

**UNVEILING THE NEXUS BETWEEN KNOWLEDGE MANAGEMENT AND PERFORMANCE OF MNOs****\*Fatima Abdullahi Nda, Ja'afaru Garba Sule and Egbunu Audu Dangana**

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**Abstract**

This study aimed at knowledge management and performance. The study explored the influence of knowledge application on customer satisfaction levels, and assessed the effects of information gathering and analysis on competitive advantage. In this study, the survey research design was utilized. The sample size was 366. The internal consistency analysis of the instrument was ascertained using the Cronbach's alpha coefficient. The quantitative data was analyzed using statistical methods like mean, standard deviation, and regression analysis. Finding revealed that knowledge application has a significant positive influence on customer satisfaction levels within the context of MNOs, and that information gathering and analysis have significant positive effects on the competitive advantage of MNOs. The study concluded that managing knowledge is crucial for the performance of Mobile Network Operators. The study recommended that policy makers should prioritize the practical implementation of knowledge within their operations and that MNOs should invest in robust data analytics capabilities and strategic information management.

**Keywords:** Knowledge Culture, Customer Satisfaction, Knowledge Creation, Competitiveness, Knowledge Sharing, Service Quality.

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**INTRODUCTION**

Knowledge is a crucial asset that many organizations seek and utilize for their superior outcomes today (Gyemang and Emeagwali, 2020). The importance of knowledge in the advancement of sophisticated technology and overall organizational success has continued to attract research interest (Nwaiwu and Imafidon, 2013). In the Nigerian Telecommunication Industry, knowledge is considered a vital asset, and the collection of adequate knowledge is crucial for organizations to have the most critical resource. At its core, knowledge management encompasses the systematic collection, organization, sharing, and application of insights, information, and expertise that are integral to operating and enhancing mobile networks. This includes the aggregation of both internal knowledge generated within the organization and external knowledge derived from collaborations, partnerships, and industry trends. Knowledge management is inevitable for Mobile Network Operators (MNOs) to manipulate the most critical resource at their disposal for superior performance (Gyemang and Emeagwali, 2020). Nawab *et al.* (2015) emphasize that the ability to create and disseminate knowledge throughout an entire organization is a strong motivation for knowledge management. In addition, Salami and Elo (2015) argue that managing knowledge is a must for every functional unit, both domestically and internationally, to achieve optimal firm performance. Within the context of Africa, an array of studies has underscored the paramount importance of knowledge management in shaping the triumph of MNOs, mirroring the significance held globally by these operators. Africa, recognized as one of the swiftest expanding mobile markets, has harnessed mobile technology as a pivotal platform for fostering communication, facilitating commerce, and nurturing social interactions (Gyemang and Emeagwali, 2020). The skillful and effective administration of knowledge emerges as a cornerstone for African MNOs to assert their

competitiveness within the industry, particularly in light of the swiftly progressing technological terrain. A comprehensive study undertaken by Dzandu *et al.* (2021) in Ghana provided compelling evidence that knowledge management functions as an essential linchpin for the attainment of optimal performance among MNOs within the country. Meanwhile, in the context of South Africa, Mabunda and Pretorius (2020) affirmed the pivotal role of knowledge management in bolstering the innovation performance of MNOs operating within the nation's borders. Given the dynamic landscape that characterizes the African telecommunications industry, characterized by a fusion of traditional and cutting-edge technologies, the strategic management of knowledge emerges as a potent force that equips MNOs with the capabilities needed to navigate these complexities. The ability to adeptly assimilate, disseminate, and apply knowledge not only strengthens operational frameworks but also amplifies the potential for pioneering solutions and novel services, thereby fortifying the MNOs' position within the competitive arena. As the African mobile market continues its trajectory of growth and evolution, the significance of proficient knowledge management remains an unwavering principle that shapes the destiny of MNOs across the continent. The observed connection between knowledge management and the performance of MNOs in Nigeria suggests a linear association. Abubakar *et al.* (2017) emphasize that an active and efficiently managed knowledge system serves as the foundation for fostering distinctive creative processes, encompassing application, renewal, and sharing of knowledge, potentially leading to a superior level of performance. The significance of knowledge management extends far beyond the immediate horizon; it is a cornerstone for ensuring sustained success by enabling these organizations to elevate their operational standards and respond adeptly to the evolving needs and desires of consumers (Alzghoul *et al.*, 2018; Elrehail, 2018; Alshanty *et al.*, 2019). Within this context, knowledge management emerges as a pivotal facet that underpins the long-term prosperity of MNOs. This management practice empowers these entities to not only stay competitive but also to excel in diverse dimensions. These

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dimensions encompass factors such as competitiveness, network coverage, subscriber base, service quality, and customer satisfaction. Each of these aspects is integral to the comprehensive performance evaluation of MNOs within the Nigerian telecommunication industry. Exploring the world of knowledge management practices is like embarking on a complex and multi-layered journey. It requires careful thought and deliberate planning to put these practices into action effectively. This complexity emphasizes just how important it is to approach knowledge management with great care. It acts as a significant force that can drive positive changes in various aspects. The multifaceted nature of knowledge management lies in its ability to intertwine various aspects of business operations, technology, human resources, and customer interactions. It necessitates a comprehensive strategy that encompasses the creation, sharing, and strategic application of knowledge across every echelon of an organization. Given the dynamic telecommunications landscape of North Central Nigeria, achieving and maintaining the desired levels of customer satisfaction, competitiveness, service quality, network coverage, and subscriber growth hinges on the adept management of knowledge. Effective knowledge management serves as a catalyst, propelling MNOs toward innovative solutions, operational efficiencies, and customer-centric strategies. As MNOs endeavor to stay ahead in a fiercely competitive environment, the role of knowledge management is pivotal. It shapes their capacity to swiftly respond to changing market dynamics, anticipate customer preferences, and introduce novel services that align with the evolving landscape.

