatty (2011), strategic leadership is basically related to three key dimensions, which are think, act, and influence. This study concluded that the main job of strategic leadership is to drive the organization toward a long-run success via competitive advantage. On the other hand, strategic leadership was found to significantly predict strategic planning and strategic thinking. Furthermore, both strategic planning and strategic thinking were significantly related to competitive advantage. The overall finding of this study was that strategic planning and strategic thinking mediated the effect of strategic leadership on competitive advantage.

2.3.3 Technological Innovation, Knowledge Management, and Competitive Advantage

Saabs and May (2020) assessed how organisations under low- and medium-technology (LMT) industry category innovate, and the impact the chosen innovation strategy with knowledge accumulation and organizational performance in Sweden. Adopting an abductive research approach, the data was gathered via semi-structured interviews with C-level executives and management responsible for innovation initiatives. Findings indicate that the ability to identify relevant knowledge and assimilate it drove innovation within the LMTs assessed. Organizational cultures influence the choice of innovation strategies, while peoples' knowledge drives performance. The study however focused on LMTs, while the telecommunication industry is technology-intensive.

López-Nicolás and Mero˜no-Cerdán (2020) studied the linkage among strategic knowledge management, innovation and performance. Based on SEM, the study surveyed 310 spanish organisations. Results show that both knowledge management strategies (personalisation and codification) impacts on innovation and organisational performance directly and indirectly (through an increase on innovation capability). Moreover, findings demonstrate a different effect of knowledge management strategies on diverse dimensions of organisational performance. The study was however focused on the association between knowledge management and innovation, with no linkage to competitive advantage.

Young (2020) studied the linkage among knowledge management, innovation and firm performance of United States Ship Repair. Data were collected from 69 CEO/Presidents, Human Resource personnel, or members in leadership positions of the Virginia Ship Repair Association in the mid-Atlantic region of the United States. It was found that increasing knowledge sharing and innovation practices provide for positive social change for the personnel of these organizations, since the skills they learn within their organizations are immediately usable in their personal endeavors in their churches, neighborhoods, and family relationships and are transferrable to those they interact with outside of their organizations. The study was however focused on the association between knowledge management and innovation in relation to firm performance, which is conceptually different from competitive advantage.

Subin *et al.* (2020) investigated the effect of channel innovation and knowledge management on competitive advantage, the researchers empirically examined how knowledge derived from vertical channel partners can be managed and deployed in multiple ways to gain competitive advantage through a dual path model. The study established that firms could pursue exploitation and exploration simultaneously by deploying channel innovation knowledge management capabilities through two contrasting but complimentary paths to gaining competitive advantage that is new product development knowledge capabilities. The study however narrowly focused on channel innovation, which is conceptually different from strategic innovation.

In a desktop review whose key objective was to analyze the theoretical relationships between strategic leadership, knowledge management, firm performance, and information technology, Mostafa (2020), demonstrated that although past empirical research confirms the significant role of these theoretical relationships in building organizational performance outcomes, they fail to present an integrated model depicting these theoretical links. This study found that strategic leaders not only impact knowledge management directly through improved use of data, information and knowledge thus increasing speed and lowering cost, but also fosters more effective information technology use that can positively contribute to effectiveness of knowledge management as a critical firm performance driver.

Kipkosgei *et al*. (2020) evaluated trust among coworkers and sharing of knowledge among employees of Kenya's public sector. In the study, Kipkosgei *et al*. (2020) argued that in the recent times, advanced technologies have increasingly gained prominence in Kenya. Further, the study argued that through Vision 2030, Kenya is focusing on becoming a knowledge-driven state, with knowledge sharing playing an important role to support rapid economic growth that is a crucial aspect of the Kenya Vision 2030. Mostafa (2020) argues that information technology is an internal resource that develops and integrates organizational knowledge as the most strategic factor of competitiveness. In addition, information technology can be also considered as a facilitator of the knowledge creation process through providing the essential infrastructures to store and retrieve organizational knowledge.

Mardani *et al.* (2018) assessed the relationship between innovation and management of knowledge and organizational performance with reference to the Iranian power syndicate. The study found that knowledge management activities directly affected organizational performance and indirectly affected innovation by an increase in innovation capability. The study, however, relied only on secondary data whose validity is not assured and also lacked the primary, first-hand information from the practitioners of strategic leadership and their perspectives informed by actual experience. To address this gap, the present study set out to obtain responses from strategic leaders across large telecommunication firms in the country for their first-hand information informed by actual experience. According to Karimi & Javanmard (2014), if organizations fail to observe proper management of knowledge, they can become obsolete and useless. Knowledge management is, therefore, a process that entails acquisition of knowledge, knowledge dissemination, and the utilization of information by leadership.

Liophanich (2014) observes that world over, knowledge-oriented companies often endeavor to tap into experiences from their workers. Therefore, having a knowledge management system in place allows the company to achieve this goal. For instance, telecommunication companies, including British Telecom, AT&T, and Deutsche Telekom demonstrated that they value intellectual assets by creating the position of Chief Knowledge Officer tasked with ensuring effective knowledge management programs in their respective companies. In a case study of Saudi Telecom that sought to assess integration of knowledge management system in telecommunication, AIRowaily & Olsadhan (2012) opined that knowledge management is a very essential parameter for industrial growth.

Specifically, the study highlighted the critical role of knowledge management in telecommunications companies, including serving as important business intelligence, and enhancing good practice and work relationships between strategic leadership and workers thereby creating conducive environment for creative ways for success. Bratianu and Orzea (2010) performed a critical analysis of the knowledge dynamics model elaborated by Ikujiro Nonaka and concluded that knowledge creation is a dynamic capability that enables firms to achieve a sustainable competitive advantage in the market. In a different study, Mitchell (2010) observed that the ability to create knowledge is a critical foundation for an organization's ability to be continuously dynamic, Viju (2010) concluded that knowledge management influences the degree of innovativeness demonstrated by any particular company. The study suggested that the presence of an educational environment and an information sharing attitude creates potential for creativity and creativity and thus competitive advantage by leaders.

As noted by Kiessling *et al.* (2009) knowledge management involves not just acquiring and storing of knowledge, but also understanding, sharing, and implementing the knowledge in a manner consistent with the firm's business strategy. However, the particular properties of knowledge necessitate that knowledge assets be accorded special attention. Research on the association between technological innovation, knowledge management, and firm's competitive ability abounds. The modern international economy is largely and increasingly knowledge-based. According to Riege (2007), knowledge is an important driving force for organizational success and survival as the creation of wealth and prosperity relies on the amount and quality of information and knowledge available to be used. Furthermore, organizations today focus on strategic knowledge management as a way

to obtain a competitive edge in an ever-changing and challenging market. Through effective knowledge management, organizations create distinctive capabilities that go a long way to improve business. According to Hall and Mairesse (2006), knowledge possesses characteristics of a public good, is often entrenched in workers, and can hardly be sold or bought in the market. Consequently, a technologically innovating organization will seek to have in place a sophisticated knowledge management framework that focuses on the knowledge creation dimensions and the special interactive knowledge necessities.

This implies that effectiveness in emerging distributed organizations is defined in terms of how well information is disseminated between units, teams and individuals (Mardani *et al.*, 2018). Similarly, the study by Muhammed (2006) highlights major functions for information technology. The study explains that information and communication technology enhance learning and knowledge sharing by providing access to knowledge, stimulating new ideas and knowledge generation, thereby improving knowledge capturing, storing, and accumulating to achieve organizational goals resulting into competitive advantage.

2.3.4 Technological Innovation, Strategic Leadership, Knowledge Management, and Competitive Advantage

Scholarly interest on the joint effect of competitiveness, technological advancement, leadership that is strategic, and management of knowledge on continues to develop. Mahdi and Nassar (2021) conducted a study aimed at to combat the COVID-19 virus, researchers are evaluating the business model for long-term competitiveness via strategic leadership qualities and information management procedures. Following in-depth discussions with academics and other participants, as well as inference, the study established that a strategic leader can bring about change since IIUI performs better than competing institutes.

This was particularly attributed to the presence of a strategic theme line that influences the organizational culture in the institution. The study, however failed to capture technological innovation and knowledge management. It was also qualitative in design, with findings. Hunitie (2021) conducted a bi-meditational study to assess the impact of strategic leadership on strategic competitive advantage through strategic thinking and strategic planning with reference to the health care sector in Jordan. The results pinpointed that strategic leadership significantly predicted strategic planning, strategic thinking and competitive advantage. The context of the study was however the health care sector in Jordan which operates differently from the telecommunications industry, and therefore the findings may not be generalizable to the present study context. The study also fails to capture technological innovation and knowledge management.

Mahdi *et al.* (2021) examined in private institutions, operational leadership competencies and a long-term competitiveness are important. Employing Structural Equation Modeling (SEM), 44 private universities were surveyed in Iraq. Findings indicate a important relationship between strategic leadership capabilities and sustainable competitive advantage. The findings highlight the importance of private colleges utilizing, maintaining, and developing their physical and social infrastructure in order to achieve a more durable competitive edge. The context of the study was however private universities in Iraq, which operate differently from the telecommunications industry. The findings may therefore not be generalizable to the present study context.

Owusu-Boadi (2019) studied the role of strategic leadership in the profitability of large organizations. The sample consisted of 2 board members and 3 senior leaders from a large tax preparation organization located in the United States. Data were analyzed through thematic analysis. Five themes emerged, including effective planning, risk management, the use of unique resources, development of training and skill for strategic leaders, and organizational performance. Findings derived from this study show that senior executives use efficient strategies to increase economic viability and employment opportunities through improved business growth while ensuring profitability. The study, however, focused on firm profitability, which is a narrower aspect of competitive advantage. The findings may therefore not be applicable in the present context.

Medforth (2020) sought to establish the effect of strategic alliance practices on designated firms' organizational performance in Kenya's energy sector. It was found that information exchange promotes innovation and progress by giving employees access to a shared skill set. The outcomes of the study pointed out that knowledge transfer may be useful in identifying and filling knowledge gaps, and nurture a learning culture hence enabling faster and better decision-making. Nekmahmud and Rahman (2018) aimed at measuring the competitiveness of factors in telecommunications markets, argued that the telecommunication industry has arose to be the quickest growing technology market in the globe, and has become part of every person's life. Therefore, a core service for telecommunication companies' strategic leadership should involve networks to use mobile phones services and broadband. Support services by workers are tailored to facilitate the core service.

Khajeheian (2017) argued in their study that telecommunication companies endeavor to achieve customer loyalty, quality, and satisfaction. However, an important aspect highlighted by this study was the suggestion that emerging markets in the telecommunication industry are characterized by changing technological innovation, changing laws and changing value patterns. This requires strategic leadership formulating and implementing dynamic innovative strategies coupled with knowledge management for any telecommunication company to achieve sustainable competitive advantage.

As stated by Titi-Amayah (2013), knowledge sharing and transfer were found to be key among the knowledge management elements due to their ability to aid the spread and accessibility of knowledge within or between selected enterprises; shared amongst stakeholders or transferred from one department to another, a conclusion that was also arrived at. This paints an incomplete depiction of how the variables interact between and among each other to influence competitive advantage. To address this gap, the present study sought to articulate how competitive advantage is both indirectly and directly influenced by the variables. Cowhey and Aronson (2012) focused on this issue and concluded that firms used technological innovation to spur market penetration, aided by knowledge management strategies. The study, however, failed to account for the possible influence of strategic leadership on the connections between advancement that is technological and competitiveness. In the effort to bridge this gap, the study strived to articulate the nature of both the direct and indirect relationships.

Bera *et al*. (2011) established that strategic leadership was a key cornerstone in ensuring there is development of competitive advantage that is sustainable. However, the influence of technological innovation on the connection between strategic leadership and competitiveness was not within the scope of the study. The studies further failed to clearly articulate the nature of the linkage among the concepts, either as mediation or moderation. As a way of filling this gap, the study sought to investigate the moderation and mediation effects of strategic leadership and knowledge management respectively. Leadership that is transformational is suited for developing social networks for innovative organizations where information is exchanged, according to Coakes and Smith (2007), since leaders that are transformational encourage engagement in social connections. Leaders that are transformational according to Lin and Hsiao (2014), create n environment that encourages followers to share their knowledge.

2.4 Knowledge Gap Summary

From empirical literature reviewed, various gaps in knowledge were identified. The gaps were classified as conceptual, contextual, and methodological. Some studies showed a narrow focus of the dimensions of the variables of interest, others focused on different regional contexts with unique characteristics using different methodologies hence gaps. Various strategies were developed in the current study to fill the different gaps in knowledge identified. The identified gaps were summarized as evidenced in Table 2.1.

Table 2.1: Knowledge Gap Summary

Researcher(s)	Focus of Study	Study Model / Variables and Typologies	Methodology	Findings	Research Gaps	Focus of Current Study to Fill the Gaps
Pulgarín-Molina and Guerrero (2021)	A review of literature on competitiveness and innovation	Innovation that is technological and competitiveness	Desktop review	technological innovations stand out among the best performing Colombian firms and are thus normally considered as regular aspects in the implementation development of competitive advantages	Qualitative in design; not specific to the telecommunication sector, and findings may not be generalized to the present study context	Quantitative approaches adopted in data collection and analysis; focuses on the telecommunication industry
Khan and Hira Amin (2021)	The strategic leadership's role in achieving excellence	Strategic leadership; competitive advantage	Qualitative, in-depth interviews, observation	Strategic leadership results in competitive advantage	Only direct linkage between strategic leadership and competitive advantage	Explores the indirect relationship between technological innovation and competitive advantage through strategic leadership
Mahdi *et al.* (2021)	Private colleges have strategic managerial skills and a long-term competitiveness	Strategic leadership capabilities, sustainable competitive advantage	Structural equation modeling	To achieve a stronger sustainable competitive advantage, private institutions must employ, maintain, and expand their physical and social infrastructure	Only direct relationship assessed; the context of the study was also private universities in Iraq, which operate differently from the telecommunications industry	Assesses the indirect relationship between technological innovation and competitiveness via management of knowledge and leadership that is strategic

Table 2.1: Summary of Knowledge Gaps Continued

Researcher(s)	Focus of Study	Study Model / Variables and Typologies	Methodology	Findings	Research Gaps	Focus of Current Study to Fill the Gaps
Dodgson (2021)	Effect of strategic management on technological innovation	Technical advancement and management planning	Desktop review	Strategic management of technology and innovation is hurdled by the better environmental reliability is a major need and the impact of new digital and data-rich technologies	A desktop design, which is not context-specific and the findings may therefore not be appropriate in the present context	Focuses on the telecommunication sector, and the indirect effect of technological innovation on competitive advantage through strategic leadership
Saabs and May (2020)	Impact of innovation strategy on knowledge accumulation and organizational performance	Innovation strategy, knowledge accumulation, organizational performance	Mixed methods approach	the ability to identify relevant knowledge and assimilate it drove innovation within the LMTs assessed	Focused on LMTs, while the telecommunication industry is technology-intensive	Focuses on the telecommunication sector, and the indirect effect of technological innovation on competitive advantage through knowledge management
Chege, Wang & Suntu (2019)	Innovations in information technology and performance	Entrepreneur innovativeness and Government policy	Cross sectional survey	Government policies on improvement of ICT infrastructure and establishment of ICT centers would help improve the performance of SMEs	The study adopted a linear conceptualization, not considering any indirect effects on the link between performance and creativity	Multivariate conceptualization

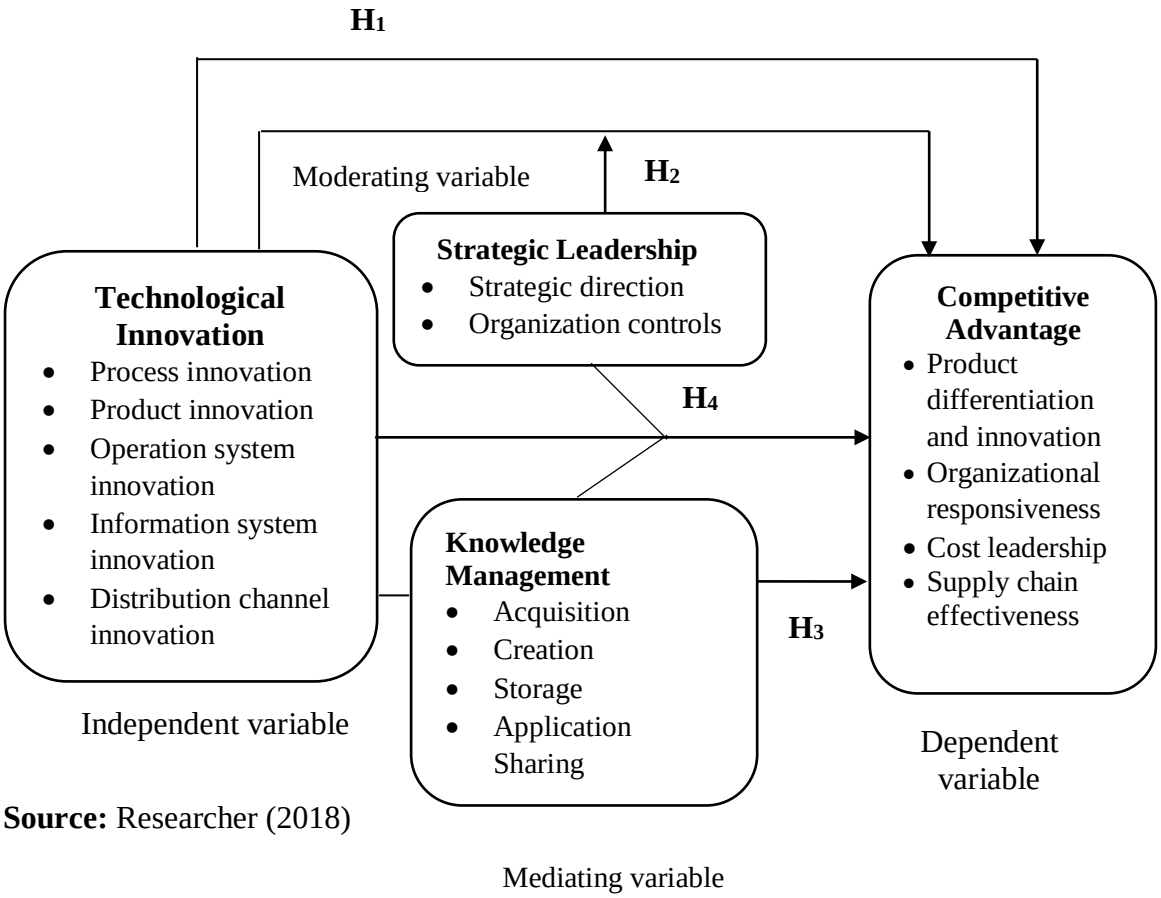
Table 2.1: Summary of Knowledge Gaps

Researcher(s)	Focus of Study	Study Model / Variables and Typologies	Methodology	Findings	Research Gaps	Focus of Current Study to Fill the Gaps
Omaiyo (2017)	The link between competitive strategy and ability of Kenyan telecommunication firms to perform	Competitive strategy and organizational performance	Cross sectional survey, Multiple regression analysis	Competitive strategies and firm performance are positively and significantly connected	Linear conceptualization.	Multivariate conceptualization. Focus on large telecommunication firms in Kenya Explanatory and cross-sectional survey
Palladan *et al*. (2016) & Wen (2016)	Being a strategic leader, firm innovative behavior, IT Capabilities and their influence on implementation	Strategic leadership, organization innovativeness, IT capability, strategy implementation	Descriptive survey design using primary data collected through a questionnaire	Having strategic leaders and ability of the firm to innovate and use IT brings about effectiveness	Linear conceptualization; no moderation or mediation	Multivariate conceptualization with moderation and mediation.
Kombo (2015)	Knowledge management, innovations, firm attributes and the ability of manufacturing firms in Kenya to perform	Knowledge management, innovation, firm characteristics, and performance	Cross sectional survey	The interaction between firm attributes and ability to Innovate influenced the link between knowledge strategy and performance of firms	The study only considered firm performance which is conceptually and practically different from competitive advantage	Investigation of strategic leadership as moderating variable. The study focused on competitive advantage

Source: Researcher (2020)

2.5 Conceptual Framework

From the conceptual framework figure (Figure 2.1), strategic leadership was measured in terms of determination of strategic directions and organization controls. Management of knowledge was operationalized in terms of acquisition, creation, storage, application and sharing. Technological innovation was assessed from innovation process, innovation of products, and distribution channel innovation.



Source: Researcher (2018)

Figure 2.1: Influence of Strategic Leadership and Knowledge Management on the Connection between Competitiveness and Innovation that is Technological

Differentiation of products and innovation, being cost leaders, and organizational responsiveness were the proxies of competitive advantage. The different strategic leadership aspects and knowledge management influence the level of innovations especially in a technologically empowered environment (Grunert *et al*., 2004).

2.6 Conceptual Hypotheses

From the conceptual framework in Figure 2.1, the study was guided by the following hypothesis statements:

H_1: Technological innovation has a significant effect on the competitive advantage;

H_2: Strategic leadership has a significant moderating role on the relationship between technological innovation and competitive advantage;

H_3: Knowledge management has a significant mediating effect on the relationship between technological innovation and competitive advantage; and

H_4: Technological innovation, strategic leadership, and knowledge management have a significant joint effect on competitive advantage

Chapter two discussed relevant literature as presented by various scholars in relation to various studies in the study. It first identified key models on which the study was anchored including the technological networks theory of innovations, dynamic capabilities theory, the knowledge-based view, and the Porter's model of sustainable competitive advantage. The chapter further presented detailed pairwise analyses of study relationship among the variables as follows: innovation that is technological and competitiveness; innovation that is technological, strategic leadership, and competitiveness; innovation that is technological, management of knowledge, and competitiveness; and innovation that is technological, leadership that is strategic, management of knowledge and competitive advantage. The chapter then presented a detailed conceptual framework identifying the independent, including moderating and mediating, as well as the dependent variables. Finally, the chapter presented the conceptual hypotheses that were tested in the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodologies which the study sought to utilize. It concentrates on identification of the philosophical underpinnings adopted by the study, target population, research design, sampling design, how the instruments were tested to determine how reliable and valid they were, data collection instrument, how data was collected as well as analyzed. The choice of study methodology has been justified based on study objectives (Mugenda and Mugenda, 2003; Saunders, Lewis & Thornhill, 2007).

The essence of the study was to address the identified conceptual, contextual and methodological gaps, which formed the basis for formulation of a paradigm that a number of businesses operate and had been found to be problem-oriented in approach. It was assumed that firms are entities with a high level of rationality, and this helped in solving key challenges and problems that abound (Flowers, 2009). The study was directed by objectives, which the researcher sought to find answers to. The study selected various methodologies to ensure that accurate and reliable data was collected.

The chapter identified how the study conducted pre-tests to ensure that the study instruments were valid and reliable. This was meant to ensure that in case the study was repeated in future the results would post similar trends. In addition, the chapter highlights the manner in which the analyses were conducted so as to ensure that the research objectives were well covered (Saunders, Lewis & Thornhill, 2007). This ensured that collected data adequately addressed research objectives.

3.2 Research Philosophy

The present study adopted the positivism paradigm, which advances objective, deductive and quantitative research methodologies in generating knowledge. Saunders *et. al. (*2007) observes that the positivism paradigm is grounded on constancy, unbiased, real facts, neutrality, mensurations, and validity of results. It is focused with existing theory and aims to disprove the research model. According to Lewis (2015), positivism is a methodological paradigm under the objectivism epistemology in quantitative research which applies the natural sciences methods to carry out social science inquiries (Crotty, 1998). This is in contrast to interpretivism which advocates for non-engagement of the subjects during data collection; realism which focuses more on figures and how they are subject to change over time; and relativism which advocates for experimental data collection methods (Kumar, 2011).

In tandem with the positivism paradigm, the study applied quantitative research methodologies and research methods including the adoption of the descriptive cross-sectional research design, applying criterion-based sampling, collection of quantitative data, and the application of both descriptive and inferential data analyses. This paradigm also maintains that the subjects and researcher are independent as they do not affect the outcome or each other (Creswell & Clark, 2007). The researcher thus supports impartiality by remaining unbiased and by observing objectivity throughout the research process in order to prevent biasness and values from affecting outcome. Similar studies (Mucai *et al.*, 2018; Mbithi *et al.*, 2016; Awino, 2013) have also been anchored on positivism.