There is an observed absence of extant research on how knowledge application, information gathering and analysis affect customer satisfaction, competitiveness, service quality, network coverage and subscriber base of MNOs in North Central Nigeria. The absence of research attention can lead to a range of adverse consequences. These facets, when left unaddressed, can be directly linked to the challenges faced by MNOs in North Central Nigeria. The repercussions extend across a spectrum of vital areas, each playing a pivotal role in determining the overall success and performance of these operators. Poor customer satisfaction, decreased competitiveness, compromised service quality, limited network coverage, and stagnant subscriber growth become the unfortunate outcomes. To avoid these detrimental results, it becomes imperative for research to be carried out. This study proposes to explore knowledge management and performance of MNOs in Nigeria. The study specifically:

- i. Explore the influence of knowledge application on customer satisfaction levels within the context of MNOs in North Central Nigeria.
- ii. Assess the effects of information gathering and analysis on competitive advantage of the Nigerian MNOs.
- iii. Unveil the relationship between knowledge management, network coverage, subscriber base and service quality of MNOs in Nigeria.

## LITERATURE REVIEW

In contemporary discourse, the field of knowledge management has demonstrated a remarkable trajectory of evolution, its contours dynamically adapting to the shifting currents within the domains of information, technology, and the intricacies of organizational dynamics. A comprehensive

retrospective analysis demonstrates the extensive duration of knowledge management as a subject of rigorous investigation. Notably, Halawi *et al.* (2021) assert that the study of knowledge management has persevered for over four decades, a temporal span that demonstrates its enduring significance within the scholarly landscape. Over the course of this extended timeline, the conceptual terrain of knowledge management has been intricately enriched by a diverse range of viewpoints, each aiming to elucidate the various aspects of its meaning and extent. The resultant collection of perspectives unveils the complex interweaving of scholarly reflections, ultimately shaping the intricacies of our understanding regarding the multifaceted influence intricately threaded by knowledge management. At the core of knowledge management's operation lies a fundamental principle rooted in its reliance on an organization's existing resources (Fisher and Qualls, 2018; Johansson *et al.*, 2018). This encompassing range encompasses a diverse set of elements, extending from establishing robust data management systems that serve as the bedrock for structural integrity, akin to the intricate interlocking gears of a mechanism. These systems ensure smooth operations, just as gears synchronize to ensure precise movement. Additionally, there is the deliberate coordination of effective change management processes, guided by skilled hands adept at steering progress. These processes are like expert hands shaping the direction of advancement. Within these dimensions, the pivotal role of human resources emerges prominently. These individuals, drawing from their cultivated expertise, accumulated experiences, and nuanced interactions, collectively contribute to weaving the dynamic tapestry of knowledge that permeates every aspect of the organization's fabric. Embedded deep within its core, knowledge management embodies a meticulously designed methodology aimed at achieving a balance of precision. This is manifested in the seamless and timely distribution of relevant information to the intended recipients. However, this orchestrated transmission of knowledge extends beyond mere mechanics. It seamlessly integrates with the fostering of an environment where knowledge evolves from inert data into a living entity. It is more than just sharing; it's about absorbing and effectively applying this knowledge, transforming it into actionable strategies. This mutually beneficial interaction results in a transformative increase in organizational performance. This nurtures an environment where the wealth of intellectual resources is not solely harnessed for informed decision-making but also serves as a crucible for innovation, well-considered strategies, and consequential actions that drive the organization forward.

Stepping back to view the bigger strategic picture, Omotayo (2021) shines a spotlight on the profound strategic role of knowledge management within the fiercely competitive landscape. For organizations with ambitions of securing a lasting strategic edge over their rivals, knowledge management transcends being a mere choice – it is an indispensable cornerstone that underlies the bedrock of enduring success. This perspective echoes the sentiments shared by Girard and Girard (2023), who emphasize that the process of knowledge management can be likened to crafting an intricate tapestry. The term "intricate tapestry" metaphorically refers to a complex and detailed composition or arrangement of various elements that are woven together to create a unified and intricate whole. In the context provided, it signifies the multifaceted and interdependent nature of knowledge management and its various processes, where each element is

carefully connected and integrated to create a comprehensive and harmonious result. This intricate tapestry unfolds through the creation, sharing, practical application, and scrupulous management of knowledge and information. Undoubtedly, knowledge management stands as a cornerstone of paramount significance within the telecommunications industry. This pivotal concept has emerged as a central focus within organizational and management spheres, owing to its inherent potential to forge strategic and consequential links to competitiveness, productivity amplification, and overall capacity enhancement. In its essence, knowledge management assumes a role of paramount importance, akin to the lifeblood of an organization's competitive prowess and sustained existence. Scholars such as Anwar and Ghafoor (2017) have underscored its significance as a comprehensive framework that orchestrates the very fabric of an organization's structure, strategy, and operational processes. This orchestration is meticulously designed to harness the organization's reservoir of knowledge, facilitating the assimilation of insights, experiences, and expertise into a cohesive whole. This fusion of knowledge streams propels the organization's ability to learn, innovate, and subsequently generate substantial economic and social value for both its customer base and the broader community. By instilling a purposeful structure and strategy, knowledge management empowers the organization to effectively leverage its intellectual capital to craft new ideas, refine existing practices, and pioneer advancements that transcend conventional boundaries (Othman *et al.*, 2019). Integral to this dynamic is the art of ascribing value to cognitive assets – a process that encompasses not only the recognition and appraisal of intellectual capital but also the acquisition, application, sculpting, and strategic oversight of knowledge reservoirs. In doing so, knowledge management becomes a guiding compass directing an organization towards the attainment of its long-term objectives. This involves the astute harnessing of insights to enhance operational efficiencies, bolster decision-making processes, and engender a culture of continuous improvement.

The term "performance" has garnered substantial attention and contributions within the realm of research. Within the expansive domain of management, organizational performance emerges as a pivotal focal point. This concept, characterized by its multifaceted perspectives, has undergone meticulous examination, revealing its inherent intricacies. A salient point of emphasis is the assessment of how organizations gauge their own performance, a facet that has sparked considerable inquiry. Notably, Maduekwe and Kamala (2016) illuminate a pertinent line of inquiry wherein one of the pivotal concerns revolves around the methodologies employed for quantifying performance. This avenue of investigation delves into the very essence of how organizations ascertain the efficacy of their endeavors, unveiling a discourse that encompasses diverse paradigms. At the heart of this discourse lies the distinctive position that MNOs occupy within their industry. Their performance, a dynamic interplay of operational prowess and strategic prowess, signifies their unique standing within the competitive landscape. Crucially, high-performing MNOs carve their presence by attaining and even surpassing their overarching objectives, juxtaposed against established benchmarks. This distinction demonstrates their ability to manifest their aspirations into tangible achievements, thereby solidifying their status as exceptional players within the industry. Expanding on this trajectory, Ankrah and Mensah (2015) contribute an insightful perspective, suggesting that the

measurement and control of a Telecommunication Organization's performance are contingent on a structured performance measurement framework, intricately aligned with a preconceived strategic roadmap. This proposition suggests a proactive and systematic approach to orchestrating organizational performance, guided by a predetermined strategy. By invoking this methodology, MNOs stand to not only elevate their present accomplishments but also sculpt a trajectory of sustained growth and strategic excellence. MNOs stand as enterprises that offer vital telecommunication services to the ever-expanding mobile phone user base, facilitated by intricate wireless networks. The paramount significance of MNO performance within the broader telecommunication sector is incontrovertible, for it serves as the linchpin upon which the quality of services rendered to customers and the company's financial viability pivot. Central to the narrative is the pivotal role that organizational performance assumes within the sphere of MNOs. This metric serves as a mirror, reflecting the efficacy and efficiency inherent in their operational endeavors. It is a multifaceted gauge that encapsulates the ability of MNOs to deliver seamless services while optimizing resources, thereby carving a path toward operational excellence. Indeed, the organizational performance of MNOs is a sum that is influenced by a range of factors. In this arrangement, the rhythm of knowledge management, the way customers are satisfied, the extent of network coverage, the number of subscribers, the quality of services, and the level of competitiveness all work together to influence the overall performance.

### **Knowledge Application and Customer Satisfaction Levels**

Centered within the context of MNOs, this conceptual framework delves into the relationship between knowledge application and the echelons of customer satisfaction. In the world of mobile networks, this idea looks at how using what we know, the things we have learned, and our skills within mobile companies can affect how happy customers are. Basically, it is about how well these MNOs can turn what they know into helpful solutions, and how this can make customers feel even better about the things they get from these MNOs, like products, services, or experiences. When companies are good at using their knowledge to solve problems, it can make customers see what they offer in a better way, which makes them happier and more satisfied with the company (Fishman, 2016). In the fast-changing world of telecommunications, where technological progress plays a key role, knowledge application becomes even more important. The core of this concept is about recognizing that MNOs, who provide modern communication solutions, have a special position to improve how they interact with customers by using what they know. By using their knowledge smartly to come up with useful solutions, MNOs can have a positive impact not just on the quality and importance of what they offer, but also on how well they meet the changing needs of their customers. The nexus between putting knowledge into action and the contentment of customers mirrors the intricate and highly coordinated nature of modern telecommunications (Ansell and Geyer, 2016). As Mobile Network Operators utilize their knowledge and expertise to effectively tackle customer concerns, they unintentionally create an environment where customers feel valued, comprehended, and actively involved. This emphasizes the pivotal role that knowledge plays, acting as a central point around which customer satisfaction revolves (Koskela-Huotari and Vargo, 2016; Migdadi, 2021).