3.3 Research Design

A descriptive cross-sectional design was used in this investigation, defined by Cooper and Schindler (2011) an approach in which the study is undertaken at an instant. Data about the subjects that would be collected is a representation of the situation about them in light of the study variables at that particular instant. When carrying out descriptive cross-sectional surveys data is obtained from the general public to assist solve the research question. Surveys allow researchers to gather the features of a group and testing the proposed statistically. A descriptive cross-sectional survey determines and reports the way things are. As contended by Cooper and Schindler (2006), cross-sectional survey enables gathering of data across many firms at a particular point-in-time. These surveys aid researchers in determining if there are any significant relationships between variables.

This study sought to establish how strategic leadership and knowledge management affected the relationship between innovations that are oriented technologically and the firm's ability to remain competitive among the telecommunication firms in Kenya. Other researchers (Mucai *et al*., 2018; Awino, 2013; Adede, Kibera & Owino, 2017) successfully used cross-sectional survey in the same context. A cross-sectional survey was appropriate as data was gathered at one point in time involving all telecommunication firms in Kenya. Descriptive cross-sectional survey was adopted because it provided a picture of a social phenomenon as it is naturally. The variables under study were measured naturally without being manipulated or controlled (Burns & Grove, 2003). This design was preferred given the study scope, nature of standard data to be gathered, and the method of analysis to be performed.

Although cross-sectional design was adopted it had limitations of not delving into details of the study variables compared to longitudinal research design that takes more time and considers the changes that occur during the course of the study hence affecting the findings. In order to prepare the key information sought for processing, descriptive analyses which consisted of frequency tables, measures of central tendency, and dispersion were adopted. These descriptive analytics played a crucial role in the study as it brought about a way of generalizing the sample results from the entire study population. descriptive analytics helped to identify the general feelings of the respondents thus making it easy to reach inferences. It is through statistical analysis that the link between and amongst variables were explored (Yin, 2013).

3.4 Population of the Study

The study's target population comprised all the licensed telecommunication firms in Kenya. The context was chosen owing to the dearth of literature pertinent to the subject matter in the telecommunication industry as well as the uncompetitive nature of the sector, occasioned by one player controlling nearly 70% of the industry's share and value (CA, 2020; Bodo, 2021), bringing to question, the strategies employed by the large telecommunication organizations to earn competitiveness. The unit of analysis comprised of all 83 large telecommunication firms in Kenya, defined by the by Kenya National Bureau of Statistics (KNBS) (2016) as those firms with more than 100 employees, exceeding Kshs 800 million in annual turnover, and exceeding Kshs100 million in investment in plant and machinery (Appendix VI).

To arrive at the list of large telecommunications entities in Kenyan context, the study adopted an exclusion criterion of Micro, Small and Medium Enterprises (MSMEs), as per the definition by KNBS (2016), which defines MSMEs on the basis of employee base where micro firms employ 10 staff, small firms have from 10 to 49 staff, medium firms comprise of 50-99 staff, and large firms comprise of over 100 staff. As such, the present study targeted large firms with an employee base of over 100 staff, which total 83 telecommunication firms in Kenya. The uncompetitive nature of the industry is harmful to the economy as it limits competition and investments putting consumers at risk.

It is therefore important that the large telecommunications companies' tactics for gaining a competitive edge in a market that is highly concentrated but uneven in terms overall supremacy are identified and studied. Additionally, there are increased concerns on the influence of strategic leadership and management of knowledge on the connection between technological innovation and competitive advantage of these firms which is critical in supporting and advancing national development and growth via employment generation and economical transformations.

3.5 Sample Frame

Kothari (2004) defines a sample frame as the actual collection of units through which a sample was taken. A sample frame depends on the context of the study, and particularly the study universe. According to Cooper *et al*. (2011) a sample frame is not synonymous with the general study population since the former is normally data-based and can form the basis for sampling. It is from the sampling frame that researchers select samples. The current study has a population frame as it adopted census survey technique.

This study adopted criterion-based sampling. Criterion sampling involves selecting samples that meet some predetermined criterion of importance. By focusing on carefully selected sample that is statistically representative sample of the population one can get in-depth information as opposed to gathering standardized information from a large sample (Patton, 1990). Criterion sampling deals with the identification of particular criterion of importance, articulation of these criterion and systematic reviews and study of cases that meet the set criterion. This sampling was relevant for the study because it is purposive and it is intended to compare relevant data from specific large telecommunication firms in Kenya. Therefore, all the large telecommunication firms in Kenya were approached and served with questionnaires as these were considered as a statistically representative sample of the population. The study focused on large telecommunication firms in Kenya as listed in Appendix VI. The firms are in diverse sub-industries such as mobile network service provision, internet service provision, and software development.

In Kenya, the telecommunication firms are under the Ministry of ICT and a data base of the telecommunication firms is maintained and regularly updated monthly by the Information, Communication, and Technology Authority. Due to relatively few large telecommunication firms in the study's target population, a census survey was carried out where all 83 firms were included for participation in the study and, therefore, reached for response. A census survey entails the systematic and procedural gathering of information from all the targeted respondents (Cooper *et al.*, 2011). As such, the present study collected data from all the 83 large licensed telecommunications service providers in Kenya.

3.6 Data Collection

Data gathering is the process that involves gathering opinions and vital information from target population concerning research questions or topic (Zikmund *et al*., 2012). The data for this study was collected during the unprecedented period of the Corona Virus 2019 (famously referred to as COVID-19) pandemic and, therefore, involved using a mix of strategies, as the respondents deemed appropriate. The instruments were dropped and picked later. However, in circumstances where respondents requested for alternative modes like emails as sometimes physical interactions were unattainable, the researcher made arrangements and shared with them the instrument in soft copy, which was completed, stamped, scanned and finally emailed back by the respondents.

Company stamps for the large telecommunication firms in Kenya were appended on the questionnaires for authenticity. This approach was successfully employed by Mucai *et al*., (2018) and Awino (2013) in a similar context. The adoption of other varied data collection techniques combined produced advantages like cost effectiveness, versatility, and speed of execution. First-hand information was gathered through the use of a semi-structured questionnaire. The questionnaires were developed in line with the objectives and hypotheses of the study and guided by the literature reviewed on the concepts of the study as well as theories upon which the study was anchored on. Questions were designed to cover several aspects of strategic leadership, knowledge management, technological innovations and competitive advantage. The tool contained only close-ended items.

The close-ended items were used with the aim of providing responses that were in some way structured for effective statistical analysis, hypothesis testing, and drawing of conclusions. A few of the items were built using a five-point Likert scale ranging from no degree (1) to very big extent (5). The much more common sort of summated rating scale inquiry is a likert type assessment question. It's used to gauge a person's perceptions or emotions. On one hand, there is a positive opinion of the study, yet on the other hand, there is a distorted view of the study. The instrument was precisely adjusted for effectiveness through various suggestions from the supervisors and able discussants from the School of Business who attended the proposal's Departmental, Doctoral Committee and Open Forum presentations.

The questionnaire comprised of five sections. Section A sought to gather general social as well as demographic attributes of the targeted respondents. Section B concentrated on questions covering technological innovation, section C concentrated on strategic leadership; section D contained questions on knowledge management while section E focused on competitive advantage. One respondent per one large telecommunication firm in Kenya was tasked with filling out the questionnaire. Newbert (2008) argued that one strategic leader per organization is adequate as they are in a position to understand organization's internal and external operations. This ensured reliability, objectivity, and consistency of responses from each large telecommunication firms in Kenya.

The data collection instrument is attached as Appendix I (Research Questionnaire). The questionnaires were administered to Chief Executive Officers (CEOs), Managing Directors/equivalent or designate as respondents. These were purposively selected owing to their conversance with the subject matter. In their absence, those who act in those positions responded. Newbert (2008) advanced that the primary contributors should be well-versed in the major issues at hand in the study and should communicate the information voluntarily. For purposes of research introduction and erasing doubt on the part of the respondent, an introduction letter from the School of Business, University of Nairobi and a license from National Commission for Science, Technology, and Innovation (NACOSTI) were obtained.

3.7 Study Variable Operationalization

In order to measure different variables in this study, the variables had to be operationalized in terms of their indicators. These variables of the study were premised on the four specific objectives. As exhibited in the conceptual framework, the study had four variables: technological innovation, strategic leadership, knowledge management, and competitive advantage. Operational definition and measurement of variables as was used in this study is shown in Table 3.1.

Table 3.1: Study Variable Operationalization

Variable	Operational Indicators	Supporting Literature	Measurement	Research Questionnaire
Technological Innovation (Independent variable)	Process innovation (new operational processes, new innovative operational process, customers, and innovative ideas)	Hajir *et al*. (2015); Schaffers *et al*. (2011); Camisón & Monfort-Mir (2012)	A five-point Likert type scale. Likert type scale here measured the state of technological innovation and how it influences competitive advantage in the large telecommunication firms in Kenya. Descriptive statements were elaborated and responders were asked to reply to the extent to which the items apply to their organizations on a 5-point Likert type scale as per the questionnaire. Hajir *et al*. (2015); Schaffers *et al*. (2011); Schaffers *et al*. (2011)	Section B
	Product innovation (collaborations, demand for new innovative products, and desire for new innovative products).			
	Distribution channel innovations (new innovative distribution channels)			
	Information system innovation (Information System adoption)			

Table 3.1 continued: Study Variable Operationalization

Variable	Operational Indicators	Supporting Literature	Measurement	Research Questionnaire
Strategic Leadership (Moderating variable)	Strategic direction (clarity of strategic directions, mission statement, review of mission and vision statements, clarity of strategic planning process, direction of strategic plan, and review of strategic plan)	Palladan *et al*., (2016); Acuna (2014); Quong & Walker (2010); Hitt et. al., (2012); Burgelman (2014)	A five-point Likert type scale. The degree to which different types of effective management are used in the large telecommunication firms in Kenya as per the questionnaire. Palladan *et al*., (2016); Acuna (2014); Quong & Walker (2010); Hitt *et al*., (2012); Burgelman (2014).	Section C
	Organization controls (appropriate internal controls, human capital development, core competencies, and utilization of resources).			
Knowledge Management (Intervening variable)	Acquisition (Desire to acquire new knowledge and sources of new knowledge).	Jones & Sallis (2013); Wiig (2012); Hislop (2013)	A 5-item scale was used. Measured the extent to which the five aspects of knowledge management existed in the large telecommunication firms in Kenya as per the questionnaire. Descriptive statements were elaborated and expressed on a five-point Likert scale to the respondents	Section D
	Creation (Desire to create new information and technology has been applied in new knowledge creation)			

Table 3.1 continued : Study Variable Operationalization

	Storage (The ability to store new knowledge has influenced competitive advantage, and ease with which knowledge can be retrieved).	Holtshouse (2013); Durst & Edvardsson (2012)	Jones & Sallis (2013); Wiig (2012); Holtshouse (2013); Durst & Edvardsson (2012).	
	Application (Application of innovations in the creation of new knowledge, and ability to retrieve knowledge).			
	Sharing (Ability to share knowledge amongst staff and knowledge acquired has influenced competitive advantage).			
Competitive Advantage (Dependent variable)	Product differentiation and innovation (products are unique or rare, products are imperfectly imitable, products are non-substitutable, and products cannot be easily substituted). Organisational responsiveness (reconstruction of market boundaries, focus on the big picture and not the numbers, execution into our marketplace strategy, greater bargaining power, and outcompete marketplace rivals).	Porter (1980; 1985);	A five-point Likert type scale Likert type scale here measured factors considered during the firm's competitive advantage decision making processes.	Section E

Table 3.1 continued: Study Variable Operationalization

	Cost leadership (pricing is determination: new entrants and replacement items are a threat; competitive low pricing; and cost minimization in marketing and research).	Barney (1997); Kamakura *et al*., (2016); Afande (2015).	Descriptive statements were elaborated and presented on a 5-point Likert type scale to the respondents who were in turn requested to respond to what extent the statements applied to their organizations.	Section E
	Supply chain effectiveness (strategic sequence in supply chain management; key organizational hurdles in supply chain; organizational learning culture; and greater bargaining power over suppliers).		Porter (1980; 1985); Barney (1997); Kamakura *et al*., (2016); Afande (2015).	

Source: Various Literature Reviewed

in Table 3.1, each of the study variables was operationalized using multiple indicators rated on a 5-rate Likert degree. The rationale for this scale is that it is well aligned with the study objectives. The scale is also interval hence was suitable for the regression analysis in the analytical model. The inresultant variable for the research was technological innovation while competitiveness was the resultant variable. Strategic leadership was the moderating variable whereas knowledge management was the intervening variable of the study.

For this study, technological innovation was delineated as all innovations in regard to process, product, distribution channel, and information systems. The indicators proposed by Hajir *et al*., (2015), Schaffers *et al*., (2011), as well as Camisón & Monfort-Mir (2012) were used to actualize technology advancement. They categorized technological innovation into process innovation that involved new operational processes, new innovative operational process, customers, and innovative ideas. Product innovation that sought for collaborations with other information technology firms, demand for new innovative products, and desire to come up with new innovative products. Distribution channel innovations that involved the firms initiating new innovative distribution channels for its products and services, new innovative challenges that had caused changes in competitive advantage, and new innovative distribution channels that had increased performance. Finally, information system innovation that encompassed adopted information system in the operations and operation systems adopted that had influenced competitive advantage in the large telecommunication firms.

Strategic leadership was the moderating variable and was summarized in accordance with the reasoning by Palladan *et al*., (2016), Acuna (2014), Quong & Walker (2010), Hitt *et al*., (2012) and Burgelman (2014). Strategic leadership was categorized into strategic direction and organizational controls. Strategic direction was exhibited in clarity of strategic directions, mission statement of the organizations that identified who they were, what they did and their targeted customers. In instances where mission and vision statements were reviewed as need arose, clarity of strategic planning process which established clear strategic direction, strategic plan direction of the overall annual operational plan, and concerns about the strategic plan being reviewed quarterly to allow for corrective actions. Organizational controls entailed appropriate internal controls, degree of human capital development required, desire to maintain core competencies, and if leaders understood organizational policies in utilization of resources.

Knowledge management was operationalized along postulations by Jones & Sallis (2013), Wiig (2012), Hislop (2013), Holtshouse (2013), and Durst & Edvardsson (2012). Indicators of knowledge management included acquisition that involved desire to acquire new knowledge which influenced competitive advantage and diverse sources of new knowledge. Storage that was demonstrated in the ability that new knowledge was stored; how it influenced competitive advantage, and the ease with which knowledge could be retrieved. Application was exemplified through the application of innovations that in turn played a major role in the creation of new knowledge, and the ability to retrieve knowledge that had a resultant influence on competitive advantage.

Innovation and differentiation of products were used as indicators of competitiveness which was demonstrated in products that were unique or rare, imperfectly imitable, non-substitutable, could not be easily substituted, and products' reach that exceeded existing demand. Another measure was organizational responsiveness that was exhibited in the market boundaries in response to competition, organizational responsiveness that focused on the big picture and not the numbers, execution into marketplace strategy, organizational responsiveness that had greater bargaining power over buyers, and outcompeting marketplace rivals. The final measure of competitive advantage was cost leadership that involved pricing determination in consideration with the threat of new entrants, pricing determination in consideration with the threat of substitute products, pricing that was competitively low, and observation of cost minimization in marketing and research in large telecommunication firms in Kenya.

3.8 Data Analysis

Once data was collected, it was prepared, analyzed, and recorded on a spreadsheet for analysis. Data preparation involved questionnaire checking, coding, sorting, editing, transcription, data cleaning, and finally the data was analyzed using SPSS version 25 to derive information related to innovation that is technological, leadership that is strategic, management of knowledge, and competitiveness. The study used descriptive and inferential statistics for data evaluation. descriptive analytics such as distribution of frequency and percentages, standard deviation, and mean scores were used to analyze the respondent's and organizational demographic profiles (Cooper & Schindler, 2006). The diagnostic tests were then conducted to confirm the adherence to regression assumptions. These included tests of normality (Shapiro-Wilks), multicollinearity (VIF and tolerance), and heteroscedasticity (Levene's test).

Multicollinearity occurs whenever more than one of the regression model's predictors are temperately or correlated in higher terms. One of the methods of testing for multicollinearity is by the examination of the variance inflation factors (VIF). VIF is an indicator of the impact of collinearity among the variables in a regression model. VIF values greater than 10 are normally considered as indicators of significant multicollinearity and unstable beta coefficients. The study hence used VIF to undertake multicollinearity diagnostics. The results were technological innovation (VIF = 1.075<10; Tolerance =.930<1); strategic leadership (VIF = 1.075<10; Tolerance = .930<1).

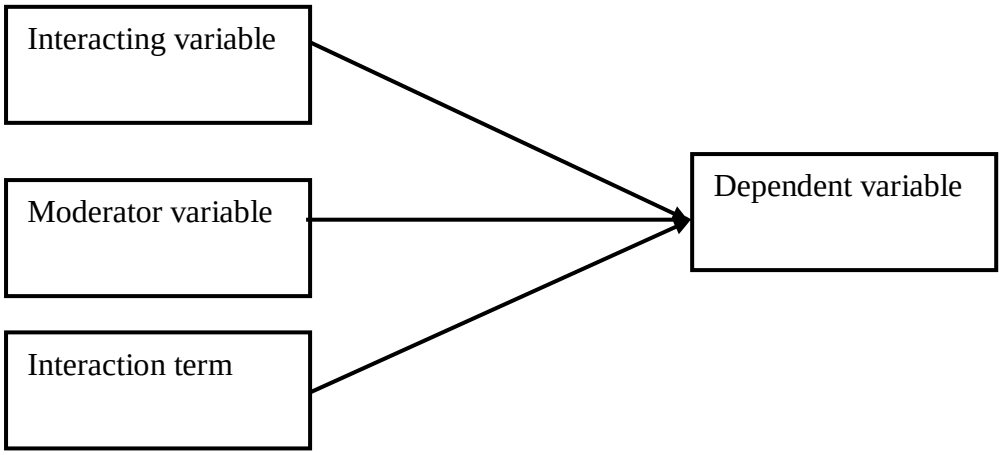
The statistics depicted the absence of the problem of multicollinearity thus variables, technological innovation, strategic leadership, and knowledge management were fit to be used in the model. Heteroscedasticity describes a condition in which the error term's variability is not constant. The study used Levene's test for homogeneity of variances. The study compared the generated p-values to 0.05. If the coefficients were less than 0.05, the null hypothesis was rejected thereby concluding that heteroscedasticity was present. The study recorded p- value = 0.766>0.05 indicating homogeneity of variance. The assumption of homoscedasticity was therefore met.

Descriptive analysis entailed the use of such statistics as frequencies and percentages to indicate the manifestation of items in both absolute and proportional terms. Mean scores were also applied to depict the rating and the degree at which the various landscapes of the constructs were manifested across the respondent organizations. The standard deviation values were further calculated to reflect variability in responses from the established mean scores.

In a few cases, counts were used to calculate proportions based on length of employment in the organization, years of experience in the telecommunication industry, level of education, existence of strategic plans, and number of new applications developed over the past one year. Inferential analysis on the other hand entailed Pearson's product moment correlations aimed at depicting the degree, direction and strength of linear associations between the predictor and outcome variables. In the same vein, multiple regression analyses were carried out to indicate both the magnitude of change in the outcome variable with unit changes in the predictor, mediating and moderating variables and the significance thereof leading to the hypothesis tests. Inferential statistics were used to evaluate the hypotheses presented in the study.

The direct association between technical innovation and performance of large telecommunications enterprises in Kenya was investigated using simple linear regression analysis. Stepwise regression analysis was utilized to test the moderating effect of strategic leadership on the relationship between technological innovation and competitive advantage. Stepwise regression analysis includes a collection of parameter combinations in the regression model and see just how much the collection of candidate variables contributes to the reliant variable's forecast over and beyond the contributions of earlier included predictor factors. Interaction term was used to test for moderating impact of strategic leadership. Strategic leadership interaction term was obtained by multiplying strategic leadership score by technological innovation to get interaction term.

Path analysis was utilized to test the intervening effect of knowledge management on the relationship between technological innovation and competitive advantage. A mediating variable also known as intermediary or intervening variable is a hypothetical variable used to explain causal links between two variables usually independent and dependent variables in empirical research (Baron & Kenny, 1986). The relationship was depicted in the schematic diagram Figure 3.1.



Source: Adopted from Baron and Kenny (1986)

Figure 3.1: Test of Mediation

The joint effect of technological innovation, strategic leadership and knowledge management on competitive advantage was tested using multiple linear regression analysis. The coefficient of determination (R2) was calculated using multiple regression analysis and offered a measure of volatility in the random variance explained for by the mixture of predictors (Mugenda & Mugenda, 2008). The regression equation was written as $\mathbf{CA = \beta_0 + \beta_1 TI + \beta_2 SL + \beta_3 KM + \varepsilon}$.

Where: CA= Composite score for Competitive Advantage of large telecommunication firms in Kenya; β_0 = Constant; β_1, β_2, β_3 = coefficients; TI = Composite score for Technological innovation; SL= Composite score for Strategic Leadership; KM = Composite Score for Knowledge Management; **ε** = error term. Data was collected using a five-point Likert type scale and the responses aggregated to get a composite index for each variable where necessary. To test the influence of technological innovation on competitive advantage, the following general model was used:

$$\mathbf{CA_1 = \beta_{01} + \beta_{11}TI + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)}$$

Where:

CA_1= Composite score for Competitive Advantage; β_{01} = Constant; TI= Composite score for Technological innovation; β_{01} = Constant; β_{11} = Coefficient; **ε** = Error term

On the moderating effect of strategic leadership on the relationship between technological innovation and competitive advantage, the following analytical models were used:

$$\mathbf{CA_2 = \beta_{01} + \beta_{11}TI + \varepsilon}$$
$$\mathbf{CA_2 = \beta_{01} + \beta_{11}\,TI + \beta_{12}\,SL + \varepsilon}$$
$$\mathbf{CA_2 = \beta_{01} + \beta_{11}\,TI + \beta_{12}\,SL + \beta_{13}\,TI{*}SL + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (ii)}$$

Where:

CA_2= Composite score for Competitive Advantage TI= Composite score for Technological innovation SL= Composite score for Strategic Leadership TI*SL= Interaction term; β_{01} = Constant; β_{11}, β_{12}, β_{13} = Coefficients; **ε** = Error term on the intervening effect of knowledge management on the relationship between technological innovation and competitive advantage, the following analytical models were used:

$$\mathbf{CA = \beta_{01} + \beta_{11}TI + \varepsilon \quad KM = \beta_{01} + \beta_{11}TI + \varepsilon \quad CA = \beta_{01} + \beta_{11}KM + \varepsilon}$$

$$\mathbf{CA = \beta_{01} + \beta_{11}TI + \beta_{12}KM + \varepsilon} \text{...}\mathbf{(iii)}$$

Where:

CA= Composite score for Competitive Advantage; TI= Composite score for Technological innovation; KM= Composite score for Knowledge Management; β_{01} = Constant; β_{11}, β_{12}, are the coefficient; ε = Error term. Lastly, on the joint effect of innovation that is technological, leadership that is strategic and management of knowledge on competitiveness, the following analytical model was used;

$$\mathbf{CA = \beta_{01} + \beta_{11}TI + \beta_{12}SL + \beta_{13}KM + \varepsilon} \text{...}\mathbf{(iv)}$$

Where:

CA= Composite score for Competitive Advantage TI= Composite score for Technological innovation SL= Composite score for Strategic Leadership KM= Composite score for Knowledge Management β_{01} = Constant; β_{11}, β_{12}, β_{13} = Coefficient; ε = Error term

An objectives summary, hypothesis, statistical test, analytical model, and interpretation is evidenced in Table 3.2. The table particularly summarizes the foregoing in relation to the influence of technological innovation on competitive advantage; the moderating effect of strategic leadership on the relationship between technological innovation and competitive advantage; the intervening effect of knowledge management on the relationship between technological innovation and competitive advantage; and lastly, on the joint effect of technological innovation, strategic leadership and knowledge management on competitive advantage.