Understanding this critical connection demonstrates the adept utilization of knowledge in the complex interplay between MNOs and customers, serving as a fundamental element that shapes an atmosphere where customers experience gratification, fulfillment, and acknowledgement.

### **Information Gathering and Analysis and its Effect on Competitive Advantage**

Information gathering and analysis play a crucial role in shaping an organization's competitive advantage. Information gathering and analysis are paramount for Nigerian MNOs to establish and maintain their competitive edge in a dynamic and rapidly evolving telecommunications industry. In today's fast-paced business landscape, having access to accurate and relevant information can make a significant difference in staying ahead of the competition (Bandari, 2020). Effective information gathering allows businesses to understand the market trends, customer preferences, and competitor strategies. By staying attuned to these factors, companies can make informed decisions about product development, pricing, and marketing strategies (Holt *et al.*, 2017). Information gathering enables MNOs to comprehend market dynamics, customer behaviors, and preferences. By analyzing customer data, and usage trends, MNOs can tailor their services to meet specific demands. For example, if data analysis reveals a surge in data usage during weekends, MNOs can offer special weekend data packages, enhancing customer satisfaction and loyalty. Information gathering about competitors' pricing strategies, network coverage, and service offerings equips MNOs with insights to differentiate themselves. Through analysis, MNOs can identify gaps in the market and craft strategies that position them uniquely. This might involve offering better value packages, superior network quality, or innovative services that competitors lack (Matthyssens, 2019). Analyzing gathered data empowers MNOs to innovate and customize their services. With insights into user preferences, MNOs can introduce innovative products like data-sharing plans for families or tailored business bundles for corporate clients, setting themselves apart from competitors and attracting niche markets. Effective information analysis aids MNOs in optimizing their operations. By monitoring network performance data, they can proactively identify and resolve issues, minimizing downtime and enhancing service quality (Alkenani and Nassar, 2022). This can lead to improved customer experiences and a stronger competitive position. Economic fluctuations can pose a significant threat, as changes in the economic landscape can lead to shifts in consumer spending behavior and market dynamics. By systematically collecting and analyzing relevant data, MNOs can proactively identify signals of impending regulatory changes or economic shifts. This early detection empowers them to develop comprehensive contingency plans that outline potential courses of action in response to these risks. These plans could involve adjusting pricing strategies, reallocating resources, or diversifying service offerings. The true strength of information analysis lies in its capacity to facilitate swift adaptation. With insightful data, MNOs can quickly recalibrate their strategies to mitigate negative impacts caused by regulatory changes or economic downturns. Such adaptation might involve rolling out new promotional campaigns to attract cost-conscious consumers during an economic recession or revising service packages to align with new regulatory requirements seamlessly. The study conducted by Hlásny *et al.* (2021) demonstrates the critical importance of information gathering

and analysis in risk assessment and management. Their findings illuminate how MNOs that effectively utilize data-driven insights can navigate uncertain regulatory and economic environments with agility and resilience. By integrating this approach into their decision-making processes, MNOs can safeguard their competitive advantage, ensuring that their services remain relevant, responsive, and reliable even in the face of unforeseen challenges.

### **Knowledge Management, Network Coverage, Subscriber Base and Service Quality: The Relationship**

The relationship between knowledge management, network coverage, subscriber base, and service quality of Mobile Network Operators (MNOs) in Nigeria is complicated and interdependent, with each element influencing the others. Effective knowledge management within MNOs involves the organization, storage, sharing, and application of information and expertise. When MNOs successfully manage their knowledge resources, they can optimize their network planning and expansion strategies. Knowledge about technological advancements, infrastructure deployment, and regional demand can help MNOs identify areas where network coverage needs improvement or expansion (Pérez-Romero and Sallent, 2021; Patwary *et al.*, 2020). In turn, enhanced network coverage contributes to better service quality and attracts more subscribers. Network coverage holds a pivotal role in not only attracting but also retaining subscribers for MNOs. The extent and reliability of network coverage have a direct impact on the accessibility (Ahmad *et al.*, 2020; Pérez-Romero *et al.*, 2016) and availability of MNO services to potential and existing subscribers alike. A comprehensive network coverage ensures that MNO services can reach a wider geographic area, spanning urban centers, suburban regions, and even remote or underserved locations. The significance of expansive network coverage lies in its correlation with the potential subscriber base. A larger coverage area inherently opens doors to a larger pool of potential subscribers who can access the services. As the network footprint expands, so does the reach of the MNO's offerings, encompassing a diverse range of customers across various demographics and locations. In the competitive landscape of telecommunications, subscribers are naturally drawn to MNOs that boast broader coverage. This preference is rooted in the assurance of consistent connectivity that comes with a well-covered network. The prospect of seamless communication and uninterrupted access to data services holds considerable appeal for consumers (Banafaa *et al.*, 2023). This is particularly notable in remote or underserved areas where connectivity might otherwise be limited. Moreover, the conveniences brought about by extensive network coverage cannot be overstated. Subscribers are more likely to opt for an MNO that can cater to their communication needs regardless of their location. Whether they are in the heart of a bustling city, in the suburbs, or in remote rural areas, a network that maintains its reliability and quality empowers subscribers to stay connected with loved ones, conduct business, access information, and enjoy entertainment without disruptions. The correlation between the size of an MNO's subscriber base and the quality of its services is a vital aspect in the telecommunications industry. As the number of subscribers connected to a network increases, the demands placed on that network also rise proportionally (Morley *et al.*, 2018). This surge in demand encompasses various aspects, such as call volume, data usage, and overall network traffic (Navarro-Ortiz *et al.*, 2020). When an MNO's network infrastructure is not

suitably expanded to accommodate this growing subscriber base, the result can be network congestion, which can subsequently lead to a cascade of service-related issues. Dropped calls become more prevalent as network resources struggle to handle the influx of calls simultaneously. Data speeds might slow down significantly due to the limited capacity to transmit data packets efficiently, causing frustration among users who expect quick and seamless data access (Alnawayseh *et al.*, 2023). One of the most tangible impacts of inadequate scaling is the deterioration of service quality. Users may experience compromised call quality, leading to unclear audio or disruptions during conversations. Additionally, the slowed data speeds can hinder smooth online experiences, affecting activities such as streaming, browsing, or even accessing critical work applications. In contrast, a well-managed and properly scaled network is engineered to cater to higher subscriber volumes without compromising the quality of service. Adequate scaling involves anticipating future growth and strategically expanding network resources to handle the increased load. This entails bolstering core network components, enhancing backhaul infrastructure, and optimizing cell site distribution to evenly distribute the load. Backhaul infrastructure refers to the network components and technologies that connect the core network of a telecommunications provider to the smaller, local networks or base stations that are closer to end-users. By effectively scaling the network to match subscriber growth, MNOs can uphold service quality even during peak usage periods. Subscribers will experience consistent call quality, seamless data connectivity, and rapid data transfer speeds. This positive user experience fosters customer satisfaction, loyalty, and an overall positive perception of the MNO's services.

Knowledge management plays a pivotal role in elevating the quality of services offered by MNOs. MNOs that adeptly harness their knowledge resources gain the ability to not only recognize existing service gaps but also proactively address them. By meticulously collating and scrutinizing data stemming from customer interactions and experiences, MNOs can pinpoint specific pain points in their services, whether it's related to connectivity, customer support, or other aspects. The power of knowledge management extends to analyzing customer feedback, which serves as a direct window into the user experience (Liu *et al.*, 2016). By attentively interpreting customer suggestions, complaints, and sentiments, MNOs can glean insights that guide them towards meaningful improvements. This strategic use of feedback fosters a two-way communication channel between the MNO and its customers, fostering a sense of responsiveness and care that resonates positively. Perhaps the most significant impact of knowledge management is its potential to tailor services with remarkable precision. Armed with a deep understanding of customer preferences, behaviors, and emerging trends, MNOs can shape their offerings to be finely attuned to user needs. This customization spans from designing data plans that cater to specific usage patterns to crafting innovative service bundles that align with changing technological demands. The outcome is a service portfolio that not only meets expectations but exceeds them, leading to increased customer satisfaction. Moreover, knowledge management empowers MNOs to anticipate shifts in the market landscape and adapt preemptively. By remaining vigilant in their analysis of customer behavior and preferences, MNOs can foresee potential changes and proactively innovate to stay ahead. This agility in responding to dynamic market conditions positions

MNOs as industry leaders, consistently delivering services that align with customer desires.

### METHODOLOGY

The research design is a crucial aspect of any research as it outlines the procedures and methods for conducting the study. In this study, the survey research design was utilized. This design involved gathering data from a sample of individuals through the use of a questionnaire survey. The target of this study was the MNOs operating in North Central Nigeria, specifically focusing on those within the telecommunications industry. This included all MNOs that provide mobile services and operate within the defined geographical region. The total number of 7,750 employees of MNOs makes up the population size. Through strategic initiatives, innovative services, and a relentless commitment to meeting customer needs, these operators persistently bolster the knowledge of these employees, and solidifying their influence and presence within the mobile communication sector. For the purpose of this study, the researcher employed the technique of stratified random sampling to select the sample. This approach involved partitioning the targeted population, in this case, the staff members of the MNOs, into distinct strata based on shared characteristics. These strata encompassed departments, organizational levels, or any other pertinent attributes deemed significant by the researcher. The strata were defined, and a random sample was drawn from each group, employing a random number generator. This procedure guarantees that each stratum's representation in the sample is proportional to its size within the entire population (Ganju and Zhou, 2011). To optimize the statistical accuracy of the research, a specific parametric statistical equation was utilized to derive a suitable sample size for the study. The sample size was determined through the application of Sallant and Dillman's (1997) method. This approach is advantageous due to its robust statistical capability, ensuring both a precise level of measurement and effective stratification. It assures the selection of pertinent units of analysis with a heightened degree of accuracy. The formula is shown below:

1.20=0.20e confidence level: 5.210e=0.05e confidence level)  
 C= 2.58 (for 95% confidence level with the confidence interval) (1.96=0.05 confidence level)  
 B= 0.05 (for 5% confidence level) (0.02 = 0.02; 0.03 = 0.03)  
 Np= proportion expected to answer in a certain way (20% of 0.2 is most conservative)  
 N= sample population  
 N2= confidence interval size reduction  
 Where:

$$N^2 = \frac{(N^2 - 1) \left( \frac{C}{B} \right)^2 + (N)(1 - B)}{N^2 (B)(1 - B)}$$

$$= \frac{7,750 (0.5)(1 - 0.5)}{(7,750 - 1) \left( \frac{0.05}{1.960} \right)^2 + (0.5)(1 - 0.5)}$$