Table 3.2: Objectives Summary, Hypothesis, Statistical Test, Analytical Model, and Interpretation

Objectives	Hypothesis	Statistical Test	Analytical Model	Interpretation
Objective 1: To Ascertain the influence of Technological Innovation on Competitive Advantage of Large Telecommunication Firms in Kenya	**H_1:** Technological innovation has significant effect on the competitive advantage of Large Telecommunication Firms in Kenya	Simple Linear Regression Analysis	**$CA = \beta_{01} + \beta_{11}TI + \varepsilon$** *Where:* CA= Composite score for Competitive Advantage β_{01} = Constant TI= Composite score for Technological innovation β_{11}, is coefficients **ε** = Error term	R^2 to assess how much the reason for the change in competitiveness is because of technological innovation
Objective 2: To Determine the moderating role of Strategic Leadership on the relationship between Technological Innovation and Competitive Advantage of Large Telecommunication Firms in Kenya	**H_2:** Strategic leadership has significant moderating role on the relationship between Technological Innovation and Competitive Advantage of Large Telecommunication Firms in Kenya	Stepwise Regression Analysis	**$CA = \beta_{01} + \beta_{11} TI + \beta_{12} SL + \beta_{13} SL*TI + \varepsilon$** *Where:* CA= Composite score for Competitive Advantage β_{01} = Constant TI= Composite score for Technological innovation SL= Composite score for Strategic Leadership SL*TI=Interaction term between TI and SL β_{11}, β_{12}, β_{13} are coefficients **ε** = Error term	R^2, R^2 change and change in F statistics to assess how much change in competitiveness is because of its relationship with technological innovation and strategic leadership A significant change in R^2 upon introduction of the interaction term SL*TI confirms a moderating effect

Table 3.2 Continued: Objectives Summary, Hypothesis, Statistical Test, Analytical Model, and Interpretation

Objectives	Hypothesis	Statistical Test	Analytical Model	Interpretation
Objective 3: To Asses the mediating effect of Knowledge Management on the relationship between Technological Innovation and Competitive Advantage of Large Telecommunication Firms in Kenya	**H_3:** Knowledge Management has significant mediating effect on the relationship between Technological Innovation and Competitive Advantage of Large Telecommunication Firms in Kenya	Path Analysis (Baron & Kenny, 1986)	Step 1: $\mathbf{CA = \beta_{01} + \beta_{12}TI + \varepsilon}$ Step 2: $\mathbf{KM = \beta_{01} + \beta_{11}TI + \varepsilon}$ Step 3: $\mathbf{CA = \beta_{01} + \beta_{11}KM + \varepsilon}$ Step 4: $\mathbf{CA = \beta_{01} + \beta_{11}TI + \beta_{12}KM + \varepsilon}$ *Where:* CA= Composite score for Competitive Advantage TI= Composite score for Technological innovation KM = Composite Score for Knowledge Management β_{11}, β_{12} are coefficients ε = Error term	R^2, R^2 change and change in F statistics to assess how much change in competitive advantage is explained by technological innovation and knowledge management; some form of mediation is supported if TI is no longer significant when KM is controlled; partial mediation is supported if both TI and KM significantly explain competitive advantage
Objective 4: To establish the joint influence of Technological Innovation, Strategic Leadership, and Knowledge Management on the Competitive Advantage of Large Telecommunication Firms in Kenya	**H_4:** Technological Innovation, Strategic Leadership, and Knowledge Management have a significant joint effect on Competitive Advantage of Large Telecommunication Firms in Kenya	Multiple Regression Analysis	$\mathbf{CA = \beta_{01} + \beta_{11}TI + \beta_{12}SL + \beta_{13}KM + \varepsilon}$ *Where* CA= Composite score for Competitive Advantage TI= Composite score for Technological innovation SL= KM = Composite Score for Knowledge Management β_{01} = Constant $\beta_{11}, \beta_{12}, \beta_{13}$ are coefficients ε = Error term	R^2, R^2 change and change in F statistics to assess how much change in competitiveness is because of its relationship with the independent variables

Source: Researcher (2018)

Multiple linear regression analysis was utilized to come up with the model representing the association between the resultant variable and predictor variables. The results were then interpreted using Multiple R, Coefficient of determination (R^2), F-statistic, coefficients of variation, coefficients of the variables and significance levels. The summary of this interpretation of results is evidenced in Table 3.3 below.

Table 3.3: Summary of Key Statistical Questions, Sample Statistics, and Interpretation of Results

Key Statistical Question	Sample Statistic	Interpretation of Results
Is there a relationship between Y and X variables?	Multiple (R) $0<R<1$	The higher the R the stronger relationship
Influence of X on Y "Goodness of fit"/ Explanatory power?	Coefficient of Determination (R^2) $0<R^2<1$	The higher the R^2 the better fit e.g. if $R^2=0.9$ it meant 90% of change in Y are explained by X, 10% is explained by other factors than X
Is the model statistically significant?	F-Statistic or Significant F value	The higher the F-Statistic more significant the model will be or The lower the Significant F the significant in the model will be
Which is the outcome equation?	$\mathbf{CA = \beta_0 + \beta_1 TI + \beta_2 SL + \beta_3 KM + \varepsilon}$ *Where* CA= Composite score for Competitive Advantage TI= Composite score for Technological innovation SL= Composite score for Strategic Leadership KM = Composite Score for Knowledge Management β_0 = Constant $\beta_1, \beta_2, \beta_3$ are coefficients ε = Error term	
How is Y influenced by predator?	Positive? Or Negative?	Will Check coefficient sign (+.-) i.e. sign on β_0, β_1, β_2, β_3
Significance of individual variables	Absolute T statistic or P value	The higher the Absolute T statistic the better significant as variable or The lower the P the more significant as variable (tested at 0.05 level)

Source: Researcher (2020)

The chapter covered research methods that the researcher used in collection of data, processing and analysis. It specifically covered the philosophical paradigm that involved elaboration on the positivistic approach that the study employed. Further, the chapter explained that the study was a cross-sectional survey design because data was gathered across several large telecommunication firms in Kenya at one point in time. The population of the study was equally described. Specifically, the chapter provided a detailed description of the research philosophy premised on ontology and epistemology. It distinguished between positivism and phenomenology, and further delved into why the study adopted positivism research philosophy. The research design was also explained in details and why the study adopted cross-sectional survey was elaborated and its critique presented at the end.

Attention was put on the operationalization of study variables hence giving a detailed description of how the variables were broken down into their component parts for measurement. All the variables of the study were operationalized along evidence in literature. This operationalization was described in Table 3.1. Table 3.2 describes the Objectives Summary, hypotheses, analytical models, and interpretation while Table 3.3 summarizes the key statistical questions, sample statistics, and interpretation of results. This was important in putting forth the map on how activities unfolded to ensure that accurate and reliable data was collected and that the research hypotheses were adequately tested. The next chapter tackles data analysis and results.

CHAPTER FOUR
DATA ANALYSIS AND RESULTS

4.1 Introduction

The study set out to establish the influence of strategic leadership and knowledge management on the relationship between technological innovation and competitive advantage with reference to large telecommunication firms in Kenya. To this end, the four hypotheses corresponding to the four specific objectives were tested. A census survey was carried out where all 83 firms in the target population were included for participation in the study and from whom, therefore, primary data was collected and analyzed for statistical inferences to be made. The chapter elaborates the results that form the foundation upon which additional investigations were done to examine hypotheses. The chapter is premised on different examinations of the collected data and the demonstrations of variables of the research amongst the study's population.

This chapter is structured into two major sections as detailed by subsequent sections. The first section presents the descriptive analysis of technological innovation, strategic leadership, knowledge management, and competitive advantage. The second section delves into the hypothesis test results, in which various regression analyses were performed aimed at testing each of the four hypotheses stated. In each section, results are presented and interpreted as an index of the variables under study. Descriptive analysis entailed the use of descriptive analytics such as frequencies, percentages and mean scores to indicate the manifestation of items in both absolute and proportional terms.

The standard deviation values were further calculated to reflect variability in responses from the established mean scores. Inferential analysis on the other hand entailed Pearson's product moment correlations aimed at depicting the degree, direction and strength of linear associations between the predictor and outcome variables as well as multiple regression analyses to indicate both the magnitude of change in the outcome variable with unit changes in the predictor, mediator and moderating variables, and the significance thereof, leading to the hypothesis tests.

4.2 Response Rate

The response rate was determined on the basis of the total number of questionnaires that had been issued to the respondents against those that were returned back as having been duly filled up. In this regard, the researcher administered 83 questionnaires to the CEOs or their equivalents from the large licensed telecommunications service providers in Kenya. Out of these questionnaires that were administered to these respondents, 61 of them were completely filled up and returned. This was equivalent to a response rate of 73.5% as illustrated in Table 4.1.

Table 4.1: Response Rate

Statement	Frequency	Percentage
Response	61	73.5
Non-Response	22	26.5
Total	83	100.0

Source: Field Data (2020)

The response rate is considered excellent by Creswell (2013) who postulates that for reporting and analysis, a return rate of 50% is sufficient. A success rate of 60% or more is good, as well as a rate of 70% or more is exceptional. This is consistent with Rea and Parker (1997) who recommend a response rate of 50% to 60% as adequate and a response rate of 70% and over as excellent.

Also, in agreement, Fowler (1984) cited in Njeru (2013) suggests that a response rate of 60% is representative of the population of the study. The excellent response rate is attributable to the utilization of trained and aggressive research assistants, application and obtaining of a Research License from NACOSTI (Appendix IVA and IVB); and the Letter of Introduction from the University of Nairobi (Appendix III). The study further found out that both the Introduction Letter and the Research License were valuable in dispelling suspicion by organizations about the study's intentions and encouraged participation in the study.

4.3 Reliability Tests

A study instrument is noted to be reliable only if it is in a position to provide consistent outcomes if the process is repeated (Saunders, Lewis, & Thornhill, 2007). This means that incase data collection is repeated; similar results would be obtained because the instrument is objective. The two main aspects of reliability are stability and equivalence. The stability aspect of reliability in the study was assessed using internal consistency by evaluating Cronbach's Alpha coefficient, commonly applied where multiple rating scales are involved. Cronbach's Alpha (α) is in the range of 0 to 1 and is a coefficient of reliability mirroring how effective the metric items positively inter-correlate (Nunnaly, 1978).

Piloting of instruments provided data that was used to generate α which was subsequently used to perform internal consistency tests on the study instrument; the average α in the pilot study was set at 0.70. The equivalence aspect of reliability would be automatically vitiated if the resultant Cronbach Alpha was more than 0.70. To check for reliability in the instruments employed, the study utilized the Cronbach Alpha coefficients. These values were computed on the basis of the returned piloted instrument. The results were as evidenced in Table 4.2.

Table 4.2: Reliability Results

Variable(s)	Cronbach's Alpha Based on Standardized Items	No of Items
Technological Innovation	.707	13
Strategic Management	.856	10
Knowledge Management	.754	10
Competitive Advantage	.864	18

Source: Field Data (2020)

The findings in Table 4.2 indicate that all the items of the variables had Cronbach Alpha coefficient values above 0.7. The results conform to the benchmark set by Cronbach (1951) at 0.7 indicating that all the scales used in formulating the items on the questionnaire were reliable. Specifically, competitive advantage had the highest reliability rating (α=.864) followed by strategic management (α=.856), knowledge management (α = 754), and technological innovation (α =.707) respectively. The results led to the inference that the research instruments adopted for the study had an acceptable reliability coefficient and were thus adequate for the study. The results resounded well with Nunnally (1978) who set an alpha coefficient of 0.7 as the threshold for reliability. Compared to Davis (1964), who suggested 0.5 as the cut-off coefficient for reliability, the results depicted higher coefficients.

4.4 Validity Tests

Kothari (2004) defines validity as the capability of the study instruments to indicate what it is envisioned to measure. It refers to the criterion applied to demonstrate the degree to which study conclusions represent the correct explanation or description of phenomena. The various forms of validity included content, face and construct validity. Content validity defined the degree that the instrument adequately covers the topic that was in consideration by the study. Both intuitive and judgment are crucial in

determination of content validity. To check the suitability of earlier stated constructs, Exploratory Factor Analysis (EFA) was used. This aimed at examining the variables related to the investigation. EFA also plays an important role in stipulating the hypothesized elements that should be incorporated to determine and test for validity (McNabb, 2008). To achieve this, Kaiser-Meyer-Olkin (KMO) tests were used as a way of measuring the adequacy of the sample.

Two pretests were first performed to determine the data's appropriateness for factor analysis. These included: KMO and Bartlett's test, aimed at determining sphericity and sample adequacy in turn. The goal was to ensure that the hypothesized link is tested. The Principal Component Analysis (PCA) technique was then used to confirm the primary solution. A rotated answer and an unrotated answer were used in this process. Rotated solutions were used to load various variables in to the identified factors using absolute factor loading $\geq$0.5.

4.4.1 Factor Analysis for Technological Innovation

This section details the validity results on technological innovation as an inresultant variable of the study. In determining the sample adequacy of technological innovation, the value of Tests of Bartlett and KMO was computed and the results are evidenced in Table 4.3.

Table 4.3: Tests of Bartlett and KMO for Technological Innovation

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**.886**
Sphericity Test (Bartlett)	Approx. Chi-Square	202.141
	df	78
	Sig.	0.000

Source: Field Data (2020)

As evidenced in Table 4.3, the KMO statistic is 0.886 with a p-value being 0.000. Cerny and Kaiser (1977) shared that, values of KMO ranging from 0.80 to 0.89 are deemed to be meritorious. Thus, it can be inferred that the sample used for running factor analysis for technological innovation was adequate, and thus suitable for use in this present study. Once the sample of the study was determined to be adequate, factor analysis was performed. One of the outputs obtained from this factor analysis was the Total Explained Variance. The findings of the Total Explained Variance derived from factor analysis are evidenced in Table 4.4.

Table 4.4: Total Explained Variance

Component	Eigenvalues			Squared Loadings' Extraction Sums			Squared Loadings' Rotation Sums		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.342	25.708	25.708	3.342	25.708	25.708	2.865	22.037	22.037
2	1.533	11.793	37.501	1.533	11.793	37.501	1.590	12.233	34.271
3	1.428	10.986	48.487	1.428	10.986	48.487	1.549	11.916	46.186
4	1.310	10.080	58.567	1.310	10.080	58.567	1.406	10.813	56.999
5	1.060	8.151	66.717	1.060	8.151	66.717	1.263	9.718	66.717
6	0.979	7.530	74.247						
7	0.809	6.221	80.467						
8	0.716	5.506	85.974						
9	0.550	4.231	90.204						
10	0.480	3.691	93.896						
11	0.332	2.556	96.452						
12	0.290	2.233	98.684						
13	0.171	1.316	100.000						

Method ofExtraction: Analysis of Component Principal

Source: Field Data (2020)

Evidenced in Table 4.4, technological innovation had a total of 13 items, these were reduced into 5 factors cumulatively explained 66.717% of the variance in the technological innovation using Eigen value greater than one. The Matrix of Component that is Rotated was extracted as another output from factor analysis. It was used to indicate the factor loading of the items under technological innovation As evidenced in Table 4.5.

Table 4.5: Matrix of Component that is Rotated

Statements	Component				
	1	**2**	**3**	**4**	**5**
New processes in operational activities have influenced the competitive advantage	.290	-.054	.772	-.094	-.111
New innovative operational processes are shorter than old processes	-.014	.246	.146	**.733**	-.401
New innovative processes are efficient	-.081	.049	**.809**	.265	.128
Our organisation uses customers to sport opportunities for innovations	.389	**.611**	-.126	-.194	-.272
Our organisation borrows innovative ideas from other industries where they have worked well	.318	.387	.395	-.425	.063
Our organisation enters into collaborations with other information technology firms to develop new products for customers	**.740**	.144	-.016	.253	.015
The demand for new innovative products has influenced competitive advantage in our organisation	**.566**	-.021	-.008	.132	-.206
The desire to come up with new innovative products has influenced competitive advantage in our organisation	-.240	**.658**	.145	.048	.274
Our organization has initiated new innovative distribution channels for its products and services	**.813**	.061	.162	-.088	.243
The new innovative distribution channels have caused change in competitive advantage	.452	.001	.108	**.612**	.226
The new innovative distribution channels have increased performance of the firm	**.807**	.158	.208	-.153	-.019
Our organisation has adopted information system in its operations	.031	.076	.016	-.071	**.876**
The operation systems adopted have influenced competitive advantage of our firm	.284	**.717**	-.052	.277	-.004

Method ofExtraction: Analysis of Component Principal. Method of Rotation: Normalization by Kaiser of Varimax.

Source: Field Data (2020)

Evidenced in Table 4.5, all thirteen variables were loaded onto the five factors; factor one made up of four variables was distribution channel innovation, factor two made up of three variables was operation system innovation, factor three made up of one variable was process innovation, factor four made up of two variables was product innovation, and the fifth one made up of one variable was information system innovation.

4.4.2 Factor Analysis for Strategic Leadership

The moderating variable of the study was strategic leadership and there was need to establish its validity with the use of factor analysis. The Tests of Bartlett and KMO was used to establish the sample adequacy of strategic leadership as a variable with the results evidenced in Table 4.6.

Table 4.6: Tests of Bartlett and KMO for Strategic Leadership

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**.763**
Sphericity Test (Bartlett)	Approx. Chi-Square	255.328
	Df	45
	Sig.	.000

Source: Field Data (2020)

Evidenced in Table 4.6, the KMO statistic for strategic leadership was 0.763, p-value = 0.000<0.05; this implies that the sample was adequate thus, factor analysis was valid. The next step was to extract the factors. The Total Explained Variance was extracted and the outcomes evidenced in Table 4.7.

Table 4.7: Total Explained Variance for Strategic Leadership

Component	Eigenvalues			Squared Loadings' Extraction Sums			Squared Loadings' Rotation Sums		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.418	44.182	44.182	4.418	44.182	44.182	2.999	29.993	29.993
2	1.483	14.834	59.016	1.483	14.834	59.016	2.902	29.023	59.016
3	.916	9.163	68.179						
4	.772	7.715	75.894						
5	.694	6.937	82.831						
6	.579	5.790	88.622						
7	.417	4.167	92.788						
8	.296	2.965	95.753						
9	.226	2.257	98.010						
10	.199	1.990	100.000						

Method ofExtraction: Analysis of Component Principal.

Source: Field Data (2020)

The evidence in Table 4.7 indicate that the 10 items of strategic leadership reduced into two factors cumulatively accounting for 59.016% of the variance in strategic leadership. The results of the factor loading as determined by Matrix of Component that is Rotated are evidenced in Table 4.8.

Table 4.8: Matrix of Component that is Rotated for Strategic Leadership

Statements	Component	
	1	2
Strategic directions are clear	.040	.738
Mission statement of our organisation identifies who we are, what we do and the targeted customers	.699	.203
Our mission and vision are reviewed as the need arises	.870	-.067
The clarity of strategic planning process establishes clear strategic direction	.590	.497
There are appropriate internal control systems	.774	.150
We hire competent and qualified staff	.228	.755
We desire to maintain core competencies in the organisation	.012	.700
Our leaders adhere to organisational policies in utilisation of resources	.424	.648

Source: Field Data (2020)

Outcomes in Table 4.8, indicated that all the ten variables were loaded onto the two factors of strategic leadership. Specifically factor one represents strategic direction. This is made up of five variables. Factor two represents organisation control. It is made up of five variables.

4.4.3 Factor Analysis for Knowledge Management

Knowledge management was the mediating variable used in the study and it was represented by a total of 10 items. Factor analysis was conducted on all these items starting with the Tests of Bartlett and KMO with the outcomes evidenced in Table 4.9.

Table 4.9: Tests of Bartlett and KMO for Knowledge Management

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**.878**
Sphericity Test (Bartlett)	Approx. Chi-Square	175.999
	Df	45
	Sig.	.000

Source: Field Data (2020)

As evidenced in Table 4.9, the value of Tests of Bartlett and KMO statistic was 0.878>0.5, p- value = 0.000<0.05. This means that the sample for knowledge management was adequate for factor analysis. The Total Explained Variance by the items under KM was determined and presented as evidenced in Table 4.10.

Table 4.10: Total Explained Variance for Knowledge Management

Component	Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.229	32.289	32.289	3.229	32.289	32.289	2.562	25.616	25.616
2	1.719	17.193	49.482	1.719	17.193	49.482	2.104	21.038	46.654
3	1.206	12.057	61.540	1.206	12.057	61.540	1.489	14.885	61.540
4	.950	9.504	71.044						
5	.845	8.446	79.490						
6	.579	5.787	85.277						
7	.525	5.250	90.527						
8	.415	4.154	94.681						
9	.354	3.536	98.217						
10	.178	1.783	100.000						

Method ofExtraction: Analysis of Component Principal

Source: Field Data (2020)

Evidenced in Table 4.10, the variables under knowledge management were reduced into three factors using Eigen value greater than 1. The three factors cumulatively accounted for 61.540% of the variance in knowledge management. The results of the factor loading of these components are evidenced in Table 4.11.

Table 4.11: Matrix of Component that is Rotated for Knowledge Management

Statements	Component		
	1	2	3
Our employees have the desire to acquire new knowledge	.468	.377	**-.557**
Our organisation has diverse sources of new knowledge	**.754**	.132	-.185
Knowledge acquired has influenced competitive advantage in our organisation	.136	**.764**	-.079
New knowledge is actively created in our organisation	**.700**	.404	.103
Technology is used by our organisation to create new knowledge	-.045	**.817**	-.126
The ability to store new knowledge has influenced competitive advantage	**.721**	-.066	.087
Our staff actively share new knowledge among themselves	.188	.068	**.850**

Method ofExtraction: Analysis of Component Principal. Method of Rotation: Normalization by Kaiser of Varimax
a. Converged rotation in 5 iterations

Source: Field Data (2020)

The analysis in Table 4.11 shows that ten variables under knowledge management were loaded onto three factors. The first factor was knowledge acquisition and storage. This was made up of four variables. Factor two was knowledge application. It was made up of three variables. The third factor was knowledge creation and sharing. This was made up of two variables.

4.4.4 Factor Analysis for Competitive Advantage

The resultant variable of the study was competitive advantage. Factor analysis was used to establish its validity and the outcomes of the Tests of Bartlett and KMO are in Table 4.12.

Table 4.12: Tests of Bartlett and KMO for Competitive Advantage

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**.766**
	Approx. Chi-Square	520.978
Sphericity Test (Bartlett)	Df	153
	Sig.	.000

Source: Field Data (2020)

As evidenced in Table 4.12, the Tests of Bartlett and KMO statistic for competitive advantage was 0.766>0.5. This indicated that the sample for competitive advantage was adequate and valid for factor analysis. The results of the Total Explained Variance for competitive advantage are evidenced in Table 4.13.

Table 4.13: Total Explained Variance for Competitive Advantage

Component	Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.700	31.667	31.667	5.700	31.667	31.667	3.048	16.933	16.933
2	2.339	12.992	44.659	2.339	12.992	44.659	2.928	16.269	33.202
3	1.819	10.105	54.764	1.819	10.105	54.764	2.798	15.543	48.745
4	1.303	7.237	62.001	1.303	7.237	62.001	2.386	13.256	62.001
5	.949	5.272	67.273						
6	.883	4.905	72.178						
7	.876	4.864	77.042						
8	.707	3.927	80.969						
9	.662	3.677	84.646						
10	.606	3.367	88.013						
11	.536	2.979	90.992						
12	.403	2.241	93.233						
13	.348	1.936	95.168						
14	.276	1.532	96.701						
15	.205	1.137	97.838						
16	.165	.915	98.753						
17	.136	.753	99.506						
18	.089	.494	100.000						

Method ofExtraction: Analysis of Component Principal

Source: Field Data (2020)

Table 4.13 indicates that competitive advantage had a total of 18 variables; these were reduced into four factors which had a cumulative variance of 62.001%. The outcomes of the loading of these factors are evidenced in Table 4.14.

Table 4.14: Matrix of Component that is Rotated for Competitive Advantage

Statements	Component			
	1	2	3	4
Our products are unique and rare	.183	.338	**.715**	-.111
Our products are imperfectly imitable	.357	.273	**.612**	.136
Our products are non-substitutable	.073	-.003	**.800**	.069
Our products reach beyond existing demand	.450	.159	**.611**	.022
Our products cannot be easily substituted	.070	-.331	**.722**	.215
We reconstruct market boundaries in response to competition	.143	-.039	.185	**.675**
We focus on the big picture and not the numbers	.328	**.697**	-.059	-.309
We build execution into our marketplace Strategy	**.705**	.157	.220	.221
We have greater bargaining power over our Buyers	.363	.377	.132	**.514**
We outcompete our marketplace rivals	.331	**.573**	.006	.315
Our pricing is determined in consideration with the threat of substitute products	.057	**.852**	.054	.181
Our pricing is competitively low	.090	.493	.381	.297
We observe cost minimisation in marketing and Research	.107	.130	-.090	**.644**
We have mastered the strategic sequence in supply chain management	**.672**	.042	.190	.114
We overcome key organisational hurdles in our supply chain	**.659**	.173	.078	.371
We have an organisational learning culture	**.833**	-.127	.189	.187
We have greater bargaining power over our Suppliers	.348	.170	.138	**.770**

Method ofExtraction: Analysis of Component Principal. Method of Rotation: Normalization by Kaiser of Varimax a. Converged rotation in 6 iterations

Source: Field Data (2020)

The analysis in Table 4.14 indicated that seventeen out of the eighteen variables were loaded onto the four identified factors. Factor one represented supply chain effectiveness. It was made up of four variables. Factor two was cost leadership. It composed of four variables. Factor three represented product differentiation and innovation. This was made up of five variables. Factor four was organisational responsiveness. It was made up of four variables.

4.5 Respondents' Demographic Profiles

This section presents respondents' demographics. Demographics were analysed in terms of; years with the respective organisations, years in Telecom industry and education level. Participants were first asked to show the length of service in the respective organizations. This would be essential in determining respondents' experience level with pertinent institutional memory on the organisations' undertakings relevant to the study variables' manifestation in the organisations and, therefore, improve responses' credibility. The findings were evidenced in Table 4.15.

Table 4.15: Length of Service in the Organisation

Years	Frequency	Percentage
Below 3 years	27	44.3
4 - 6 years	12	19.7
7 - 10 years	20	32.8
More than 10 years	2	3.3

Source: Field Data (2020)

Table 4.15 indicated the results on the number of years the respondents had worked in their present organizations. From the results, majority (44.3%) of the respondents had worked in their organisation for less than 3 years; this was followed by 32.8% having worked for 7-10 years, 19.7% for 4-6 years and 3.3% for over 10 years respectively. This means that cumulatively most of the respondents had worked in their organisations for a period of over 4 years thus, they were knowledgeable on the key issues like technological innovation and competitive advantage. Respondents of the study were also asked to indicate the number of years they had worked in the telecommunication sector. This would depict respondents' conversance with the telecommunication industry and the pertinent concepts thereof, as explored in the present study. Results are as evidenced in Table 4.16.

Table 4.16: Years in Telecommunication Industry

Years	Frequency	Percentage
Below 3 years	23	37.7
4 - 6 years	15	24.6
7 - 10 years	5	8.2
More than 10 years	18	29.5

Source: Field Data (2020)

It was established that 37.7% of the respondents had less than 3 years of experience in the telecommunication sector, 29.5% had over 10 years, 24.6% had 4-6 years' experience and the remaining 8.2% had 7-10 years of experience. It can be deduced that most of the respondents had worked in the telecommunication sector for a relatively longer period of time spanning over four years. As such, they were knowledgeable on technological innovation, strategic leadership, and management of knowledge as well as competitive advantage within the telecommunication industry.

The study further sought to establish respondents' academic level. This indicated the degree to which respondents had a conceptual understanding of the various constructs explored on the study and their conceptualized association. Table 4.17 evidences the outcomes.

Table 4.17: Level of Education

Level of Education	Frequency	Percentage
First degree	20	32.8
Masters	37	60.7
PhD	2	3.3
Diploma	1	1.6

Source: Field Data (2020)

The findings on participants' academic level indicated that 60.7% had master's degree, 32.8% had first degrees, 3.3% had PhDs and 1.6% had diplomas. This means that respondents were able to read, understand and comprehend the questionnaires. It further showed that respondents had background information on technological innovation, management of knowledge, strategic leadership and competitive advantage.

In terms of the positions held by the respondents in their organization, the study found out that most participants were accountants, HR officers, operations managers, chief finance officers, administrators, client relationship managers, distribution supervisors, HR managers, line managers, sales managers and representatives, system engineers and technical supervisors. The other respondents were business development officers, communication managers, coordinators, data center, general managers, graphics designers, inspection officers, knowledge managers, logistics manager, logistics officer, marketing directors, office administrators, operations assistants, procurement managers, project assistants, sales and marketing directors, strategy and innovation managers, strategy officers, systems operators and technical support staff.

Thus, the study involved respondents from diverse areas of operations as aforementioned, which could be an indication that diverse views on innovation, strategic leaders, knowledge management and competitive advantage were sought from these respondents. Some of these respondents were responsible for knowledge management, which was a mediating variable of the study while other respondents were responsible for technological innovation, which was covered as an inresultant variable of the study.

4.6 Organisational Profiles

The study collected data on various organisational demographic characteristics among the telecommunication companies in Kenya. The demographics deemed of pertinence to the present study included the existence of strategic plan and number of new applications developed over past 1 year. Telecommunication firms that have a strategic plan in place are perceived to have well established systems technological innovation, strategic leadership, knowledge management, and competitive advantage as compared to those that do not. Against this backdrop, respondents were asked to indicate whether their organizations had an existent strategic plan. Outcomes are evidenced in Table 4.18.

Table 4.18: Existence of Strategic Plan

Existence	Frequency	Percentage
Present	55	90.2
Absent	6	9.8

Source: Field Data (2020)

The analysis in Table 4.18 indicated that 90.2% of the studied firms had strategic plan in place while only 9.8 % did not have strategic plan. By having strategic plan, it can be interpreted that the firms also had vision and mission statements, which are key components of strategic leadership.

Strategic leadership involves planning for the future by setting goals and giving direction to the firm so that the formulated goals can easily be attained. Strategic leadership had further been defined as the managerial ability to formulate strategic vision either for the entire organization or strategic business unit and to encourage those working below them to buy into it and work towards it (Nastase, 2013).

Respondents were asked to show the number of new applications developed over past 1 year. This would give an impression of the level of technological innovation among the telecommunication firms. The more the number of new applications, the more innovative the firm is deemed to be. Table 4.19 evidences the outcomes.

Table 4.19: Number of New Applications Developed Over Past 1 Year

Number	Frequency	Percentage
Less than 5	28	45.9
6 - 10	19	31.1
More than 10	14	23.0

Source: Field Data (2020)

From the outcomes, the investigation uncovered that 45.9% of the firms had developed less than 5 new applications within the past one year, 31.1% had developed between 6 to 10 new applications in the past one year, and 23.0% had developed over 10 new applications in the past one year. This means that most of the firms under investigation had adopted technological innovation, and used it to come up with new applications which was the central theme in the study.

4.7 Technological Innovation

The study sought to determine the rating of the respondents on statements relating to technological innovation. Standard deviations and mean averages were used. The participants were requested to give their ratings on the thirteen (13) statements derived from the five sub-constructs, including process innovation, distribution channel innovation, product innovation, information and operation systems innovations. A five- point Likert-type scale, varying from 1 being strongly disagree to 5 being strongly agree was used. The outcomes are evidenced and presented in subsequent sections.

4.7.1 Process Innovation

One of the measures of technological innovation was process innovation. According to the Organisation for Economic Co-operation and Development (OECD) (2005), process innovation entails the creation and execution of a new or notably improved delivery method or production. This includes notable improvements in software, equipment and/or techniques. The objective of process innovations is decreasing unit costs of delivery or production, to deliver or produce new or significantly increase or improve product quality. The findings of descriptive analytics are evidenced in Table 4.20.

Table 4.20: Process Innovation

Process Innovations	n	Mean	Std. Dev
New processes in operational activities have influenced the competitive advantage	61	3.62	0.879
New innovative processes are efficient thus influences the competitive advantage	61	3.97	0.894
Overall Mean	**61**	**3.87**	**0.843**

Source: Field Data (2020)

The evidence in Table 4.20 indicated an overall mean of 3.87 for process innovation. It is deducible from this that, participants affirmed that process innovation was embraced by their firms to a large extent. The overall standard deviation on process innovation was 0.843, which is less than 1 implying that majority of the responses coalesced around affirming to a large extent while a minority either affirmed to either very large extent or moderate extent based on the five-point Likert type scale. The statement which the respondents highly agreed with a mean of 3.97 was 'new innovative processes are efficient thus influences the competitive advantage' while the statement with the lowest value of mean of 3.62 was 'new processes in operational activities had influenced the competitive advantage'.

4.7.2 Product Innovation

Technological innovation was also indicated by product innovation. Wong (2014) defines product innovation as the development and subsequent introduction of a product or service which is either an improved or new version of previous products and/or services. The dimension had a number of items that were rated on a five-point Likert type scale. The summary of the descriptive analytics using means and standard deviation are evidenced in Table 4.21.

Table 4.21: Product Innovation

Product Innovations	n	Mean	Std. Dev
Our firms enter into collaborations with other information technology firms to develop new products for the customers	61	3.67	0.926
The demand for new innovative products has influenced the competitive advantage in our organisation	61	3.95	0.669
Our organisation has initiated new innovative distribution channels for its products and services	61	3.80	0.928
The new innovative distribution channels have increased performance of our firm	61	3.85	0.946
Overall Mean	61	**3.82**	**0.867**

Source: Field Data (2020)

The overall mean score for product innovation was 3.82. This implied that to a large extent the firms had embraced product as one of the components of technological innovation. The overall value of standard deviation was 0.867<1 thus majority of the responses coalesced around affirming to product innovation being practised to a large extent across the respective firms. The statement 'the demand for new innovative products has influenced the competitive advantage in our organization' had the highest mean of 3.95, followed by 'new innovative distribution channels have increased performance of our firm' at a mean of 3.85. The statement 'our firms enter into collaborations with other information had the lowest rating with mean of 3.67.

4.7.3 Operation System Innovation

Operation systems imply the programs organisations have in place in the production of goods and services as well as day to day transactions within an organisation. Innovative operation systems are designed in a fashion that day-to-day processing of operations is performed efficiently. The participants were requested to give their ratings on the statements on operation system innovation as an indicator of technological innovations. The outcomes are evidenced in Table 4.22.

Table 4.22: Operation System Innovation

Operation System	n	Mean	Std. Dev
Our organisation uses customers to spot opportunities for innovations	61	3.98	0.785
The desire to come up with new innovative products has influenced the competitive advantage in our organisation	61	3.92	0.690
The operation systems adopted have influenced the competitive advantage	61	3.93	0.814
Overall Mean	61	**3.94**	**0.763**

Source: Field Data (2020)

The analysis in Table 4.22 shows that in overall operation system innovation had a mean of 3.94. This implied that most companiesaffirmed to operation systems innovation as an aspect of technological innovation across the telecommunication firms in Kenya surveyed to a great extent. The overall value of standard deviation was 0.763<1, which was interpreted to imply that majority of the responses coalesced around affirming to operation systems innovation being practiced as a technological innovation to a large extent across the organisations surveyed. Most companiesparticularly affirmed that their organisation uses customers to spot opportunities for innovations to a great extent (mean=3.98), followed by operation systems adopted have influenced the competitive advantage (mean = 3.93) and the desire to come up with new innovative products has influenced the competitive advantage in our organization (mean = 3.92) respectively.

4.7.4 Information System Innovation

Technological innovation was further indexed by information systems innovation, which is defined by Poon and Jevons (2017) as innovation in the firm-based application of communications and digital computer technologies. The extensive effects of information systems on performance and business operation are increasingly being acknowledged to be strategic, with new information technologies and their applications abounding in the information age. The participants were requested to give their ratings on statements on information system innovation. The outcomes are evidenced in Table 4.23.

Table 4.23: Information System Innovation

Information System Innovation	n	Mean	Std. Dev
Our organisation has adopted information system in its operations	61	3.95	0.717
Overall Mean	**61**	**3.95**	**0.717**

Source: Field Data (2020)

The analysis in Table 4.23 demonstrates that, the overall rating of information system innovation had a mean of 3.95. This means that, majority of the respondents highly agreed on information system as an aspect that had been adopted by their organisations. The overall value of standard deviation on information system was 0.717<1 this meant that majority of responses converged around affirming to information systems being utilised as a technological innovation to a large extent across majority of the organisations. Further respondent agreed that their organisation had adopted information system in its operations (mean= 3.95).

4.7.5 Distribution Channel Innovations

Distribution channel innovations is defined by Drucker (2018) as the creation of improved and more efficient the mode and/or chain of intermediaries or businesses through which a product or service goes through until it reaches the end consumer final buyer. Distribution channels include retailers, wholesalers, the internet and even distributors. The study asked the respondents to rate statements on distribution channel innovations. The outcomes are evidenced in Table 4.24.

Table 4.24: Distribution Channel Innovations

Distribution Channel Innovations	n	Mean	Std. Dev
The new innovative channels have caused a change in the competitive advantage	61	4.00	0.856
New innovative operational processes are shorter than old processes	61	3.92	0.802
Overall Mean	**61**	**3.96**	**0.829**

Source: Field Data (2020)

As evidenced in Table 4.24, the overall rating of distribution channel innovations had a mean of 3.96. It is inferrable from this that participants affirmed that to a great extent the distribution channel innovation was a dimension of technological innovation. The overall value of standard deviation was 0.829<1, implying that majority of the responses coalesced around affirming to distribution channel innovation being practised as a technological innovation to a large extent across the organisations surveyed. Most companiesaffirmed that to a great extent new innovative channels had caused a change in the competitive advantage (mean = 4.00) followed by innovative operational processes are shorter than old processes (mean = 3.92). The overall ranking on technological innovation is evidenced in Table 4.25.

Table 4.25: Overall Ranking on Technological Innovation

Technological Innovation	Mean	Std. Dev
Information System	3.95	0.717
Operation System Innovations	3.94	0.763
Distribution Channel Innovations	3.96	0.829
Process Innovations	3.87	0.843
Product Innovations	3.82	0.867
Composite Score on Technological Innovation	**3.89**	**0.820**

Source: Field Data (2020)

As evidenced in Table 4.25, distribution channel innovation was highly practiced (mean= 3.96) as an indicator of technological innovation followed by information system (mean=3.95), operation system (mean = 3.94), process innovations (mean = 3.87), and product innovation (3.82) respectively. On overall, the composite score for technological innovation was 3.89, which implies that technological innovation was highly practiced among the studied organizations. The overall standard deviation was 0.820< 1 indicating that majority of responses converged around affirming to a large extent on most statements in each scale while a minority either affirmed to either very large extent or moderate extent based on the five-point Likert-type scale.

4.8 Strategic Leadership

The study sought to determine the central tendency and dispersion of data on strategic leadership. The variable, strategic leadership generated a total of ten (10) statements from which two sub-constructs were derived, that is, strategic direction and organisation controls. Mean and standard deviation were used to summarize the rating on a five-point Likert-type scale, from strongly disagreeing depicted by 1 to strongly agreeing depicted by 5. The outcomes are evidenced and presented in the subsequent sections.

4.8.1 Strategic Direction

Strategic direction is defined by Araujo, Dubois and Lars-Erik (2017) as the actions an organisation takes to realize the organisational goals. Strategic direction includes among others, the actions and plans an organisation has put in place to work toward this vision of the future for the organisation. Different statements on strategic direction were formulated where participants were requested to show the degree of their affirmation on them. A summary of the descriptive analytics using means and standard deviation are evidenced in Table 4.26.

Table 4.26: Strategic Direction

Question Items	n	Mean	Std. Dev
Mission statement of our organisation identifies who we are, what we do and the targeted customers	61	4.13	0.763
Our mission and vision are reviewed as the need arises	61	3.72	1.157
The clarity of strategic planning process establishes clear strategic direction	61	3.89	0.798
There are appropriate internal control systems	61	3.80	0.749
Our strategic plan is reviewed quarterly to allow for corrective actions	61	3.41	1.006
Overall Mean	**61**	**3.79**	**0.8946**

Source: Field Data (2020)

As evidenced in Table 4.26, the overall mean score was 3.79 which was interpreted to mean that most companies under study had embraced organisational control as an element of strategic leadership to a great extent. The overall value of standard deviation was 0.8946 which was less than 1 indicating that majority of responses converged around affirming to a large extent. The statement that was highly rated by the respondents with a mean of 4.13 was that the mission statement of our organisation identified who they were, what they did and the targeted customers.

4.8.2 Organisational Controls

Organizational control is defined by Marchington and Vincent (2016) as a practice in which leaders determine objectives and goals. In the practice of organisational controls, middle managers specialize in making decisions associated with their fields of specialisation, while operational staff execute activities to realize the goals. Different statements on strategic leadership were formulated, where participants were requested to show the degree of their affirmation on them. A summary is indicated in Table 4.27.

Table 4.27: Organisational Controls

Question Items	n	Mean	Std. Dev
Our leaders adhere to organisational policies in utilisation of resources	61	3.87	0.866
We desire to maintain core competencies in the organisation	61	3.80	0.853
We hire competent and qualified staff	61	3.79	0.878
Our strategic plan directs overall annual operational plan	61	3.74	0.893
Strategic directions are clear	61	3.90	0.870
Overall Mean	**61**	**3.82**	**0.872**

Source: Field Data (2020)

As depicted in Table 4.27, an overall mean score of 3.82 was recorded for organisational controls implying that majority of respondent organisations affirmed to having organisational controls as part of strategic leadership in their respective organisations to a great extent. A standard deviation of 0.872 was also recorded implying that majority of responses converged around affirming to a large extent, across majority of the statements posed. Particularly, most companieshighly affirmed that there was a clear strategic direction (mean = 3.90); leaders adhered to organisational policies in utilisation of resources (mean = 3.87); and that there was a desire to maintain core competencies in the organisation (mean = 3.80).

4.9 Knowledge Management

The study further sought to explore the rating of statements on knowledge management. The variable, knowledge management, generated a total of ten (10) statements from which three sub-constructs were derived, that is, knowledge creation, knowledge storage and knowledge sharing. descriptive analytics were used to summarise the rating on a five-point Likert scale, from strongly disagreeing depicted by 1 to strongly agreeing depicted by 5. The results are summarised and presented in the subsequent sections.

4.9.1 Knowledge Acquisition

Gibbert, Leibold and Probst (2016) defined knowledge acquisition as the process of organizing, structuring, and extracting knowledge from one source, usually human experts. The study utilised descriptive analytics, that is, means and standard deviations to summarize the items provided on the Likert-type scale under knowledge management. The outcomes are evidenced in Table 4.28.

Table 4.28: Knowledge Acquisition

Question Items	n	Mean	Std. Dev
Our organisation has diverse sources of new knowledge	61	3.93	0.655
Our employees have the desire to acquire new knowledge	61	3.70	0.955
Overall Mean	**61**	**3.82**	**0.805**

Source: Field Data (2020)

An overall mean score of 3.82 was recorded for knowledge acquisition, implying that most companiesaffirmed that knowledge acquisition was an important practice in knowledge management across the organisations. A standard deviation of 0.805<1 was also established indicating that majority of responses converged around affirming to a large extent, across majority of the statements posed. Further, most participants affirmed that to a great degree, their organisation had diverse sources of new knowledge (mean = 3.93), and their employees had the desire to acquire new knowledge (mean = 3.70).

4.9.2 Knowledge Creation

Knowledge creation is defined by Chau (2016) as the continuous formation of new concepts and notions, transfer, combination, and conversion of different kinds of knowledge as a result of individuals' interaction, learning and practice. This takes place through interactions between tacit and explicit knowledge in individuals' minds. The study relied on the descriptive analytics covering means and standard deviations to summarise the items provided on the Likert type scale under knowledge creation. The outcomes are evidenced in Table 4.29.

Table 4.29: Knowledge Creation

Question Items	n	Mean	Std. Dev
New knowledge is actively created in our organisation	61	3.85	0.771
Technology is used by our organisation to create new knowledge	61	4.26	0.630
Overall Mean	**61**	**4.06**	**0.700**

Source: Field Data (2020)

As evidenced in Table 4.29, knowledge creation had an overall rating of mean of 4.06. This revealed that majority of the respondents agreed on knowledge creation as key component of knowledge management in their organisation. The value of standard deviation was 0.700 less than 1 implying that majority of responses converged around affirming to a large extent, across majority of the statements posed. Most companiesfurther affirmed that technology was used by their organisation to create new knowledge (mean = 4.26), and new knowledge was actively created in their organisation (mean = 3.85).

4.9.3 Knowledge Storage

Knowledge storage and protection involves ensuring the information acquired is kept safely within the organisation and ensuring it is not wasted or lost (Estrada et. al., 2016). The process of data protection is an important one in an organisation for purposes of enhancing functioning and important controls in the business, which often comprises the use of copyrights and patents, with the information technology system permitting the information to provide operators the rights of their practice, through file name, username, passwords and shared protocols (Matin & Sabagh, 2015). The study used means and standard deviations to summarise the rating of the items provided on the Likert type scale under knowledge management. The outcomes are evidenced in Table 4.30.

Table 4.30: Knowledge Storage

Question Items	n	Mean	Std. Dev
The ability to store new knowledge has influenced competitive advantage	61	3.67	0.851
We store knowledge in ways that make it easily retrievable	61	3.62	0.756
Overall Mean	61	**3.65**	**0.804**

Source: Field Data (2020)

An overall mean score of 3.65 was recorded for knowledge storage. This confirmed that most companiesacknowledged that knowledge storage is a crucial practice in knowledge management across the organisations. A standard deviation of 0.804<1 was also established indicating that majority of responses converged around affirming to a large extent, across the statements posed. More specifically, most companiesaffirmed that to a great extent, that the ability to store new knowledge had influenced competitive advantage (mean = 3.67) and they stored knowledge in ways that made it easily retrievable (mean = 3.62).

4.9.4 Knowledge Application

Knowledge application refers to use of information gathered to advance organisational objectives and goals (Gonzalez & Martins, 2017). Knowledge application can further be described as the ways of stimulating knowledge to generate worth in the firm, which can be revealed through inventions, formations, and new products (Estrada, Faems & de Faria, 2016). The study used means and standard deviations to summarise the rating of the items provided on the Likert type scale under knowledge management. The outcomes are evidenced in Table 4.31.

Table 4.31: Knowledge Application

Question Items	N	Mean	Std. Dev
Innovations have played major roles in the creation of new knowledge	61	3.84	0.898
The ability to retrieve knowledge has influenced competitive advantage of our organisation	61	3.77	0.693
Overall Mean	61	**3.81**	**0.796**

Source: Field Data (2020)

An overall mean score of 3.81 was recorded for knowledge application. This confirmed that most companiesacknowledged that knowledge application is a vital practice in knowledge management across the organisations. A standard deviation of 0.796<1 was also established indicating that majority of responses converged around affirming to a large extent, across the statements posed. More specifically, most companiesaffirmed that to a great extent, that innovations had played major roles in the creation of new knowledge (mean = 3.84), and the ability to retrieve knowledge had influenced competitive advantage of their organisations (mean = 3.77).

4.9.5 Knowledge Sharing

Knowledge sharing entails the exchange of knowledge among individuals within or between organisations (Lam, 2017). Knowledge maybe shared through many channels including meetings, conversations, learning sessions, videos, workshops, and other communication media. The study used means and standard deviations to summarise the rating of the items provided on the Likert type scale under knowledge management. The outcomes are evidenced in Table 4.32.