Where:  
 Ns= 366.0618996798292 (Approx. 366)  
 Np= 7750  
 P= 50% or 0.5  
 B= 0.05 or ±5%  
 C= 1.960 or 95%

Three hundred and sixty-six questionnaires were statistically right for this study which were distributed and collected from the targeted respondent of the study. The internal consistency



analysis of the instrument was ascertained using the Cronbach’s alpha coefficient. This analysis was achieved using the Statistical Package for Social Sciences (SPSS). The Cronbach statistics is specifically aimed at measuring the internal consistency of any study instrument. Cronbach’s alpha is considered a good indicator of the reliability of an instrument. The higher the degree of consistency and stability in an instrument, the more reliable the instrument will be. Any score that is above 0.7 is considered a good score (Christmann and Aelst, 2006). Table 1 shows that all the variables have a high degree of internal consistency, and the instrument is considered reliable.

**Table 1. Reliability of Instrument**

S/N	Variables	No. of Items	Results
1	Knowledge Application	10	0.791
2	Information Gathering And Analysis	10	0.882
3	Network Coverage	10	0.710
4	Subscriber Base	9	0.756
5	Service Quality	10	0.720
6	Customer Satisfaction	10	0.743
7	Competitiveness	10	0.712

Source: Field Survey (2023)

The quantitative data was analyzed using statistical methods like mean, standard deviation, and regression analysis to establish the effects and relationship between the independent and dependent variables. The linear regression model was used for inferential purpose. The models are specified below:

$$PEF = f(X_1) \dots\dots\dots 1$$

Where,

- PEF= Dependent variable (Performance of MNOs);
- f = a function to be specified
- X = a vector of explanatory variable (Knowledge Management)

In specific form, equation (1) translates into equation 2 thus:

$$CSN = a + \beta_1KAN + \varepsilon \dots\dots\dots 2$$

$$COM = a + \beta_1IGA + \varepsilon \dots\dots\dots 3$$

Where,

- a = Constant
- KAN= Knowledge Application
- IGA= Information Gathering and Analysis on competitive advantage
- CSN= Customer Satisfaction
- COM= Competitiveness
- ε = residual or stochastic term
- β<sub>1</sub>, β<sub>2</sub> are regression coefficients

**ANALYSES AND RESULTS**

Table 2 reveals descriptive statistics illuminating the patterns of knowledge application within the organization. The table shows the result for “effective application of knowledge to solve work-related challenges” (Mean- 2.9328; Std. Deviation-1.28996). This means that employees express a moderate ability to effectively apply the knowledge they possess to solve work-related challenges. The standard deviation suggests a diversity of opinions on the effectiveness of knowledge application.

**Table 2. Descriptive statistics of knowledge application**

	Mean	Std. Deviation
Effective Application of Knowledge to Solve Work-related Challenges	2.9328	1.28996
Immediate Application of Knowledge Gained from Training and Learning Opportunities	2.9636	1.28138
Regular Leverage of Existing Knowledge for Informed Decisions	2.9524	1.29627
Integration of New Insights and Ideas into Processes for Efficiency Enhancement	2.9496	1.28855
Active Use of Knowledge to Innovate and Create New Products or Services	2.9188	1.28151
Influence of Lessons Learned from Past Experiences on Current Projects	3.0224	1.28717
Adaptation of Knowledge to Suit Specific Contexts and Situations	2.9720	1.29792
Encouragement of Experimentation and Testing of New Concepts	2.9860	1.28838
Mechanisms for Capturing and Sharing Successful Applications of Knowledge	2.9552	1.27121
Continuous Improvement of Knowledge Application through Regular Feedback Loops	2.9524	1.27221

Source: Field Survey, 2023.

The result unveils immediate application of knowledge gained from training and learning opportunities (Mean- 2.9636; Std. Deviation- 1.28138). This indicates that knowledge gained from training and learning opportunities is perceived to be moderately and immediately put into practice. The standard deviation indicates variability in opinions about the immediacy and effectiveness of applying this knowledge. Regular leverage of existing knowledge for informed decisions has the mean score of 2.9524 and the Std. Deviation of 1.29627. This implies that teams are perceived to moderately leverage existing knowledge regularly to make informed decisions. The standard deviation implies diversity in opinions regarding the effectiveness of knowledge leverage for decision-making. The results show “integration of new insights and ideas into processes for efficiency enhancement (Mean- 2.9496; Std. Deviation- 1.28855). This signifies that new insights and ideas are perceived to be moderately integrated into processes to enhance efficiency. The standard deviation suggests varying opinions about the efficiency gains achieved through the integration of new insights. The results also show “active use of knowledge to innovate and create new products or services” with mean score of 2.9188 and Std. Deviation of 1.28151. This means that knowledge is moderately perceived to be actively used to innovate and create new products or services. The standard deviation indicates diversity in opinions about the effectiveness of knowledge application for innovation. Table 2 shows influence of lessons learned from past experiences on current projects (Mean- 3.0224; Std. Deviation- 1.28717). This means that lessons learned from past experiences are perceived to have a moderate influence on the approach to current projects. The standard deviation implies diversity in opinions about the extent of influence. The results show adaptation of knowledge to suit specific contexts and situations (Mean- 2.9720; Std. Deviation- 1.29792). This signifies that knowledge is moderately adapted to suit specific contexts and situations. The standard deviation suggests varying opinions about the effectiveness of knowledge adaptation. The results show “encouragement of experimentation and testing of new concepts” with the mean score of 2.9860 and Std. Deviation of 1.28838. This means that the organization is perceived to moderately encourage experimentation and testing of new concepts. The standard deviation indicates diversity in opinions about the effectiveness of this encouragement. The