Table 4.32: Knowledge Sharing

Question Items	n	Mean	Std. Dev
Our staff actively share new knowledge among themselves	61	3.84	0.879
Knowledge acquired has influenced competitive advantage in our organization	61	3.87	0.885
Overall Mean	61	**3.86**	**0.882**

Source: Field Data (2020)

An overall mean score of 3.86 was recorded for knowledge sharing. This confirmed that most companiesacknowledged that knowledge sharing is a pertinent practice in knowledge management across the organisations. A standard deviation of 0.882<1 was also established indicating that majority of responses converged around affirming to a large extent, across the statements posed. More specifically, most companiesaffirmed that to a great extent, that knowledge acquired had influenced competitive advantage in their organisation (mean = 3.87), and staff actively shared new knowledge among themselves (mean = 3.84).

4.10 Competitive Advantage

Competitive advantage was represented by four dimensions covering product differentiation and innovation, organisational responsiveness, cost leadership and supply chain effectiveness. Mean and standard deviation was used to analyse the rating. The results are as summarised in subsequent sections.

4.10.1 Product Differentiation and Innovation

The first indicator under competitive advantage was product differentiation and innovation. The results of the descriptive analytics using means and standard deviation on this indicator were determined and presented As evidenced in Table 4.33.

Table 4.33: Product Differentiation and Innovation

Product Differentiation and Innovation	n	Mean	Std. Dev
Our products are unique or rare	61	3.48	1.010
Our products are imperfectly imitable	61	3.41	1.006
Our products are non-substitutable	61	3.23	1.071
Our products cannot be easily substituted	61	3.51	0.924
Overall Mean	**61**	**3.46**	**0.984**

Source: Field Data (2020)

Evidenced in Table 4.33, the overall mean score on product differentiation and innovation as an attribute of competitive advantage among the firms was 3.46. This means that the studied firms to a moderate extent had attained product differentiation and innovation as a component of competitive advantage. Most companiesaffirmed that to a great extent their respective products reach beyond existing demand cannot be easily substituted (mean = 3.66) and products cannot be easily substituted (mean = 3.51). To a moderate extent; products are unique or rare (mean = 3.48) and products are imperfectly imitable (mean = 3.41).

4.10.2 Organisational Responsiveness

The second component of competitive advantage that the investigation concentrated on was organisational responsiveness. The outcomes of the descriptive analytics on this indicator are evidenced in Table 4.34.

Table 4.34: Organisational Responsiveness

Organisational Responsiveness	**n**	**Mean**	**Std. Dev**
We reconstruct market boundaries in response to competition	61	3.79	0.878
We have a greater bargaining power over our buyers	61	3.77	0.804
We observe cost minimisation in marketing and research	61	3.79	0.915
We have a greater bargaining power over our suppliers	61	3.97	0.774
Overall Mean	**61**	**3.83**	**0.843**

Source: Field Data (2020)

The findings in Table 4.34 indicated that the overall rating organisational responsiveness had a mean of 3.83. This implied that to a great degree most companies under study had attained organisational responsiveness as an aspect of competitive advantage. These results are supported by an overall standard deviation of 0.843<1 indicating that majority of responses converged around affirming to a great extent to organisational responsiveness as an attribute of competitive advantage of their respective firms. Most companiesaffirmed that their respective organisations have a greater bargaining power over their suppliers (mean = 3.97), their respective organisations reconstruct market boundaries in response to competition (mean = 3.79), firms observe cost minimisation in marketing and research (mean = 3.79), and firms had a greater bargaining power over their buyers (mean = 3.77).

4.10.3 Cost Leadership

Cost leadership was another dimension of competitive advantage covered by the study. The summary of the descriptive analytics on cost leadership using means and standard deviation are evidenced in Table 4.35.

Table 4.35: Cost Leadership

Cost Leadership	n	Mean	Std. Dev
Our pricing is determined in consideration with the threat of new entrants	61	3.20	0.980
Our pricing is determined in consideration with the threat of substitute products	61	3.39	0.954
Our pricing is competitively low	61	3.57	1.008
We outcompete our marketplace rivals	61	3.72	0.859
We focus on the big picture and not the numbers	61	3.66	0.998
Overall Mean	**61**	**3.508**	**0.960**

Source: Field Data (2020)

The evidence in Table 4.35 indicated that the overall mean on cost leadership was 3.508, thus respondents highly affirmed cost leadership as great component of competitive advantage in their firms. This view is corroborated by a standard deviation of 0.960<1 implying that majority of responses converged around affirming to a great extent to cost leadership as an attribute of competitive advantage of their respective firms. Participants were in afirmation to a great extent that their firms outcompete marketplace rivals (mean = 3.72) followed by focus on the big picture and not the numbers (mean = 3.66), and firm pricing is competitively low (mean = 3.57).

4.10.4 Supply Chain Effectiveness

The last component of competitive advantage covered by the study was supply chain effectiveness. Means and standard deviations were computed on this indicator with the results being shown in Table 4.36.

Table 4.36: Supply Chain Effectiveness

Supply Chain Effectiveness	n	Mean	Std. Dev
We have mastered the strategic sequence in supply chain management	61	3.59	0.901
We build execution into our marketplace strategy	61	3.77	0.844
We overcome key organisational hurdles in our supply chain	61	3.82	0.764
We have an organizational learning culture	61	3.84	0.969
Overall Mean	**61**	**3.755**	**0.867**

Source: Field Data (2020)

The evidence in Table 4.36 indicated that supply chain effectiveness had an overall mean of 3.755. This implied that to a great extent most of the respondents agreed on the provided statements under supply chain effectiveness as a dimension of their competitive advantage. The overall value of standard deviation was 0.867<1 confirmed that majority of responses converged around affirming to a great extent to supply chain effectiveness as an attribute of competitive advantage of their respective firms. To a great extent; respondents affirmed that their respective organisations have an organisational learning culture (mean = 3.84), organisations overcome key organisational hurdles in our supply chain (mean = 3.82), build execution into our marketplace strategy (mean = 3.77), and organisations have mastered the strategic sequence in supply chain management (mean = 3.59) respectively.

4.10.5 Summary for Competitive Advantage

The individual components of competitive advantage and their associated overall means and standard deviations were summarised to provide a ranking As evidenced in Table 4.37.

Table 4.37: Ranking of Competitive Advantage

Competitive Advantage	Mean	Std. Dev	Ranking
Organisational Responsiveness	3.83	0.843	1
Supply Chain Effectiveness	3.755	0.867	2
Cost Leadership	3.508	0.960	3
Product Differentiation and Innovation	3.46	0.984	4
Composite Score of Competitive Advantage	**3.63**	**0.919**	

Source: Field Data (2020)

The evidence in Table 4.37 provided a ranking on the dimensions of competitive advantage. From the outcomes, the investigation established that the highly attained aspect of competitive advantage was organisational responsiveness (mean = 3.83) followed by supply chain effectiveness (mean = 3.755), cost leadership (mean = 3.508), and lastly product differentiation and innovation (mean = 3.46).

The composite score was (mean = 3.63), which meant that most companies under study had attained competitive advantage to a great extent. The overall value of standard deviation was 0.919; this statistic is lower than 1 implying that majority of responses converged respective organisations attaining competitive advantage to a great extent.

4.11 Diagnostic Test

This segment presents the diagnostic test results in which the tests of assumptions were conducted, including tests for normality, linearity, multicollinearity, as well as homoscedasticity. It is critical to test the regression analysis assumptions in order to avoid under fitting or over fitting of the regression models which if left un-checked may lead to committing Type II or Type I errors. Additionally, it is useful to test for these assumptions since it aids in determining the most appropriate technique of data analysis. Accordingly, the study assessed the assumptions of regression analyses and confirmed that it was not disposed to violation. Statistical techniques including analyses of variance, t-test analysis, and means of regression are performed with the assumption that the data are distributed normally. The diagnostic tests were, therefore, conducted to identify and correct the statistical errors. Results for the tests of regression analysis predications are reported in subsections 4.11.1 to 4.11.4.

4.11.1 Normality Test

Statistical techniques presuppose that the assumption that data are normally distributed is tested. Distributions' normality was numerically assessed through statistical assessments particularly Shapiro-Wilk test, kurtosis and skewness as well as graphically through visual examination of plots and graphs. If the normality assumption is debased, the regression analysis tests including the model goodness of fit and the results may not portray the actual image of the association amongst variables. As per Collis and Hussey (2009) it is more appropriate to perform a Shapiro-Wilk test for small sizes of below 50 but may as well be amenable for as large samples as two thousand. Normality's significance in Shapiro-Wilk test is shown by figures higher than 0.05 (Ary et. al., 2010). Outcomes are evidenced in Table 4.38.

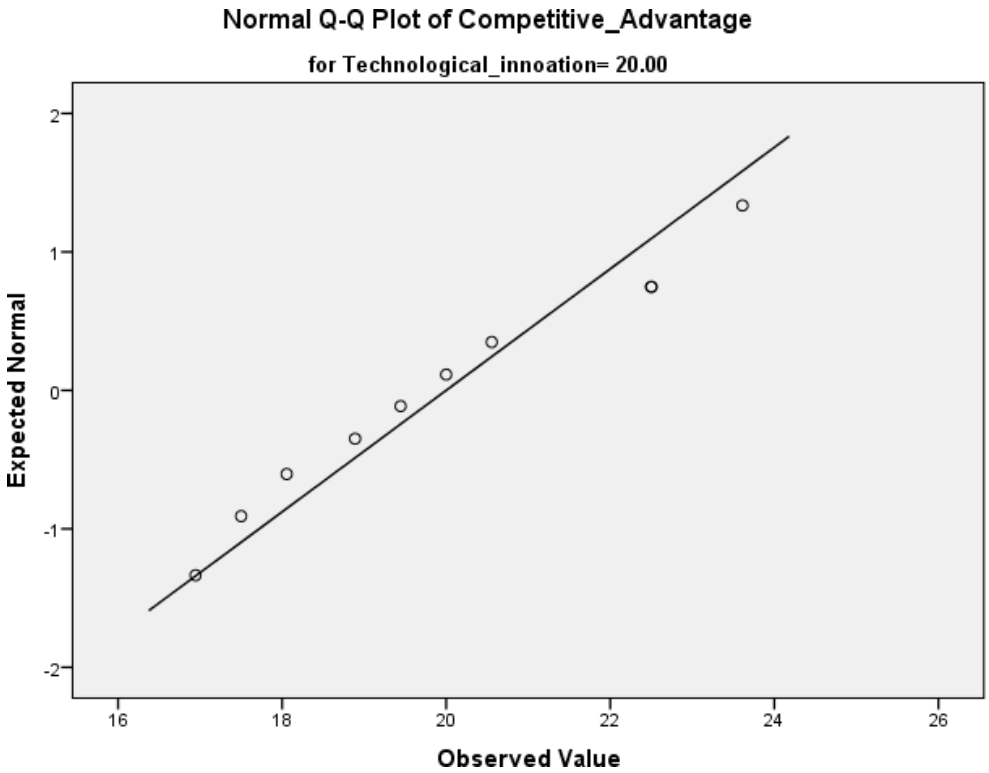
Table 4.38 Normality Test

Variables		**Tests of Normality**[a,b,d,e,g,h]					
Technological Innovation		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Competitive Advantage	15.77	.260	2				
	16.92	.260	2				
	17.31	.260	2				
	18.08	.204	3		.993	3	.843
	18.46	.314	3		.893	3	.363
	18.85	.190	4		.987	4	.943
	19.23	.253	7	.197	.883	7	.241
	19.62	.195	4		.971	4	.850
	20.00	.164	10	.200*	.946	10	.616
	20.38	.208	4		.950	4	.714
	20.77	.281	6.149		.871	6	.231
	21.92	.287	5.200*		.893	5	.372
	22.31	.269	3		.949	3	.567

***. This is a lower bound of the true significance**

Source: Field Data (2020)

Table 4.38 presents the Shapiro-Wilk tests. The p-values are greater than 0.05 indicating that the data are normally distributed. The results revealed that technological innovation and competitive advantage were normally distributed. The assumption of normality was, therefore, met.



Source: Field Data (2020)

Figure 4.1: Q-Q Plot

The Q-Q plot is an excellent technique of establishing whether or not the data diverges from other scatterings as the study is only interested in normal distribution. As shown in Figure 4.1, all the rings are distributed close to the line of best fit at 45 degrees, an indication that the data displays a normal distribution. Hence, the assumption of normality was met.

4.11.2 Test of Multicollinearity

Multicollinearity is evidenced when a pair of determinant concepts or more are highly correlated (Creswell, 2013). As evidenced in Table 4.39, multicollinearity was assessed by both the Variance Inflation Factor (VIF) and tolerance level. Whereas VIF measures how much change the regression value is exaggerated by multicollinearity, which misleadingly inflates the standard errors, tolerance is the quantity of difference in inresultant variable that is not expounded by the other determinant variable. The maximum limit score for tolerance is typically 1.0, while VIF value needs not to be more than 10 (Keith, 2006). Table 4.39 provides results of multicollinearity tests.

Table 4.39: Test of Multicollinearity

Coefficients[a]			
Model		**Collinearity Statistics**	
		Tolerance	**VIF**
1	Technological Innovation	.930	1.075
	Strategic Leadership	.930	1.075

a. Dependent Variable: Knowledge Management
Source: Field Data (2020)

As portrayed in Table 4.39, the VIF values were all below 10 and the tolerance values were also all below 1.0. Specifically; Technological innovation (VIF = 1.075<10; Tolerance = .930<1); Strategic Leadership (VIF = 1.075<10; Tolerance = .930<1). The statistics depict absence of the problem of multicollinearity thus variables, Technological innovation, strategic leadership and knowledge management are fit to be used in the model. The study further conducted the condition index values to test for collinearity as evidenced in Table 4.40.

Table 4.40: Collinearity Diagnostics

Collinearity Diagnostics[a]					
Model	Eigenvalue	Condition Index	Variance Proportions		
			(Constant)	Technological Innovation	Strategic Leadership
1	2.981	1.000	.00	.00	.00
2	.014	14.550	.08	.14	.98
3	.005	24.100	.92	.86	.01

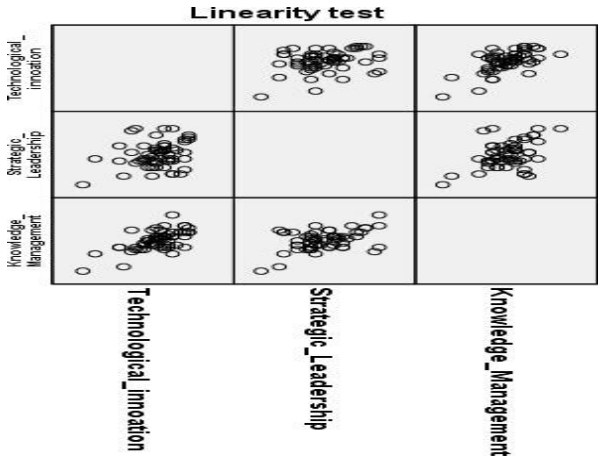
a. Dependent Variable: Knowledge Management

Source: Field Data (2020)

As evidenced in Table 4.40, the Condition Index (CI) values were below 30 suggesting that there were no problems of multicollinearity; Technological Innovation (CI = 14.55<30) and Strategic Leadership (CI = 24.1<30).

4.11.3 Test of Linearity

A scatter diagram for the outcome and determinant concepts was used to test for linearity. The scatter diagram for technological innovation, strategic leadership and knowledge management against competitive advantage shown by Loess curve is presented in Figure 4.2.



Source: Field Data (2020)

Figure 4.2: Linearity Test

The graphical display in Figure 4.2 shows that the predictor variables technological innovation, management of knowledge, strategic leadership and against competitive advantage met the condition for linearity. A Pearson correlation analysis was also performed among the predictor variables to further assess linearity, as tabulated in Table 4.41

Table 4.41: Correlations among the Variables

Variables		Competitive Advantage	echnological Innovation	Strategic Leadership	Knowledge Management
Competitive Advantage	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	61			
Technological Innovation	Pearson Correlation	0.349*	1		
	Sig. (2-tailed)	0.000			
	N	61	61		
Strategic Leadership	Pearson Correlation	0.300*	.264*	1	
	Sig. (2-tailed)	0.000	0.04		
	N	61	61	61	
Knowledge Management	Pearson Correlation	0.447*	.648**	.442**	1
	Sig. (2-tailed)	0.000	0.000	0.000	
	N	61	61	61	61

*. Correlation is significant at the 0.05 level (2-tailed)

**. Correlation is significant at the 0.01 level (2-tailed)

Source: Field Data (2020)

The results of correlation analysis indicated that all the independent variables were positively and significantly correlated with the dependent variable. Knowledge management had the highest correlation with competitive advantage (R = 0.447, p-value = 0.000) followed by technological innovation (R = 0.349, p-value = 0.000) and strategic leadership (R = 0.300, p-value = 0.000). Thus, the assumption of linearity was met.

4.11.4 Test of Homoscedasticity

According to Tabachnick and Fidell (2007), heteroscedasticity is recorded when the variance of the dependent variables' errors is not similar/constant throughout the data. Field (2009) concurred that heteroscedasticity takes place when the error term is different. It is recorded when at diverse values of the predictor variables, the error differences vary.

As such, presence of a trivial heteroscedasticity has a little effect on important statistical operations (Berry & Feldman, 1985). When heteroscedasticity occurs, it could result in a grave result misrepresentation, and weaken the analysis extremely, increasing the likelihood of type 1 error. Heteroscedasticity occurs when the distribution of residuals is not uniform around the parallel line (Tabachnick & Fidell, 2007). In this study, homogeneity of variance was assessed by Levene statistic. As per Collis and Hussey (2009), Levene's test verifies the variance equality in the samples with the standard threshold of (p-value >.05). Findings on the test for Homoscedasticityare reevidenced in Table 4.42.

Table 4.42: Test of Homoscedasticity

Levene's Test of Equality of Error Variances[a]

Resultant Concept: Competitive Advantage

F	df1	df2	Sig.
0.662	56	4	0.788

Tests the null hypothesis that the error variance of the resultant variable is equal across groups.

a. Design: Intercept + Technological Innovation + Strategic Leadership + Knowledge Management + Interact TI SL

Source: Field Data (2020)

As evidenced in Table 4.42, the study recorded p-value = 0.766>0.05 indicating homogeneity of variance. The assumption of homoscedasticity was met.

4.12 Tests of Hypotheses

This segment presents the hypothesis test results. In the study, four major hypotheses advanced based on both theory and extant empirical literature were tested. Four types of regression analyses were performed, including simple linear regression, step-wise regression analysis, path analysis, and multiple linear regression analysis. The results were interpreted by assessing coefficient of determination (R^2), R^2 change, F-statistic, t-testand p-values and standardised beta coefficients.

The direct association between technological innovation and competitive advantage was assessed using the simple linear regression analysis. Interactive effect of strategic leadership on the link between technological innovation and competitive advantage was tested using step-wise regression analysis. The mediating outcomes of knowledge management on the link between technological innovation and competitive advantage was assessed using path analysis (Baron & Kenny, 1986) and the joint effect of technological innovation, knowledge management and strategic leadership on competitive advantage was tested using multiple linear regression analysis.

4.12.1 Technological Innovations and Competitive Advantage

The study stated the first hypothesis as H_1: *Competitive advantage is significantly influenced by technological innovation*. To test Hypothesis H_1, a simple linear regression analysis was performed, which produced the regression coefficients, Analysis of Variance (ANOVA) and model summary. It was on the basis of the statistical significance of the regression coefficients that the hypothesis test results were interpreted.

Table 4.43: Model Summary for Relationship between Competitive Advantage and Technological Innovation

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.349[a]	.122	.107	2.37356	1.599

a. Determinants: (Constant), Technological Innovation
b. Resultant Concept: Competitive Advantage

Source: Field Data (2020)

The evidence in Table 4.43 shows a correlation value (R) of .349 which showed that there was a positive and moderate linear relationship between technological innovation and competitive advantage. Goodness of fit R^2 value of 0.122 was further established. This indicated that technological innovation explained 12.2% of the variations in competitive advantage, meaning 87.8% is accounted for by other factors not studied in the current regression model. ANOVA test results were further produced as evidenced in Table 4.44.

Table 4.44: Outcomes of ANOVA for Link between Competitive Advantage and Technological Innovation

ANOVA[a]					
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.977	1	45.977	8.161	.006[b]
	Residual	332.393	59	5.634		
	Total	378.370	60			

a. Resultant Concept: Competitive Advantage
b. Determinants: (Constant), Technological Innovation

Source: Field Data (2020)

The ANOVA test outcomes in Table 4.44 was conducted at 95% confidence level to show overall significance of the the model. The outcomes (F= 8.161, p-value = 0.006<0.05) demonstrated that there was overall model significance, hence dependable.

Table 4.45: Coefficients of Regression of the Relationship between Technological Innovations and Competitive Advantage

Model		Coefficients[a] Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	9.599	2.990		3.210	.002		
	Technological Innovation	.438	.153	.349	2.857	.006	1.000	1.000

a. Resultant Concept: Competitive Advantage

Source: Field Data (2020)

The evidence in Table 4.45 reveal that competitive advantage is substantially influenced by technological innovation (β = .349, t = 2.857, $p \leq 0.05$). Thus, the hypothesis that competitive advantage is significantly influenced by technological innovation was supported. Table 4.46 presents a summary of the test outcomes for hypothesis one.

Table 4.46: Summary Test Results for Hypothesis 1

Hypothesis	**Beta**	**R**	**R^2**	**Sig.**	**Conclusion**
H_1: Technological innovation has a significant influence on competitive advantage	.349	.349	.122	P = .006 <.05	H_1 Supported

Source: Field Data (2020)

The summary outcomes in Table 4.46 revealed that technological innovation had a statistically significant effect on competitive advantage as shown by a statistically significant (β=.349; p-value 0.006<0.05). Goodness of fit showed that technological innovation explained 12.2% of the competitive advantage variance. The regression model can therefore be expressed as follows:

CA= 9.599 + .349TI

The standardised beta coefficient of 0.349 suggests that holding other factors constant, there was a matching 0.349% competitive advantage change in for every 1% technological innovation change.

4.12.2 Technological Innovations, Strategic Leadership, and Competitive Advantage

The study stated the second hypothesis as *H_2: Strategic leadership has a significant moderating role on the link between technological innovation and competitive advantage.* The interactive effect was determined by testing the change in the link between the determinant variable, technological innovation, and competitive advantage after the moderator was introduced through checking the consequence level of an interaction term, which is a product between the inresultant variable and the moderating variable and how it influences the resultant variable in a model. A step-wise regression analysis was performed to this end. The model summary is depicted in Table 4.47.

Table 4.47: Model Summary for Moderating Influence of Strategic Leadership on the Relationship between Technological Innovation and Competitive Advantage

Model Summary[d]										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.349[a]	.122	.107	2.37356	.122	8.161	1	59	.006	
2	.649[b]	.421	.401	1.94325	.300	30.023	1	58	.000	
3	.690[c]	.476	.448	1.86592	.054	5.907	1	57	.018	1.714

a. Determinants: (Constant), Technological Innovation
b. Determinants: (Constant), Technological Innovation, Strategic Leadership
c. Determinants: (Constant), Technological Innovation, Strategic Leadership, Interaction term_TI_SL
d. Resultant Concept: Competitive Advantage

Source: Field Data (2020)

Table 4.47 shows that technological innovation accounted 12.2% of the variation in competitive advantage (model 1). Model 2 suggests that technological innovation and strategic leadership as independent variables jointly explained 42.1% of the variation in competitive advantage. Strategic leadership had significant contribution in

explaining variation in competitive advantage (R^2 change = .300). By introducing interaction term (in model 3), R^2 increased to .476. This implied that technological innovation, strategic leadership, and interaction term accounts for 47.6% of the variation in competitive advantage. There is significant of R^2 change .054. The ANOVA test results are as evidenced in Table 4.48.

Table 4.48: Outcomes of ANOVA for the Moderating Influence of Strategic Leadership on the Relationship between Technological Innovation and Competitive Advantage

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.977	1	45.977	8.161	.006[b]
	Residual	332.39359		5.634		
	Total	378.37060				
2	Regression	159.349	2	79.675	21.099	.000[c]
	Residual	219.02058		3.776		
	Total	378.37060				
3	Regression	179.916	3	59.972	17.225	.000[d]
	Residual	198.45457		3.482		
	Total	378.37060				

a. Resultant Concept: Competitive Advantage
b. Determinants: (Constant), Technological Innovation
c. Determinants: (Constant), Technological Innovation, Strategic Leadership
d. Determinants: (Constant), Technological Innovation, Strategic Leadership, Interaction term_TI_SL
Source: Field Data (2020)

Outcomes in Table 4.48 show that model 1 depicting the model expressing the link between competitive advantage and technological innovation was significant in overall (F= 8.161, p-value = .006<0.05). Model 2 depicting the combined influence of strategic leadership and technological innovation on competitive advantage was significant in overall and robust (F = 21.099, p-value =0.000<0.05). Model 3, when interaction term was introduced, the relationship was also significant in overall (F = 17.225, p-value = 0.000<0.05). Results for the regression coefficients which form the basis for interpretation of the hypothesis are presented on Table 4.49.

Table 4.49: Coefficients of Regression of the Moderating Influence of Strategic Leadership on the Relationship between Technological Innovation and Competitive Advantage

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.599	2.990		3.210	.002
	Technological Innovation	.438	.153	.349	2.857	.006
2	(Constant)	3.915	2.659		1.472	.146
	Technological Innovation	.250	.130	.199	1.920	.060
	Strategic Leadership	.491	.090	.567	5.479	.000
3	(Constant)	29.546	10.851		2.723	.009
	Technological Innovation	-1.097	.568	-.872	-1.931	.058
	Strategic Leadership	-.952	.600	-1.101	-1.587	.118
	Interaction term_TI_SL	.075	.031	2.220	2.430	.018

a. Resultant Concept: Competitive Advantage

Source: Field Data (2020)

The evidence in Table 4.49 demonstrated that in model 1 strategic leadership had a significant influence on competitive advantage (β = .349, p-value $\leq$ 0.05). Model 2 revealed that strategic leadership had stronger significant influence than technological innovation in explaining competitive advantage (β = .567, p-value =0.000< 0.05). Model 3 revealed that the interaction term had a stronger significant influence on the relationship between technological innovation and competitive advantage (β =2.220, p-value =0.018<0.05). The results, therefore, supported H_2, which stated that strategic leadership had a significant moderating role on the relationship between technological innovation and competitive advantage. Table 4.50 presents a summary of the test results for hypothesis 2.

Table 4.50: Summary Test Results for Hypothesis 2

Hypothesis	Beta	R	R^2	Sig.	Conclusion
H_2: Strategic leadership has a significant moderating role on the relationship between technological innovation and competitive advantage	2.220	.690	.476	P =. 018 <.05	H_2 Supported

Source: Field Data (2020)

The summary outcomes in Table 4.50 revealed that strategic leadership significantly moderates the relationship between technological innovation and competitive advantage. This was supported by a statistically significant standard beta coefficient of the interaction term of 2.220, p-value = 0.018<0.05), R^2 change = 0.054) and F=5.907. The three regression models were as follows:

CA_1= 9.599 + .349TI

CA_2 = 3.915 + .199TI + .567SL

CA_3 = 29.546 -.872TI -1.101SL + 2.220 TI*SL

4.12.3 Technological Innovations, Knowledge Management, and Competitive Advantage

The study stated the third hypothesis as *H_3: Knowledge management has a significant mediating effect on the relationship between technological innovation and competitive advantage.* To test this hypothesis, path analysis was performed. This involved four steps analyses. The first step involved assessing the relationship between technological innovation and competitive advantage.

In the second step, the study assessed the relationship between technological innovation and knowledge management. Step three tested the relationship between knowledge management and competitive advantage. In the fourth step, the study tested for the mediating effect of knowledge management on the relationship between technological innovation and competitive advantage.

Step 1: Relationship between Technological Innovation and Competitive Advantage In step 1, the study first performed a simple linear regression analysis to test for the direct relationship between technological innovations and competitive advantage. Table 4.51 evidences the outcomes.

Table 4.51: Regression Summary for Relationship between Technological Innovation and Competitive Advantage

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.349[a]	.122	.107	2.37356

a. Determinants: (Constant), Technological Innovation

Source: Field Data (2020)

The evidence in Table 4.51 showed a correlation value (R) of .349 which depicted that there was a moderate linear relationship between technological innovation and competitive advantage. R^2 value of 0.122 was further indicating that technological innovation explained 12.2% of the variations in competitive advantage, while the remaining 87.8% is accounted for by other factors not included in the study. ANOVA test results were further produced as depicted in Table 4.52.

Table 4.52: Outcomes of ANOVA for the Relationship between Technological Innovation and Competitive Advantage

ANOVA[a]					
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	45.977	1	45.977	8.161	.006[b]
Residual	332.393	59	5.634		
Total	378.370	60			

a. Resultant Concept: Competitive Advantage

b. Determinants: (Constant), Technological Innovation

Source: Field Data (2020)

The ANOVA test outcomes in Table 4.52 demonstrated that the model predicting the relationship between technological innovation and competitive advantage was significant in overall (F = 8.161, p-value = 0.006< 0.05). The regression coefficient outcomes are evidenced in Table 4.53.

Table 4.53: Coefficients of Regression of the Relationship between Technological Innovation and Competitive Advantage

Coefficients[a]					
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	9.599	2.990		3.210	.002
	Technological Innovation	.438	.153	.349	2.857	.006

a. Resultant Concept: Competitive Advantage

Source: Field Data (2020)

The evidence in Table 4.53 revealed that technological innovation had significant positive influence on competitive advantage (β = .349, t = 2.857, p -value = 0.06< 0.05). Since the results were significant, conditions in step one is met thus, the analysis proceeded to the second step. In the second step of the analysis, the influence of technological innovation and knowledge management was tested.

Step 2: Relationship between Technological Innovation and Knowledge Management The study also performed a simple linear relationship to test for the direct association between the independent variable, technological innovation and the mediator, knowledge management in order to make way for step 3.

Table 4.54: Regression Summary for the Relationship between Technological Innovation and Knowledge Management

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.648[a]	.420	.410	1.70206

a. Determinants: (Constant), Technological Innovation

Source: Field Data (2020)

The evidence in Table 4.54 showed a correlation value (R) of .648, which depicted a strong positive linear relationship between technological innovation and knowledge management. An R^2 value of .420 demonstrated that technological innovation explained 42% of the variations in knowledge management, while the remaining 58% was accounted for by other factors not included in the present regression model. ANOVA test results were further produced as depicted in Table 4.55.

Table 4.55: Outcomes of ANOVA for the Relationship between Technological Innovation and Knowledge Management

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	123.593	1	123.593	42.663	.000[b]
	Residual	170.923	59	2.897		
	Total	294.516	60			

a. Dependent Variable: Knowledge Management

b. Determinants: (Constant), Technological Innovation

Source: Field Data (2020)

The ANOVA test outcomes in Table 4.55 indicated that the model fitting the relationship between technological innovation and knowledge management was significant in overall and robust (F = 42.663, p-value = 0.000<0.05). The regression coefficient results are further evidenced in Table 4.56.

Table 4.56: Coefficients of Regression of the Relationship between Technological Innovation and Knowledge Management

Coefficients[a]					
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.247	2.144		2.447	.017
	Technological Innovation	.718	.110	.648	6.532	.000

a. Dependent Variable: Knowledge Management

Source: Field Data (2020)

Table 4.56 illustrated that technological innovation significantly explained positive variations in knowledge management (β= .648, p-value = .000<0.05). The significant results obtained in step two of the mediation tests fulfilled conditions of step two thus the analysis proceeded to the third step.

Step 3: Relationship between Knowledge Management and Competitive Advantage The study performed simple linear regression analysis to test for the direct association between the mediating variable, knowledge management and the dependent variable, competitive advantage in order to make way for step 4. Outcomes are evidenced in Table 4.57.

Table 4.57: Regression Summary for the Relationship between Knowledge Management and Competitive Advantage

Model Summary				
Model	R	R Square	djusted R Square	Std. Error of the Estimate
1	.447[a]	.200	.186	2.26511

a. Determinants: (Constant), Knowledge Management

Source: Field Data (2020)

The evidence in Table 4.57 showed a correlation value (R) of .447, which depicted that there is a moderate linear relationship between knowledge management and competitive advantage. An R^2 value of .200 indicated that knowledge management accounted for 20% of the variations in competitive advantage, leaving 80% unexplained. ANOVA test results were further produced as depicted in Table 4.58.

Table 4.58: Outcomes of ANOVA for the Relationship between Knowledge Management and Competitive Advantage

ANOVA[a]					
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	75.656	1	75.656	14.746	.000[b]
	Residual	302.714	59	5.131		
	Total	378.370	60			

a. Resultant Concept: Competitive Advantage

b. Determinants: (Constant), Knowledge Management

Source: Field Data (2020)

The ANOVA test outcomes in Table 4.58 indicated that the model fitting the relationship between knowledge management and competitive advantage was significant in overall (F= 14.746, p-value = 0.00<0.05). The regression coefficient outcomes are evidenced in Table 4.59.

Table 4.59: Coefficients of Regression of the Relationship between Knowledge Management and Competitive Advantage

Model		Coefficients[a] Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.375	2.548		3.287	.002
	Knowledge Management	.507	.132	.447	3.840	.000

a. Resultant Concept: Competitive Advantage

Source: Field Data (2020)

Table 4.59 indicated that knowledge management had significant and positive influence on competitive advantage (Beta = .447, p-value= 0.000<0.05). The results obtained in step 3 showed that the conditions were met. Therefore, the analysis proceeded to the fourth and last step. The results of mediation tests are reported in Tables 4.56 – 4.60.

Step 4: Mediating Effect of Knowledge Management on the Relationship between Technological Innovation and Competitive Advantage

The fourth and final step in the path analysis entailed the use of two models, where in the first model, the independent variable, technological innovation, is regressed against the dependent variable, competitive advantage. The mediating variable, knowledge management is then introduced in the second model, to depict any changes in the coefficient of determination. Results are as evidenced in Table 4.60.

Table 4.60: Regression Summary for the Mediating Influence of Knowledge Management on the Relationship between Technological Innovation and Competitive Advantage

Model Summary[c]											
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics						Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.349[a]	.122	.107	2.37356	.122	8.161	1	59	.006		
2	.454[b]	.206	.179	2.27600	.084	6.166	1	58	.016		1.643

a. Determinants: (Constant), Technological Innovation

b. Determinants: (Constant), Technological Innovation, Knowledge Management

c. Resultant Concept: Competitive Advantage

Source: Field Data (2020)

The evidence in Table 4.60 demonstrated that mediation of the relationship between technological innovation and competitive advantage was significant. Goodness of fit increased from 12.2% to 20.6%. The introduction of knowledge management in model two resulted in significant change of R^2 of .084. The ANOVA test statistics are evidenced in Table 4.61.

Table 4.61: Outcomes of ANOVA for Mediating Influence of Knowledge Management on the Relationship between Technological Innovation and Competitive Advantage

Model Summary						
	Model	Sum of Squares	df	Mean Square	F	
1	Regression	45.977	1	45.977	8.161	.006[b]
	Residual	332.393	59	5.634		
	Total	378.370	60			
2	Regression	77.919	2	38.960	7.521	.001[c]
	Residual	300.451	58	5.180		
	Total	378.370	60			

a. Resultant Concept: Competitive Advantage

b. Determinants: (Constant), Technological innovation

c. Determinants: (Constant), Technological innovation, Knowledge Management

Source: Field Data (2020)

The evidence in Table 4.61 indicated that the model representing the mediating influence of knowledge management on the relationship between technological innovation and competitive advantage was significant in overall (F = 7.521, p=.001<.05). The regression coefficient results are depicted in Table 4.62.

Table 4.62: Coefficients of Regression of the Mediating Influence of Knowledge Management on the Relationship between Technological Innovation and Competitive Advantage

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	9.599	2.990		3.210	.002
	Technological Innovation	.438	.153	.349	2.857	.006
2	(Constant)	7.330	3.009		2.436	.018
	Technological Innovation	.128	.193	.102	.661	.511
	Knowledge Management	.432	.174	.381	2.483	.016

a. Resultant Concept: Competitive Advantage

Source: Field Data (2020)

The evidence in Table 4.62 elucidated that in model 1 technological innovation had significant and positive influence on competitive advantage (Std. Beta = .349, p-value≤0.05). In model 2 when knowledge management was introduced, the influence of technological innovation on competitive advantage became insignificant (Beta = .102, p- value = .511>0.05). Further, the results for knowledge management were significant and positive (Std. Beta = .381, p-value =.016<0.05). Technological innovation is not significant in the presence of knowledge management; consequently, the results revealed that there was full mediation by knowledge management on the relationship between technological innovation and competitive advantage. Hence, hypothesis H_3, which states that knowledge management has a significant mediating effect on the relationship between technological innovation and competitive advantage, was supported. Table 4.63 presents a summary of the test results for hypothesis 3.

Table 4.63: Summary Test Results for Hypothesis 3

Hypothesis	BetaR	R^2	Sig.	Conclusion
H_3: Knowledge management has a significant mediating effect on the relationship between technological innovation and competitive advantage	.381.454	.206	P = .016 <.05	H_3 Supported

Source: Field Data (2020)

The summary outcomes in Table 4.63 revealed that knowledge management significantly mediates the relationship between technological innovation and competitive advantage as indicated by statistically significant standard beta coefficient of the interaction term at .381 ($p<0.05$), R^2 change (.084) and significant F change 6.166. The four regression models were as follows:

Step 1: CA = 9.599 + 0.349TI Step 2: KM = 5.247 + 0.648TI Step 3: CA = 8.375 + 0.447KM; Step 4: CA = 7.330+ 0.102TI + 0.381KM

4.12.4 Joint Influence of Technological Innovation, Strategic Leadership, and Knowledge Management on Competitive Advantage

The fourth hypothesis of the study was stated as, *H_4: Technological innovation, strategic leadership and knowledge management have a significant joint effect on competitive advantage.* To test the hypothesis, a multiple linear regression analysis was performed in three models.

The first model involved a direct regression between technological innovation and competitive advantage, while in model 2, the effect of knowledge management was introduced and in model 3, the influence of strategic leadership was introduced. The model summary outcomes are evidenced in Table 4.64.

Table 4.64: Regression Summary for the Joint Effect of Technological Innovation, Knowledge Management, and Strategic Leadership on Competitive Advantage

Model Summary[d]										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.349[a]	.122	.107	2.37356	.122	8.161	1	59	.006	
2	.454[b]	.206	.179	2.27600	.084	6.166	1	58	.016	
3	.656[c]	.430	.400	1.94481	.224	22.436	1	57	.000	1.674

a. Determinants: (Constant), Technological Innovation

b. Determinants: (Constant), Technological Innovation, Knowledge Management

c. Determinants: (Constant), Technological Innovation, Knowledge Management, Strategic Leadership

d. Resultant Concept: Competitive Advantage

Source: Field Data (2020)

The evidence in Table 4.64 demonstrated that the joint effect was significant. In model 1, technological innovation explained 12.2% (R^2 = .122) of the variation in competitive advantage. When the effect of knowledge management was introduced in model 2 goodness of fit increased from 0.122 to 0.206. This translated to a significant R^2 change of 0.084. In model 3, when the influence of strategic leadership was introduced, the goodness of fit further improved from 0.206 to 0.430. This represented significant R^2 change of 0.224. The ANOVA test statistics are evidenced in Table 4.65.

Table 4.65: Outcomes of ANOVA for the Joint Effect of Technological Innovation, Knowledge Management and Strategic Leadership on Competitive Advantage

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.977	1	45.977	8.161	.006[b]
	Residual	332.393	59	5.634		
	Total	378.370	60			
2	Regression	77.919	2	38.960	7.521	.001[c]
	Residual	300.451	58	5.180		
	Total	378.370	60			
3	Regression	162.780	3	54.260	14.346	.000[d]
	Residual	215.590	57	3.782		
	Total	378.370	60			

a. Resultant Concept: Competitive Advantage

b. Determinants: (Constant), Technological Innovation

c. Determinants: (Constant), Technological Innovation, Knowledge Management

d. Determinants: (Constant), Technological Innovation, Knowledge Management, Strategic Leadership

Source: Field Data (2020)

The evidence in Table 4.65 showed that all the three models were overally significant. Model 1 was overally significant at F statistic of 8.161 and p-value =.006<.05). Model 2 had F statistic of 7.521 and p-value =.001<.05. Model 3 which represented the joint effect of technological innovation, knowledge management and strategic leadership on competitive advantage was overally significant and robust (F = 14.346, p-value = 0.000<0.05). The regression coefficients are evidenced in Table 4.66.

Table 4.66: Coefficients of Regression of the Joint Effect of Technological Innovation, Knowledge Management, and Strategic Leadership on Competitive Advantage

Coefficients[a]					
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	Std. Error	Beta		
1 (Constant)	9.599	2.990		3.210	.002
Technological Innovation	.438	.153	.349	2.857	.006
2 (Constant)	7.330	3.009		2.436	.018
Technological Innovation	.128	.193	.102	.661	.511
Knowledge Management	.432	.174	.381	2.483	.016
3 (Constant)	3.508	2.695		1.302	.198
Technological Innovation	.153	.165	.122	.930	.356
Knowledge Management	.152	.160	.134	.952	.345
Strategic Leadership	.457	.096	.528	4.737	.000

a. Resultant Concept: Competitive Advantage

Source: Field Data (2020)

The evidence in Table 4.66 revealed that technological innovation on its own has a significant influence on competitive advantage (β = .349, t = 2.857, p-value = 0.006< 0.05). When knowledge management was introduced in model 2, the influence of technological innovation on competitive advantage became insignificant (β = .102, t = .661, p-value = 0.511>0.05). In model 3, when strategic leadership was introduced, the influence of both technological innovation (β = .122, t = .930, p-value = 0.356 > 0.05) and knowledge management (β = .134, t = .952, p-value = 0.345 > 0.05) were insignificant.

Table 4.67: Test Results for Hypothesis Four

Hypothesis	R	R^2	F	Sig.	Conclusion
H_4: Technological innovation, strategic leadership, and knowledge management have a significant joint influence on competitive advantage.	.656	.430	14.346	P =.000 <.05	H_4 Supported

Source: Field Data (2020)

The results indicated that strategic leadership has a stronger influence on competitive advantage (β = .528, t = 4.737, $p < 0.05$) than both technological innovation and knowledge management. The fourth hypothesis of the study that states that technological innovation, strategic leadership, and knowledge management have a significant joint effect on competitive advantage was, therefore, supported. The joint regression model can, therefore, be rewritten as:

$CA_4 = 3.508 + .122TI + .528SL + .134KM$

The results imply that a single percentage variation in technological innovation would result in 12.2% increase in competitive advantage among the firms surveyed, while a 1% change in strategic leadership would result in a 52.8% change in competitive advantage. Further, a 1% change in knowledge management would result in a 13.4% change in competitive advantage.

The chapter was structured into two major sections as detailed by subsequent sections. The first section presented the descriptive analysis of technological innovation, strategic leadership, knowledge management, and competitive advantage. The section in addition presented the response rate, organizational demographic data, tests for

reliability and validity as well as the diagnostic test results in which the tests of assumptions were conducted, including tests for normality, linearity, multicollinearity, as well as homoscedasticity. The second section delved into the hypothesis test results, in which various regression analyses were performed aimed at testing each of the four hypotheses stated. In each section, results were presented and interpreted as an index of the variables under study.

Descriptive analysis entailed the use of descriptive analytics such as frequencies and percentages to indicate the manifestation of items in both absolute and proportional terms. Mean scores were also applied to depict the rating and the degree at which the various landscapes of the constructs were manifested across the respondent organisations. The standard deviation values were further calculated to reflect variability in responses from the established mean scores. Inferential analysis on the other hand entailed Pearson's product moment correlations aimed at depicting the degree, direction and strength of linear associations between the predictor and outcome variables as well as multiple regression analyses to indicate both the magnitude of change in the outcome variable with unit changes in the predictor, mediator, and moderating variables and the significance thereof, leading to the hypothesis tests.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1 Introduction

In this chapter, the different statistical tests performed in chapter four are discussed in light of conceptual framework of the investigation, the theoretical model underpinning the study as well as findings from extant literature. As depicted in the conceptual framework, the study was based on four main variables, the interrelationships among which, the study sets out to test. In the conceptual framework, technological innovation formed the inresultant variable conceptualized as having a direct effect on competitive advantage, and was indexed by five sub-constructs. Strategic leadership was conceptualized as moderating the link between competitive advantage and technological innovation, and was measured by two sub-constructs while knowledge management was conceptualized as mediating the relationship between technological innovation and competitive advantage and was measured by five sub-variables. The resultant variable was competitive advantage as indexed by four sub-constructs.

The hypotheses test results assessing the conceptualizations are presented in chapter four. In the present chapter, the findings from the hypothesis's tests are corroborated with observations from pertinent previous empirical studies and the discussions underpinned by the theoretical propositions laying bare areas of both convergence and dissimilarities. The discussion of findings is done as informed by the empirical, conceptual, and postulation spheres as grounded on the main theories including the technological networks theory of innovation, dynamic capabilities theory, the knowledge-based view of the firm as well as Porter's sustainable competitive advantage model all of which anchored the study.

Statistics of both inferential and descriptive nature were used in computing the outcomes of the hypothesis's tests. The discussions drew upon discoveries of earlier research and theory and to interpret and position results within the discourse of technological innovations, strategic leadership, knowledge management, and competitive advantage. The debates centered on the results of the study and have been organized along the four research objectives.

5.2 Technological Innovation and Competitive Advantage

The investigation's first goal was to establish technological innovation's influence on competitive advantage. This corresponded with the first hypothesis of the study stated as H_1: *Technological innovation significantly influences competitive advantage.* To accomplish this goal and correspondingly test the advanced hypothesis, the determinant concept variable, technological innovation was indexed by 5 indexes including distribution channel, product, process, operation system and information system innovations while the outcome variable, competitive advantage was measured by four indexes, comprising product differentiation and innovation, organizational responsiveness, cost leadership, and supply chain effectiveness.

The study progressed to test hypothesis H_1 using a simple linear regression equation. The findings show that competitive advantage was substantially influenced by technological innovation in a positive manner ($\beta = .349$, $t = 2.857$, $p \leq 0.05$). The finding was of implication that across the telecommunication firms, there was a matching 0.349% competitive advantage change for every 1% variation in technological innovation. The investigation finding is in tandem with Pulgarín-Molina and Guerrero (2021), who found a strong linkage between competitive advantage and technological innovation among Colombian firms.

The finding is also consistent with Asa *et al*. (2021) whose desktop review revealed a correlation that is positive between technological innovations and increased market share and competitive advantage. Similarly, Ibrahim (2020) studied how organization's competitive advantage is influenced by technological innovations on with reference to an Irish food retail company and found that in the Irish food retail company, competitive advantage is positively influenced by technological innovation.

Lim *et al*. (2010) intimated that that various companies thrive and have been successful because of technological innovation, which creates competitive advantages for them, as it affords firms the ability to create rivalry that long-term by amarsing skillsets in knowledge, technology and experience in creativity and development, and introducing new ideas in form of business model innovation, process innovation, or product innovation. As per Porter (1998), a firm's competitiveness can be accrued as an outcome of goods and services that display distinct differences from the typical services or goods in the particular industry.

The findings of this study are consistent with Kanyuga (2019), who explored how telecom companies' performance is influenced by strategic innovation with a focus on Safaricom PLC. It was inferred that firms' capacity to develop new innovative products to ease their creation of and entry into new markets, employment of modern technologies and innovative strategies to target particular markets and new service/product design introduction affect their outcomes. The study informed policy makers and strategic leaders in Kenya's large telecommunication firms that development of modalities that allow the utilization of the dynamisms in the competitive environment with suitable approaches result in better performance of organizations (Adede, Kibera & Owino, 2017). The findings of the study investigation are further consistent with Mugo and Macharia (2020) who investigated the influence of technological innovation on telecommunications firms' the competitiveness in Kenya and uncovered that telecommunications firms' competitiveness in Kenya is notably influenced by technological innovation.