results for “mechanisms for capturing and sharing successful applications of knowledge” shows mean score of 2.9552 and Std. Deviation of 1.27121. This implies that there are perceived moderate mechanisms in place to capture and share successful applications of knowledge. The standard deviation implies varying opinions about the effectiveness of these mechanisms. The results show continuous improvement of knowledge application through regular feedback loops (Mean- 2.9524; Std. Deviation- 1.27221). This means that regular feedback loops are moderately ensure that knowledge application is continuously improved. The standard deviation indicates diversity in opinions about the effectiveness of these feedback loops.

**Table 3. Descriptive statistics of information gathering and analysis**

	Mean	Std. Deviation
Active Seeking of Relevant Information to Support Tasks and Responsibilities	2.6218	1.47445
Skill in Identifying Reliable Sources of Information for Work	2.6499	1.47948
Organization's Provision of Resources and Tools for Efficient Information Gathering	2.6527	1.46392
Critical Evaluation of Credibility and Relevance of Collected Information	2.6387	1.45184
Systematic Organization of Data and Information for Easy Retrieval and Analysis	2.6471	1.46833
Collaboration with Colleagues for Gathering Diverse Perspectives	2.6611	1.47640
Synthesis of Information from Various Sources to Create a Comprehensive View	2.6583	1.46524
Integral Role of Information Analysis in Decision-Making within Teams	2.7703	1.51506
Encouragement of Continuous Learning to Enhance Information Analysis Skills	2.8543	1.52178
Existence of Feedback Loops to Assess Effectiveness of Information Practices	2.7759	1.50287

Source: Field Survey, 2023.

Table 3 presents descriptive statistics offering insights into the patterns of information gathering and analysis within the organization. The results show “active seeking of relevant information to support tasks and responsibilities” (Mean- 2.6218; Std. Deviation- 1.47445). This means employees express a moderate tendency to actively seek out relevant information to support their tasks and responsibilities. The standard deviation indicates variability in individual approaches to information seeking. The results show “skill in identifying reliable sources of information for work” (Mean- 2.6499; Std. Deviation- 1.47948). This implies that participants perceive a moderate level of skill in identifying reliable sources of information for their work. The standard deviation suggests diverse opinions about the effectiveness of individuals in source identification. The results show “organization's provision of resources and tools for efficient information gathering” (Mean- 2.6527; Std. Deviation- 1.46392). This unveils that organizations moderately provide resources and tools to facilitate efficient information gathering. The standard deviation indicates variability in opinions about the adequacy of organizational support. The table show “critical evaluation of credibility and relevance of collected information” (Mean- 2.6387; Std. Deviation- 1.45184). This indicates that employees express a moderate tendency to critically evaluate the credibility and relevance of the information they collect. The standard deviation suggests diverse approaches to the evaluation process. The “systematic organization of data and information for easy retrieval and

analysis” has the mean of 2.6471 and Std. Deviation of 1.46833. This signifies that data and information are moderately organized systematically to enable easy retrieval and analysis. The standard deviation indicates diversity in opinions about the effectiveness of organizational practices in this regard. The results show “collaboration with colleagues for gathering diverse perspectives” (Mean- 2.6611; Std. Deviation- 1.47640). This shows that employees express a moderate tendency to collaborate with colleagues to gather diverse perspectives. The standard deviation suggests variability in opinions about the effectiveness of collaborative information gathering. Also, the results show “synthesis of information from various sources to create a comprehensive view” (Mean- 2.6583; Std. Deviation- 1.46524), indicating that information from various sources is perceived to be moderately synthesized to create a comprehensive view. The standard deviation indicates diversity in opinions about the effectiveness of information synthesis practices.

Table 3 shows integral role of information analysis in decision-making within teams (Mean- 2.7703; Std. Deviation- 1.51506), implying that analyzing information play an integral role in decision-making within teams at a moderate level. The standard deviation suggests diverse opinions about the impact of information analysis on decision-making. The results show “encouragement of continuous learning to enhance information analysis skills” (Mean- 2.8543; Std. Deviation- 1.52178), unveiling that organization moderately encourage continuous learning to enhance information analysis skills. The standard deviation indicates varying opinions about the effectiveness of organizational encouragement. The results show “existence of feedback loops to assess effectiveness of information practices” (Mean- 2.7759; Std. Deviation- 1.50287), indicating that feedback loops are perceived to exist to a moderate extent to assess the effectiveness of information gathering and analysis practices. The standard deviation implies diversity in opinions about the impact of feedback loops. These descriptive statistics offer a comprehensive understanding of respondents' perceptions regarding information gathering and analysis within the organization.