5.3 Technological Innovation, Strategic Leadership, and Competitive Advantage

The investigation's second goal was to determine the interactive role of strategic leadership on the link between technological innovation and competitive advantage. This corresponded with the second hypothesis of the study, stated as *H_2: Strategic leadership has a significant interactive role on the link between technological innovation and competitive advantage*. To address the objective and test the corresponding hypothesis, the moderating variable, strategic leadership, was measured by two sub-constructs, that is, strategic direction and organization controls. The study proceeded to test H_2 by running a stepwise regression analysis, whose results revealed that the interaction term strongly and significantly influence the link between competitive advantage and technological innovation (β =2.220, p-value $\leq$ 0.05), therefore, meeting the conditions for moderation. The results, therefore, supported H_2, stating that strategic leadership has a notable interactive role on the link between technological innovation and competitive advantage.

Similar results were reported by Elenkov *et al.* (2020), in whose study behaviors of strategic leadership had a positive and notable link with both administrative innovations and product–market strategies. Similarly, Subin *et al.* (2020) found evidence indicating that there are specific knowledge management capabilities that allow new product development teams to utilize knowledge that is innovation-related from members of the channel. Likewise, Mostafa (2020) found that strategic leaders enhance new idea and innovation generation through stimulation intellectually. The finding may be accredited to the significance of the role of organizational leaders as makers of decision and key technological innovation enablers across telecom companies through support by resource mobilisation, mentorship, recognition, and provision of autonomy among staff to innovate among other avenues.

Strategic leaders also create enabling and supportive environments for innovation. As opposed to hierarchical leadership with regard to innovation, strategic leaders create a network of innovators within and outside the organization as innovation are not a solitary pursuit but should bring together collective creativity to create ideas among whom creative ideas continually get bounced around and improved upon. The result is the creation of technologically innovative products and services and eventually competitive advantage that earns the organization an increased customer base and market share (Laban & Deya, 2019). The study finding is supported by Detelin et al. (2015), who conducted an international multi-cluster comparative study on the relationship between strategic leadership and executive innovation.

The finding also in concurrence with Zuraik (2017), who showed that transformational leadership behaviors of organizational leaders aided in enabling and championing innovation in their organizations at organizational level. The study also found that the ambidextrous behavior of team leadership can impact innovation outcomes at the team level. The finding is further supported by Kisingú (2017), who studied the role of strategic leadership in the attainment of a sustainable competitive advantage among Kenyan private and public universities, and found a significant linkage between strategic leadership and sustainable competitive advantage among private and public universities in Kenya.

Strategic leaders have a crucial role in developing and nurturing new ideas, and this is essential for strategic development in the organization. The finding is in support of the technological networks theory of innovation as advance by Rogers (1983) and posits that technological innovation is primarily motivated in both external and internal means. Accordingly, the finding revealed that strategic leadership constitutes a notable internal driver of technological innovation leading to competitive advantage, consistent with the theory's assertion that internally, innovation is driven by both organizational leadership and knowledge-intensive departments such as information technology and the human resource itself. Strategic leaders are also instrumental in deciding how organizations leverage technological innovation in response to environmental changes and externalities.

5.4 Technological Innovation, Knowledge Management, and Competitive Advantage

The investigation's third goal was to explore the mediating influence of knowledge management on the link between technological innovation and competitive advantage. This corresponded with the third hypothesis stated as *H3: Knowledge management has a significant mediating effect on the relationship between technological innovation and competitive advantage*. In testing the hypothesis, the mediating variable, knowledge management, was measured by five sub-variables, comprising knowledge attainment, knowledge creation, knowledge storage, knowledge application, and knowledge sharing.

The study proceeded to test H_3 by conducting path analysis. The results revealed that when knowledge management was introduced in the direct model between competitive advantage and technological innovation, the technological innovation' influence on competitive advantage diminished (Std. Beta = .102, p-value = .511). Knowledge management, however, exhibited a significant and positive indirect relationship with competitive advantage (Std. Beta = .381, p-value =.016). Consequently, the results revealed that there was full mediation by knowledge management on the link between competitive advantage and technological innovation. Hypothesis H_3, which states that knowledge management has a significant mediating effect on the link between technological innovation and competitive advantage was, therefore, supported. The outcomes are attributed to the major and significant effect of the knowledge acquired from the external environment has on the competitiveness of firms engaged in the development of innovative products as firms in the telecommunication industry. It is thus paramount that the telecommunication firms surveyed were found to have established a process by which they create, acquire, store, apply and share useful knowledge.

This is expected as technological innovation cannot by itself alone assure competitive advantage but as well as by leveraging on pertinent knowledge. Similarly, Young (2020) found that increasing knowledge sharing and innovation practices provide for positive social change for the personnel of these organizations. In the context of the highly dynamic and competitive telecommunication industry, the objective of every organization is to out-compete rivals and acquire new customers through technological innovation. The knowledge possessed and adequately managed is able to create new and innovative ideas, which can help the telecommunication firms to realize competitive advantage (Khajeheian, 2017).

The findings are consistent with Mardani, Nikoosokhan and Moradi (2018), who assessed the link between knowledge management and innovation performance with reference to the Iranian Power Syndicate. The study found that knowledge management activities directly affected organizational performance and innovation, and indirectly by an increase in innovation capability. Both exploitation and exploration of knowledge have further been shown to add to the organizational innovativeness as well as to its competitive advantage (Levinthal & March, 2015; Hall & Andriani, 2016; March, 2017).

A cross- section of studies has also focused on the role of knowledge management in the innovation process. The study findings are in congruent with the findings reported by Liao *et al*., (2016), which support the critical role of knowledge management in the capability to process knowledge, in activity and speed of innovation and eventually earning a competitive advantage. The study findings are also in agreement with

The outcome is also in tandem with Mostafa (2020), who opined that executive as strategic leaders enhance innovation and new idea generation through intellectual stimulation. Executives can contribute to overall organizational performance through implementing information technology to increase knowledge management performance, and help close the gap between success and possible failure. Strategic leaders have a crucial role in developing and nurturing new ideas, and this is essential for strategic development in the organization. The study also agreed with Kisingú (2017), who established a notable effect of practicing the management of knowledge on sustainable competitiveness in Kenyan private and public and universities. The study findings are in support of the KBV of the firm.

As a knowledge-intensive industry and primarily driven by technological innovations, telecommunication firms have to constantly acquire, create, store and share or transfer knowledge in order to remain competitive in the highly dynamic and competitive industry. This is in line with a key assumption of KBV, that knowledge is deemed to be a crucial strategic asset and resource and hence the knowledge intensive firms ought to consider knowledge as a unique asset that can be used for strategic responses to technological disruption (Grant, 1996; Roos, 1998; De Carolis, 2002). As such, KBV is also of relevance to the present study as the theory's assertion lends to how large telecommunication firms in the country leverage their organizational knowledge to earn competitive advantage.

5.5 Technological Innovation, Strategic Leadership, Knowledge Management, and Competitive Advantage

The investigaton's fourth goal was to establish the joint influence of technological innovation, strategic leadership, and knowledge management on competitive advantage. This corresponded with the fourth hypothesis, stated as *H_4: Technological innovation, strategic leadership, and knowledge management have a significant joint effect on competitive advantage.* The dependent variable, competitive advantage, was measured by four sub-constructs, that is, product differentiation and innovation, cost leadership, organizational responsiveness, and supply chain effectiveness.

To achieve this objective and subsequently test H_4, the study proceeded to perform a multiple linear regression analysis. The results indicated that strategic leadership has a stronger competitive advantage influence (β = .528, t = 4.737, $p < 0.05$) than both technological innovation (β = .122, t = .930, $p > 0.05$), and knowledge management (β =.134, t = .952, $p > 0.05$). The results imply that a single percentage variation in technological innovation would result in 12.2% increase in competitive advantage among the firms surveyed, while a 1% change in strategic leadership would result in a 52.8% increase in competitive advantage. Further, a 1% change in knowledge management would result in a 13.4% increase in competitive advantage. Goodness of fit of the joint effect (R^2 = 0.430) was greater than the individual effect (R^2 = 0.122). The fourth hypothesis of the study that states that technological innovation, strategic leadership, and knowledge management have a significant joint effect on competitiveness was, therefore, supported.

The findings can be attributed to the overriding effect of strategic leadership as a centermost variable towards the attainment of competitive advantage as compared to any other variable. As the decision makers, organizational strategic leaders determine the extent, to which technological innovation takes place in an organization as well as how adequately knowledge is acquired, created, stored, applied, and shared, which in turn influence the competitive advantage thereof. As such, strategic leadership accounts forthe greatest variability in the competitive advantage of an organization, as compared to both technological innovation and knowledge management.

Taylor (2016) assertion that strategic leadership enables an organization form a structure by projecting a strategic vision and allocating resources. In such dynamic environments as the telecommunication industry, strategic leadership can be leveraged to navigate the highly competitive businesses environment with rapid technological innovations by creating an enabling and supportive envirnonment to innovate, acquire and manage knowleldge environment to attain and sustain competitive advantage (Palladan, Kadzrina & Chong, 2016). Phipps and Burbach (2017) also intimated in support that strategic leaders are indispensable in enabling orgnisations develop and deliver unique products and services having extraordinary value and benefits for customers, therefore, earning their organizations competitive advantage.

The current investigation outcomes agree with the findings of Jiménez and Fuentes (2013) on the link between firm performance, innovation, and knowledge in which it was acknowledged that innovation and capability for knowledge combination are firm performance's precursors necessitated by competitive advantage. The outcomes of the investigation also indicated that capability for knowledge combination might be requisite for innovative performance's success for organizations that are technological in nature. The outcomes' implications were that merely possessing information is not sufficient to acquire benefits from the knowledge. Rather, the capacity to marshal this knowledge in combination with capabilities into innovative services and goods is more imminent. For organizations to be successful, leadership that is strategic ought to thus promote and disseminate information combination capacity for all organization members to generate better entrepreneurial outcomes and support the innovation's development.

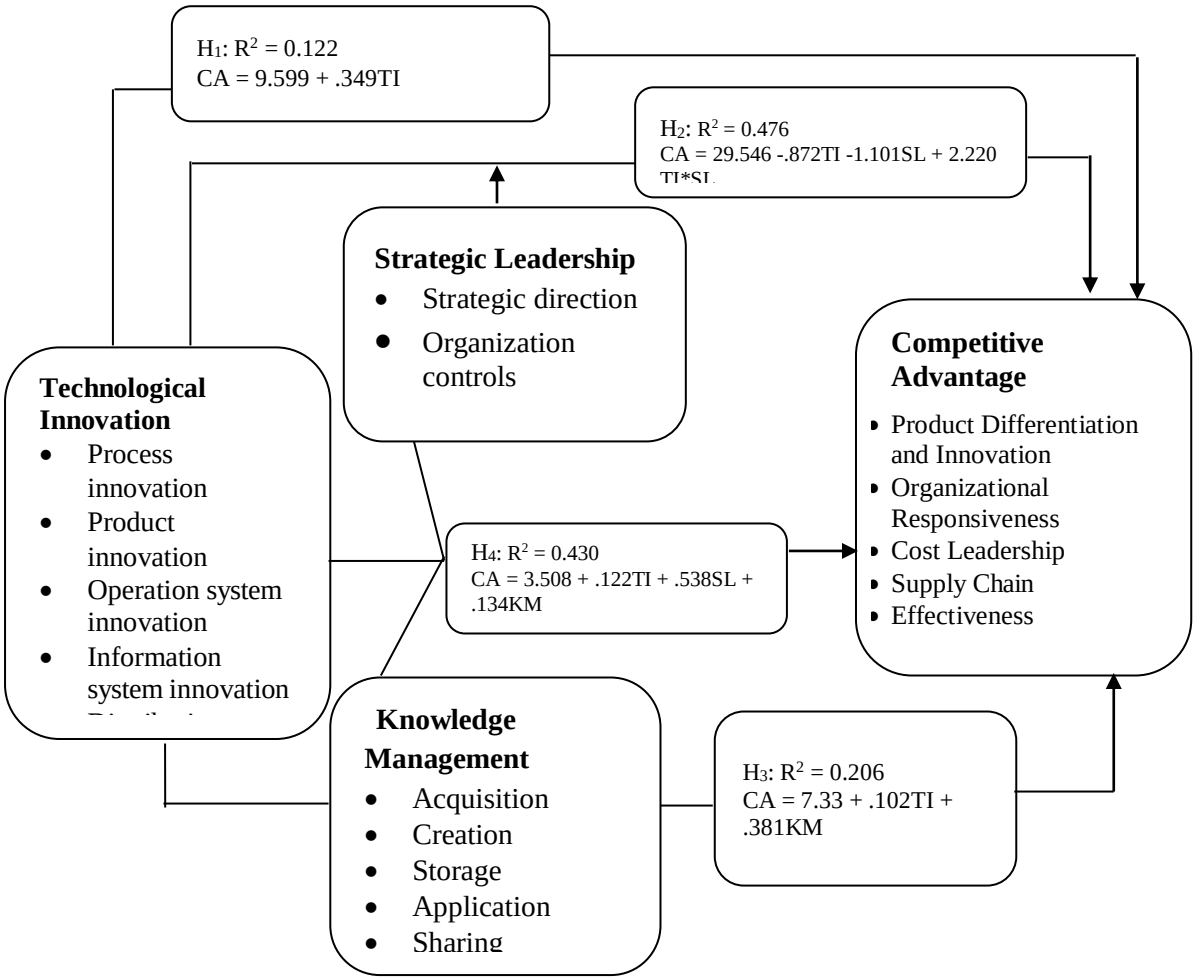
The study findings finally support all the four underpinning theories in the study. The findings are in congruent with the technological networks theory of innovation coined by Rogers (1983). It was established in this regard that both strategic leadership and knowledge management are individually significant drivers of competitive advantage of majority of the telecommunication firms surveyed. The findings are further in conformity with dynamic capability theory proposed by Teece *et al*. (1997). It was demonstrated in this regard that technological innovations are a key strategy by telecommunication firms in the country to navigate the highly dynamic and competitive business environment and earn competitive advantage.

Further, the study is in tandem with the Knowledge-Based View arguing that in line with Wiklund and Shepherd (2003), knowledge and its management is a key internal resource by telecommunication firms that can be leveraged to guarantee sustainable competitive advantages owing to its inimitability. Further, in line with Porter's (1985) model of sustainable competitive advantage, telecommunication companies utilize both cost leadership and product differentiation to earn a competitive advantage and acquire more customers.

5.6 Empirical Model

Results from hypothesis test indicated that the direct relationship between technological innovation and competitive advantage was supported. Both moderating influence of strategic leadership and mediating effect of knowledge management on the link between technological innovation and competitive advantage was supported. The joint effect of technological innovation, management of knowledge and strategic leadership on competitive advantage was also supported. Figure 5.1 shows the empirically supported direct, moderation, mediation, and joint effect relationships.

The conceptual gap of studying all the four concepts (technological innovation, knowledge management, strategic leadership and competitive advantage) in one model has been filled by the model as all the hypotheses were supported by the model. The contextual as well as the methodological gaps have been filled as the empirical model demonstrated direct, moderation, mediation, and joint influence relationships were supported in the study done in the Kenyan context using different methods respectively.



Source: Researcher, 2020

Figure 5.1: Empirical Model

The conceptual, contextual and methodological gaps in knowledge identified as warranting this study, have been addressed. In this regard, the empirical model in Figure 5.1 demonstrates the direct, moderation, mediation, and joint effect relationships and interaction amongst technological innovation, strategic leadership, and knowledge management as the various factors key in generating competitive advantage.

The research findings have been discussed elaborately in this chapter, anchored on the four objectives and study hypotheses. Firstly, ascertaining the influence of technological innovation on competitive advantage. Secondly, determining the interactive role of strategic leadership on the link between competitive advantage and technological innovation. Thirdly, assessing the mediating influence of knowledge management on the link between technological innovation and competitive advantage. Finally, establishing the joint influence of strategic leadership, technological innovation and management of knowledge on competitive advantage.

The study results discussed in this chapter demonstrated that all the study hypotheses were supported by the research data. The empirically supported model elucidating direct, moderation, mediation, and joint influence relationships was presented as Figure 5.1. The model demonstrated that all the study hypotheses were supported by the research data. The next chapter includes a summary of the key findings of the study, the consequential conclusion drawn, implications of the study, contribution to new knowledge, limitations encountered in the course of the study, and recommendations for further considerations.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The main objective of the study was to establish the influence of strategic leadership and knowledge management on the relationship between technological innovation and competitive advantage: evidence from large telecommunication firms in Kenya. To gauge the linkages among the main variables under investigation, four respective hypotheses were stated and tested. The hypothesis test results were presented and interpreted in chapter four, and the subsequent discussions delved into in chapter five. In the present chapter, a brief summary of the key findings of the study are presented, the consequential conclusion drawn, limitations in the course of the study presented and recommendations for policy, practice, research and theory presented.

The focus of the present chapter is to tie the research objectives and the respectively stated hypotheses to the findings and inferences deduced based on the research findings, and suggest recommendations based on the research findings and inferences drawn thereof. To this end, each objective and corresponding hypothesis is mentioned, the resultant findings, and hypothesis test results presented, which then inform pertinent deductions. Each policy, practice, theory and research recommendation is as directly informed by the reported findings and conclusions. The methodological and logistical limitations are then presented, culminating in suggestions for future research as a way of highlighting how the identified knowledge gaps and limitations can be bridged and addressed.

6.2 Summary of Key Findings

The main objective of the study was to establish the influence of strategic leadership and knowledge management on the relationship between technological innovation and competitive advantage: evidence from large telecommunication firms in Kenya. To address the objective, the study formulated four primary goals, and stated four corresponding hypotheses which were then tested. The population of intereset to this investigation consisted all licensed telecommunications firms that are large in the country, totaling 83. The descriptive cross-sectional survey design was embraced in data collection and analysis. Questionnaires that were structured were utilized to gather primary information.

The information was gathered using questionnaires that were self-administered, targeting Chief Executive Officers, Managing Directors or their equivalents, who are charged and well versed with the strategic direction of their respective organizations. In analysing the information gathered statistics that are of both inferential and descriptive nature were employed, preceded by diagnostic tests including tests for normality, multicollinearity, linearity and homoscedasticity. descriptive analytics included counts, proportions, standard deviations and mean averages. Inferential statistics, on the other hand, included a simple linear regression analysis which was employed to assess the direct relationship between technological innovation and competitive advantage, and therefore, test $H_{1.}$ Step-wise regression analysis was also employed to determine the moderating role of strategic leadership on the relationship between technological innovation and competitive advantage and, therefore, test $H_{2.}$

The first goal of the study was to determine how competitive advantage is influenced by technological innovation. Technological innovation generated four sub-constructs which were affirmed to as elements of technological innovation in majority of the firms

surveyed, to a great extent, including process innovation (mean = 3.82), product innovation (mean = 3.96), distribution channel innovation (mean = 3.95), and information system innovation (mean = 3.94). The investigaiton's second goal was to determine the interactive role of strategic leadership on the link between technological innovation and competitive advantage. The variable, strategic leadership, was measured by two sub-constructs, which yielded a rating of organizational controls (mean = 3.82) and strategic direction (mean = 3.79), both of which were affirmed to as elements of strategic leadership in majority of the firms surveyed, to a great extent.

The study further sought to explore the mediating influence of knowledge management on the link between technological innovation and competitive advantage. The variable, knowledge management, generated three sub-constructs, which were affirmed to as elements of knowledge management in majority of the firms surveyed, to a great extent. These included knowledge creation (mean = 3.84), knowledge acquisition (mean = 3.99), and knowledge sharing (mean = 3.38). The dependent variable, competitive advantage generated four dimensions, including organizational responsiveness (mean = 3.83), cost leadership (mean = 3.50), and supply chain effectiveness (mean = 3.75), which were affirmed to as elements of competitive advantage in majority of the firms surveyed, to a great extent, while product differentiation and innovation (mean = 3.46) was affirmed to a moderate extent.

All the four stated hypotheses were supported. It was established from a simple linear regression that innovation that is technological had a substantial positive influence (β = .349, t = 2.857, $p \leq 0.05$) on competitive advantage, and H_1 was therefore supported. It was also revealed from stepwise regression analysis, that the interaction term between technological innovation and strategic leadership had a substantial effect on the link between competitive advantage and innovation that is technological significant (β

=2.220, p-value ≤ 0.05) and H_2 was, therefore, supported. Knowledge management (Std. Beta = .381, p-value =.016) was also found to exhibit a full mediating outcome on the link between technological innovation (Std. Beta = .102, p- value = .511), and competitive advantage, and H_3 was, hence, supported. Further goodness of fit of the joint effect ($R^2 = 0.430$) was greater than the individual effect ($R^2 = 0.122$). H_4, which stated that technological innovation, strategic leadership, and management of knowledge have a substantial joint effect on competitive advantage was, therefore, supported.

6.3 Conclusion

It is inferred from the study findings that the conceptual model grounding the study is validated in line with the technological network's model of innovation, dynamic capabilities theory, the knowledge-based view of the firm as well as Porter's sustainable competitive advantage model. From the study findings, it can be concluded that technological innovations in the telecommunication industry were implemented to enhance competitive advantage. Of evidence in this regard was the way participants answered to statements posed in the investigation and the subsequent analysis. It is thus deducible that the same could help in monitoring both the exterior and interior context to ascertain what innovative technology to be executed.

The study also concludes that the intensity of of link between competitive advantage and technological innovation is affected by variation in strategic leadership. This may be credited to the significance of organizational leaders as makers of decisions, and notable technological innovativeness enablers across telecommunication firms through support by resource mobilization, mentorship, recognition and provision of autonomy among staff to innovate. As opposed to hierarchical leadership with regard to innovation, strategic leaders create a network of innovators within and outside the organization leading to a collective and continuous innovation process leading to the formation of technologically innovative products and services and eventually competitive advantage that earns the organization an increased customer base and market share.

The study further concludes that technological innovation does not affect competitive in isolation but it does so through knowledge management. This can be attributed to the significant effect the knowledge acquired from the external environment has on the competitiveness of such firms engaged in the development of such innovative products as firms in the telecommunication industry. As a knowledge intensive industry, the telecommunication firms surveyed have established a process by which they create, acquire, converge, store and share useful knowledge and skills both amongst staff within the respective organizations, and outside the organizations. The knowledge is then leveraged to drive technological innovation, and the subsequent creation of innovative services and products leading to competitiveness.

This investigation further infers that whereas technological innovation, strategic leadership, and knowledge management, each influence competitive advantage, their combined effect on the latter is more than their individual effects. In other words, as compared to both technological innovation and knowledge management, strategic leadership accounts for the greatest variability in the competitive advantage of an organization. This can be attributed to the overriding effect of strategic leadership as a centermost variable towards the attainment of competitive advantage as compared to any other variable.

6.4 Implications of the Study

The study has, through the formulated objectives, the corresponding stated hypotheses and findings established, presented noteworthy inferences to the policy agenda, the practice of strategic management, and implications to theory in the telecommunication sector. As such, the study makes the following recommendations aimed at policy, the overall advancement of the practice of strategic management in the industry of telecommunication and theory implications.

6.4.1 Implications on Policy

It has been uncovered in the study that telecommunication firms' competitive advantage was influenced by various factors. The factors include: technological innovation, strategic leadership, and knowledge management. In view of this outcome therefore, the study advances the recommendation that regulatory authorities and policy makers in the Kenyan government particularly in the telecom industry institute policies to promote technological innovation, strategic leadership, and knowledge management as a strategy for enhancing telecom firms' competitive advantage.

Policy makers and regulators are also urged, as informed by the study findings to formulate polices and regulations that ensure that as technological innovations progress and advance rapidly, the rights of the consumers of these innovative products and services are safeguarded. This can mitigate against any attempts by telecommunication firms in the country to create technological innovations that earn the firms competitive advantage at the expense of user rights. This investigation was important and timely to firms in the telecom sector as it helps the strategic leadership responsible for policy implementation and formulation, to have a comprehensive understanding of the interelationship amongst competitive advantage, knowledge management, and technological innovation. It has also insights on possible avenues through which strategic leadership can take full advantage of Research and Development to achieve competitive advantage and sustain it. The study, therefore, has aided the extant firms to readjust their technological innovation in an optimal manner in order to tap fully into the acquisition of competitive advantage.

6.4.2 Implications on Practice

The study found that strategic leadership significantly moderates the link between competitive advantage and technological innovation among firms in the telecommunication industry in Kenya. As such, the study recommends that leaders in the telecommunication firms in Kenya institutionalize innovation through the creation of pertinent cultures, structures, systems, and processes that support innovation. Strategic leaders in these firms ought to support technological innovation that incorporates all dimensions of process, product, operation system, information system, and distribution channel innovations to ensure in addition to competitive advantage, sustainability, diversification, organizational responsiveness, and long-term profit are maximized.

A strategic leader in this regard can guide the firm to consider the entire system, beyond process and product, and inspire innovations that can encourage strategy, participation, sustainability, and value creation for sustainable competitive advantage. The research would be of great utility to the country's prospective telecommunication sector entrants. The study has provided invaluable insights into the industry and its operating environment. The potential entrants' strategic leadership would have the ability for acquisition of skills and knowledge on where, when, and how to employ their technological innovation and knowledge management with a view to realize competitiveness. The telecommunication firms would the ability to set up systems proactively to enhance resolution of challenges emanating from execution of technological innovation to realize competitiveness. It was further established in the study that knowledge management exerts a significant mediating outcome on the link between competitive advantage and technological innovation among firms in the telecommunication industry in Kenya. This finding offers organizations with new insights which strategic leadership in telecommunication firms can translate and apply.

Telecommunication firms in the country can particularly utilise these findings and institute pertinent knowledge management systems, practices and programs with a view to translate the technological innovations thereof into well informed and differentiated innovative products and services, earning the companies' competitiveness. This investigation thus recommends greater awareness of the various knowledge management practices and processes, and how the firm can complement their technological innovations with the knowledge to develop products and services that can earn them competitive advantage in increasingly technologically turbulent times.

6.4.3 Implications on Theory

The study outcomes have extended the postulations of various theories. For instance, the findings are in support of the dynamic capabilities' theory advanced by Teece *et al*., (1997) that postulates that if a firm's unique resources are utilized properly, they can result in a competitive edge. This is because the outcomes of the study were in tandem consistent with this argument. In line with the dynamic capabilities' theory, telecom companies' technological innovativeness of may deemed as dynamic capabilities that innovative company utilize and constantly reconfigure consistent with technological advancements and the user demands that are dynamic.

Accordingly, the finding reveals that strategic leadership constitutes a notable internal driver of technological innovation leading to competitive advantage, consistent with the theory's assertion that internally, innovation is driven by both organizational strategic leadership and knowledge-intensive departments such as information technology and the human resource itself. Strategic leaders are also instrumental in deciding how organizations leverage technological innovation in response to environmental changes and externalities. The study also extends the postulations of the knowledge-based value of the firm. This is because it was concluded that as knowledge-intensive industry and primarily driven by technological innovations, telecommunication firms have to constantly acquire, create, store, apply and transfer knowledge by sharing in order to remain competitive in the highly dynamic and competitive advantage.

This is in line with a key assumption of KBV, that knowledge is deemed to be a crucial strategic asset and resource, and hence the knowledge intensive firms ought to consider knowledge as a unique asset that can be used for strategic responses to technological disruption (Grant, 1996; Roos, 1998; De Carolis, 2002). As such, KBV is also of relevance to the present study as the theory's assertion explains how large telecommunication firms in the country leverage their organizational knowledge to earn competitive advantage.

Majority of the firms surveyed were found to leverage technological innovations as a key strategy to navigate the highly dynamic and competitive business environment through the creation of innovative and highly differentiated products and services, which are competitively priced with a view of earning competitive advantage. The investigation has also added to Porter's model of sustainable competitiveness by highlighting occasions in which companies have potential and strengths that are alike with regard skills and resources, but varied competitiveness largely owing to how these resources are utilised and executed by the firms' strategic leadership.

6.4.4 Contribution to New Knowledge

In a number of ways, the present investigation's outcomes help contribute to new knowledge in this field. First, the findings demonstrate that organizations are increasingly competing by using knowledge-based resources to shape how they innovate (Robertson, Caruana & Ferreira, 2021). However, owing to the highly turbulent and competitive context of today's business environment, the current study established that technological innovation, knowledge management and strategic leadership generate competitiveness.

The business environment today is characterised with high pressure emanating from multiple customers' demands that large telecommunication firms must satisfy in order to remain competitive. It is on this basis that that the present investigation has provided an empirical model outlining the direct, moderation, mediation, and joint effect relationships and interaction amongst technological innovation, strategic leadership, and knowledge management as the various factors key in generating competitive advantage. This study, therefore, finds that strategic leadership has a pivotal role in as far as shaping organizational controls and strategic direction are concerned.

This study argues that strategic leadership is critical in managing resources (knowledge assets) proactively in order to realize desired technological innovation and competitive advantage. Secondly, the current study finds that it is not enough to possess knowledge, rather, there is need for strategic leadership that focuses on how to combine technological innovation and knowledge management into unique goods and services thus generating benefit for the application of good knowledge management practices (Wahyono, 2019).

The current study also contributes to new knowledge in various important ways. Possibly, this investigation's greatest contribution was its advancement of a conceptual and empirical discourse on the relationships between models that inform technological innovation, strategic leadership, knowledge management, and competitive advantage. This study aimed at making several contributions to theory as it delved into how both the anchoring theory that is the technological networks theory of innovation and support theories including dynamic capability theory, knowledge-based view, and Porter's model of sustainable competitive advantage underpinned the present study variables.

Through the technological networks theory, the study emphasized that technological innovation occurred as an outcomw of both external and internal drivers. Internally, strategic leadership and knowledge-intensive departments such as information technology and the human resource itself drove innovation. Externally, innovation was driven by the way organizations responded to changes in processes necessary for value addition. The study has depicted that time and again, firms needed to obtain technologies for new process (Medforth, 2020). The study has elucidated that large telecommunication firms are increasingly competing based on ability to innovate by utilising knowledge-based resources. Therefore, the study has provided an empirical model outlining the direct, moderation, mediation, and joint effect relationships between the various factors involved in generating competitive advantage for the firm and has demonstrated how these factors dynamically interact in the process (Porter, 1998).

The study, therefore, has confirmed that strategic leadership plays a pivotal role in modelling organizational course and organization control. While taking into consideration the contemporary and dynamic world, the current study has added on the extant body of knowledge the fact that technological innovation needed not be defined only in terms of developing new technologies into new products, but also as involving finding new models for doing business in the face of change. This entails purposive change of rules of the game by a strategic leadership targeting for instance, better ways of meeting customer demands, and significant form of growth. To do this, strategic leadership must realize that remaining competitive in the dynamic world would require the understanding that knowledge has to be innovatively and effectively managed Mostafa, 2020). The need to manage organizational knowledge, to get as much utility as possible from it, is greater today than in the past.

Despite having superior technology, firms could fail to successfully compete in the marketplace especially if organizations had taken a tactical as opposed to a strategic approach of technology management. In the ever-changing operational environment, strategic leadership, therefore, needs to effect successful change by strategically assessing available knowledge resources and capabilities to inform their knowledge strategy (Mahdi & Nassar, 2021). In this regard, planning and application of knowledge management is a challenging task for strategic leadership. Technological innovation hence comes in because of application of knowledge and management. With innovation, an enterprise would be capable of developing new capacity that could assure it of competitive advantage over the market competitors. The current study showed the strategic leadership role in leading execution of information technology at each of the stages of organizational knowledge management process: acquisition, creation, storage, sharing and application of knowledge.

In line with Mostafa (2020), strategic leadership is a critical component in knowledge acquisition by facilitating knowledge transfer, and simultaneously exploring more innovative solutions for organizational problems. Whenever executives embrace strategic leadership, they positively influence the knowledge accumulation process. Furthermore, strategic leaders helped to improve knowledge integration by facilitating knowledge sharing throughout the various organizational levels. Strategic leadership develops interactions and relationships within firms, set desirable controls and expectations and offer inspiration to followers to further identify ideas in their context (Mostafa, 2020).

The current study, therefore, has demonstrated that possession of information is not sufficient to reap utility from it. Rather, the ability to combine this knowledge and capabilities into unique goods and services is more important. In order for firms to succeed competitively, strategic leadership, therefore, disseminated and promoted knowledge management capabilities amongst all organizational members that supported the advancement of technological innovation and generated better entrepreneurial outcomes, which in turn enhanced competitive advantage.

6.6 Limitations of the Study

Whereas the investigation's goal was sufficiently met, the study had various limitations. Among the key limitations was in the target respondents. This is because the study assumed that data from the CEOs represented the perspective of the entire organization. It is unknown whether Board of Directors would provide similar data. Whereas the respondents were adequate as they were best versed in the interest areas of the study, it would be desirable to obtain data on the operational perspectives from the actual innovators since strategic management is a cycle that transcends strategy formulation, implementation, monitoring and evaluation.

In this regard, perspectives of innovators would be important in understanding the operational perspectives of the technological innovation and competitive advantage. The investigation conentrated on firms in telecommunication sector in Kenya. The findings may not, therefore, be generalizable to other industries such as manufacturing, banking or education sectors due to their differences in characteristics. inspite of these limitations, the study quality was not jeopordized. The investigator affirms that the the outcomes, development and output of the investigaton were not affected by drawbacks.

6.7 Suggestions for Future Studies

In order to achieve set objectives of the study and test the corresponding hypotheses, the present study assessed the direct and indirect associations between and among the independent, moderating, mediating and dependent variables. Whereas the stated hypotheses were tested and the objectives of the study met, the statistical techniques employed were not exhaustive as there exist other underlying cause and effect linkages among the variables that were not explored in the present study. To address this, the study recommends that future studies employ such deeper analytics as mediated moderation and moderated mediation for deeper insights into the interrelationships among the various variables employed. Further, the study conducted a census survey of large telecommunication firms in Kenya. While the findings could be generalized to all similar telecommunication firms in the country, the findings cannot be extrapolated to other countries in Africa and beyond.

This study was mainly quantitative employing quantitative techniques in sampling, data gathering and in data analysis, where the analysis tools employed were quantitative including simple linear, step-wise, path analysis (Baron & Kenny, 1986) and multiple regression analyses. Whereas these tools are robust and helped in achieving the study objectives, various qualitative concepts and associations pertinent to a deeper understanding of the conceptualized linkages in the study were not captured and analyzed. Future studies should employ different statistical techniques such as structural equation modeling and tests for reverse cause and effect relationships.

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APPENDICES

Appendix I: Research Questionnaire

SECTION A: GENERAL INFORMATION

1. Organization Name (Optional)……
2. Position you hold……
3. Number of years worked in this organization

   Below 3 years [ ] 4-6 years [ ]
   7-10 years [ ] More than 10 years [ ]

4. Period worked in the telecommunication sector?

   Below 3 years [ ] 4-6 years [ ]
   7-10 years [ ] More than 10 years [ ]

5. Highest education level achieved?

   First Degree [ ] Masters [ ] PhD [ ]

   Other Please specify……..

6. Is there a strategic plan in your organization?

Yes [ ] No [ ]

SECTION B: TECHNOLOGICAL INNOVATION

7. How many new applications have been developed over the past one year?

Less than 5 [ ] 6-10 [ ] More than 10 [ ]

8. Below are different statements about the state of technological innovation in your organization. Kindly show your degree of affirmation on each as regards to its influence in competitive advantage. Use a 1 to 5 scale, in which *no extent is indexed by 1; small extent is indexed by 2; moderate extent is indexed by 3; large extent is indexed by 4; very large extent is indexed by 5*.

Statements	**1**	**2**	**3**	**4**	**5**
Process Innovations					
New processes in operational activities have influenced the competitive advantage					
New innovative operational process is shorter than old processes					
New innovative processes are efficient thus influences the competitive advantage					

SECTION C: STRATEGIC LEADERSHIP

Our organization uses customers to spot opportunities for innovations					
Our organization borrows innovative ideas from other industries where they have worked well					
Product Innovations					
Our firms enter into collaborations with other information technology firms to develop new products for the customers					
The demand for new innovative products has influenced the competitive advantage in our Organization					
The desire to come up with new innovative products has influenced the competitive advantage in our Organization					
Distribution Channel Innovations					
Our organization has initiated new innovative distribution channels for its products and services					
The new innovative channels have caused a change in the competitive advantage					
The new innovative distribution channels have increased performance of our firm					
Information System					
Our organization has adopted information system in its operations					
The operation systems adopted have influenced the competitive advantage					

9.Below are different statements about the state of strategic leadership in your organization. Kindly show your degree of affirmation on each as regards to its influence in competitive advantage. Use a 1 to 5 scale, in which no extent is indexed by 1; small extent is indexed by 2; moderate extent is indexed by 3; large extent is indexed by 4; very large extent is indexed by 5.

Statements	**1**	**2**	**3**	**4**	**5**
The clarity of strategic directions determines competitive advantage					
The Mission statement of our organization identifies who we are, what we do and the targeted customers					
Our mission and vision statements are reviewed as need arises which influences the overall competitive advantage					
The clarity of strategic planning process which establishes a clear strategic direction determines competitive advantage					
The degree of human capital development required determines competitive advantage					
The desire to maintain core competencies in the organization determines competitive advantage					
Our strategic plan directs overall annual operational plan					

Our strategic plan is reviewed quarterly to allow for corrective actions					
The leader's level of understanding on organizational policies in utilization of resources determines competitive advantage					
Establishment of appropriate internal controls determines competitive advantage					

SECTION D: KNOWLEDGE MANAGEMENT

10. Below are different statements about the state of knowledge management in your organization. Kindly show your degree of affirmation on each as regards to its influence in competitive advantage. Use a 1 to 5 scale, in which no extent is indexed by 1; small extent is indexed by 2; moderate extent is indexed by 3; large extent is indexed by 4; very large extent is indexed by 5.

Knowledge management Actions and Statements	**1**	**2**	**3**	**4**	**5**
The desire to acquire new knowledge has influenced our competitive Advantage					
Our organization has diverse sources of new knowledge					
Knowledge acquired has influenced competitive advantage in our Organization					
The desire to create new knowledge has influenced the competitive advantage in our organization					
Technology has been applied in creation of new knowledge					
Innovations have played a major role in the creation of new Knowledge					
The ability to store new knowledge has influenced competitive Advantage					
The easy with which knowledge can be retrieved has influenced competitive advantage of our organization					
The ability to retrieve knowledge has influenced the competitive advantage of our organization					
The ability to share knowledge among staff has influenced the competitive advantage of our organization					

SECTION E: COMPETITIVE ADVANTAGE

11. Below are different statements about the state of competitive advantage in your organization. Kindly show your degree of affirmation on each as regards four firm. Use a 1 to 5 scale, in which no extent is indexed by 1; small extent is indexed by 2; moderate extent is indexed by 3; large extent is indexed by 4; very large extent is indexed by 5.

12.

Statements	1	2	3	4	5
Product Differentiation and Innovation					
Our products are unique or rare					
Our products are imperfectly imitable					
Our products are non-substitutable					
Our products reach beyond existing demand					
Our products cannot be easily substituted					
Organizational Responsiveness					
We reconstruct market boundaries in response to competition					
We focus on the big picture and not the numbers					
We build execution into our marketplace strategy					
We have a greater bargaining power over our buyers					
We outcompete our marketplace rivals					
Cost Leadership					
Our pricing is determined in consideration with the threat of new Entrants					
Our pricing is determined in consideration with the threat of substitute products					
Our pricing is competitively low					
We observe cost minimization in marketing and research					
Supply Chain Effectiveness					
We have mastered the strategic sequence in supply chain Management					
We overcome key organizational hurdles in our supply chain					
We have an organizational learning culture					
We have a greater bargaining power over our suppliers					

Appendix II: Full Admission to Doctoral Studies

UNIVERSITY OF NAIROBI
GRADUATE SCHOOL

Telephone: 020 491-0000/3129
Email: gs@uonbi.ac.ke
Our Ref: D80/97269/2015

P. O. Box 30197 00100
NAIROBI, KENYA
14th November 2019

Mrs Perpetua Sidi Wanaswa
C/o Dean,
School of Business

Dear Mrs. Wanaswa,

FULL ADMISSION TO POSTGRADUATE STUDIES (DOCTORATE)

Following your application for a higher degree at this University, I am pleased to inform you that the Director, Graduate School has approved your application for full registration for the degree of Doctor of Philosophy in Business Administration in the School of Business. She has also approved **Prof. Zachary Bolo Awino, Prof. Martin Ogutu,** and **Dr. Joseph Owino** as the supervisors of your thesis entitled; **"Influence of Strategic Leadership and Knowledge Management on the Relationship between Technological Innovation and Competitive Advantage: Evidence from Large Telecommunication Firms in Kenya."** The Guidelines on Postgraduate Supervision can be accessed on our website (www.gs.uonbi.ac.ke) while the Research Notebook is available at the University Bookstore.

The degree for which you are registered will be offered by coursework, research and thesis.

Your registration is governed by the common regulations for Doctorate degrees in all Faculties and the School of Business. **You will be expected to carry out supervised thesis research in your chosen area of study for a minimum period of four (4) semesters, with effect from the date of this letter, culminating in a doctoral thesis. You shall be required to file quarterly progress reports to Graduate School to confirm the progress in your research work.**

Please note that all fees and other charges due shall be paid by **Direct Cash Deposits, EFT (Swift Code is "BARCKENX) or RTGS transfer to UON CESSP Collection Account No. 2032771362 at Barclays Bank, Barclays Plaza Nairobi, Kenya or at any Barclays Bank Branch countrywide using the Reference Number quoted above.** Personal Cheques, Bankers Cheques or Institutional Cheques are NOT acceptable. The student account will be updated the next working day after payment and can be accessed through the student online portal (http://smis.uonbi.ac.ke) available in the University website (www.uonbi.ac.ke).

You will also be required to provide evidence of 2 publications or 2 letters of acceptance from peer reviewed journals from your PhD work before the oral defence. The publication should be co-authored with the supervisors.

Details regarding payment of fees and other charges remain as outlined in the attached fees structure.

Yours sincerely,

CATHERINE NJUE (MS)
FOR: DIRECTOR, GRADUATE SCHOOL

c.c. Dean, School of Business
PhD Programme Co-ordinator - School of Business
Chairman, Department of Business Administration
Prof. Zachary Bolo Awino (Supervisor) – Department of Business Administration
Prof. Martin Ogutu (Supervisor) – Department of Business Administration
Dr. Joseph Owino (Supervisor) – Department of Business Administration

Encl. Fees structure
CN/mv

Source: Director, Graduate School, University of Nairobi (2019)

Appendix III: Introduction Letter

UNIVERSITY OF NAIROBI
COLLEGE OF HUMANITIES AND SOCIAL SCIENCES
SCHOOL OF BUSINESS
DOCTORAL STUDIES PROGRAMME

Telephone: 4184160/1-5 Ext. 231
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P.O. Box 30197
Nairobi, Kenya

11/14/2019

National Commission for Science Technology and Innovation,
P. O. Box 30623, 00100.
Nairobi, KENYA.

INTRODUCTORY LETTER FOR RESEARCH
PERPETUA SIDI WANASWA - REGISTRATION NO.D80/97269/2015

The above named is a registered PhD candidate at the University of Nairobi, School of Business. She is conducting research on ***"Influence of Strategic Leadership and Knowledge Management on the Relationship between Technological Innovation and Competitive Advantage: Evidence from Large Telecommunication Firms in Kenya".***

The purpose of this letter is to kindly request you to assist and facilitate the student with necessary data which forms an integral part of the thesis. The information and data required is needed for academic purposes only and will be treated in **Strict-Confidence.**

Your co-operation will be highly appreciated.

Prof. Mary Kinoti
Associate Dean, Graduate Business Studies
School Of Business

MK/jkm

Source: Dean, School of Business, University of Nairobi (2019)

Appendix IV: Research License

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 272794

Date of Issue: 28/November/2019

RESEARCH LICENSE

This is to Certify that Ms.. PERPETUA WANASWA of University of Nairobi, has been licensed to conduct research in Nairobi on the topic: INFLUENCE OF STRATEGIC LEADERSHIP AND KNOWLEDGE MANAGEMENT ON THE RELATIONSHIP BETWEEN TECHNOLOGICAL INNOVATION AND COMPETITIVE ADVANTAGE: EVIDENCE FROM LARGE TELECOMMUNICATION FIRMS IN KENYA for the period ending : 28/November/2020.

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Source: NACOSTI (2019)

Appendix V: List of Large Telecommunication Firms in Kenya

1. Wananchi Group Limited	42. Asper Worldwide Enterprises
2. Safaricom Limited	43. Aster Global services Kenya Ltd (AGSKL)
3. Jamii Telecommunications Limited	44. Aster Ltd
4. Mobile Telephone Networks Business Kenya Limited (MTN)	45. Astron Computer Ltd
5. Mawingu Networks Limited	46. Bell Atlantic Communication Limited
6. Argon Telecom Services Limited	47. Bell Computers
7. Access Kenya Group	48. Billboard Creations
8. Liquid Telecommunications Kenya Limited	49. Cellulant
9. Telkom Kenya Limited	50. Centurion Systems
10. Iway Africa Kenya Limited	51. CIO East Africa
11. Mobile Telephone Networks Business Kenya Limited	52. CISI Kenya
12. Internet Solutions Limited	53. COMP-USA (K) Ltd
13. Airtel Networks Limited	54. Computer Aid International
14. Mobile Pay Limited	55. Data Centre Ltd,
15. Finserve Africa Limited	56. Digi-Tel Limited
16. Sema Mobile Services	57. Dimension computers
17. Seven Seas Technologies	58. Direct Communications Systems Ltd
18. Dimension Data	59. Disney Media
19. Symphony Technologies Limited	60. Domains Kenya
20. Cloud Productivity Solutions Ltd	61. East Africa Data Handlers Ltd
21. Computer Revolution Africa Ltd	62. East Africa Virtual School
22. M2M Systems	63. East Africa Webhost
23. Eldama Technologies Ltd - Microsoft Partner	64. Empire Microsystems Ltd
24. Interface Solutions Ltd	65. Endeavour Africa Kenya
25. Smartec Systems Limited	66. Enet Online Solutions
26. Teknohub Limited	67. Enterprise Information Management Solutions (EIM)
27. Timeline Solutions	68. ESRI Eastern Africa
28. Xtranet Communications Ltd	69. Essar Telecom Kenya Limited
29. XRX Technologies Limited	70. Express Communications Ltd
30. Specicom Technologies Limited (STL)	71. Gem Multimedia Ltd
31. Eclectics International	72. Gigabyte Systems Ltd
32. Technology Today Ltd.	73. Global Link Consultants Limited
33. Empire Microsystems Ltd.	74. Google Kenya
34. Africa360 Ltd	75. Graphics Beyond LTD
35. African Desktop Ltd	76. HOME – The Kenyan Homepage
36. Africa Online Kenya Limited	77. Hongkong Yejian Technologies Co., Ltd.
37. Afritech Solutions Ltd.	78. HP Kenya
38. A.I Records (Kenya) Ltd	79. Imagine Brands
39. AITEC East Africa	80. Impact Communications Group
40. Arid Land Information Network	81. I.Net Microsystems Kenya Limited
41. Armaco Kenya Ltd	82. Institute of Software Technologies
	83. Integrated Networks and Data Systems Ltd.

Source: ICT Authority of Kenya (2018)

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Registration Number D80/97269/2015

Title of Thesis Influence of Strategic Leadership and Knoledge Management on the relationship between Technological Innovation and Competitive Advantages Evendence from large telecommunication firms in Kenya

Degree Doctor of Philosophy in Business Administration

Field of Study Strategic Management

The above named candidate has completed the corrections required in his/her thesis as required.

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