**Table 4. Influence of knowledge application on customer satisfaction levels**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.691802	0.194712	8.688737	0.0000
KAN	0.368152	0.060735	6.061638	0.0000
R-squared	0.094035	Mean dependent var		2.772472
Adjusted R-squared	0.091476	S.D. dependent var		1.549712
S.E. of regression	1.477132	Akaike info criterion		3.623684
Sum squared resid	772.3990	Schwarz criterion		3.645453
Log likelihood	-643.0157	Hannan-Quinn criter.		3.632343
F-statistic	36.74346	Durbin-Watson stat		1.686888
Prob(F-statistic)	0.000000			

Source: Author's Computation Using E-view 12

$$\text{Model Line: } CSN_{it} = \beta_{0it} + \beta_{1it}KAN + \mu$$

$$\text{Regression Line: } CSN = 1.691802 + 0.368152KAN$$

Where KAN= Knowledge Application; CSN= Customer Satisfaction Levels;  $\mu$ = Stochastic Error Term

Table 4 shows the  $R^2$  of 0.094035, examining the influence of knowledge application on customer satisfaction levels within the context of MNOs. The proportion of the variance in customer satisfaction levels within the context of MNOs

explained by knowledge application is 9.40%. This implies that knowledge application accounts for a relatively small portion of the variability in customer satisfaction. The remaining 90.6% unaccounted variation indicates that other factors can also be liable for the variability of customer satisfaction levels within the context of MNOs. The adjusted R-squared value for the predictor in the model is 9.15%. The F-statistic tests the overall significance of the model. The moderate F-statistic of 36.74346 with a very low associated probability (0.0000) suggests that the model as a whole is statistically significant. The probability associated with the F-statistic is 0.0000, indicating that the overall regression model is highly significant. The Durbin-Watson statistics is 1.686888, showing that there is no issue of autocorrelation in the residual. The study aimed to understand how knowledge application influences customer satisfaction levels within the context of MNOs. The coefficient for the constant term is 1.691802. This represents the expected value of customer satisfaction levels within the context of MNOs when knowledge application is zero. The standard error for the constant term is 0.194712. The t-statistic for the constant is 8.688737, and its associated probability is 0.0000, indicating its significance. The coefficient for Knowledge Application is 0.368152. This indicates that for a one-unit increase in knowledge application, customer satisfaction levels within the context of MNOs are expected to increase by approximately 0.368152 units. The standard error for the knowledge application variable is 0.060735. The t-statistic for the knowledge application variable is 6.061638, and its associated probability is 0.0000, indicating its high significance.

**Table 5. Effects of information gathering and analysis on competitive advantage of MNOs**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.601405	0.125544	4.790405	0.0000
IGA	0.793834	0.034986	22.68989	0.0000
R-squared	0.592556	Mean dependent var		3.241573
Adjusted R-squared	0.591405	S.D. dependent var		1.391346
S.E. of regression	0.889368	Akaike info criterion		2.608992
Sum squared resid	280.0055	Schwarz criterion		2.630761
Log likelihood	-462.4005	Hannan-Quinn criter.		2.617651
F-statistic	514.8312	Durbin-Watson stat		2.101212
Prob(F-statistic)	0.000000			

Source: Author's Computation Using E-view 12

$$Model\ Line : COM_{it} = \beta_{0it} + \beta_{1it} IGA + \mu$$

$$Regression\ Line: COM = 0.601405 + 0.793834 IGA$$

Where IGA= Information Gathering and Analysis; COM= Competitive Advantage of MNOs;  $\mu$ = Stochastic Error Term

Table 5 shows the R<sup>2</sup> examining the effects of information gathering and analysis on the competitive advantage of MNOs. The variance in the competitive advantage of MNOs explained by information gathering and analysis is 59.26%, indicating a significant contribution of these factors to the variability in competitive advantage. The remaining 40.74% unexplained variation suggests that other factors may also contribute to the variability in the competitive advantage of MNOs. The adjusted R-squared value for the predictor in the model is 59.14%. The F-statistic, testing the overall significance of the model, is notably high at 514.8312, with an associated probability of 0.0000, signifying the model's statistical significance. The probability linked with the F-statistic is 0.0000, underscoring the high overall significance of the

regression model. The Durbin-Watson statistics is 2.101212, showing that there is no issue of autocorrelation in the residual. The coefficients for constant term is 0.601405. This represents the expected value of the competitive advantage of MNOs when information gathering and analysis are zero. The standard error for the constant term is 0.125544. The t-statistic for the constant is 4.790405, and its associated probability is 0.0000, indicating its significance. The coefficient for information gathering and analysis is 0.793834. This indicates that for a one-unit increase in information gathering and analysis, the competitive advantage of MNOs is expected to increase by approximately 0.793834 units. The standard error for the information gathering and analysis variable is 0.034986. The t-statistic for the information gathering and analysis variable is 22.68989, and its associated probability is 0.0000, indicating its high significance.

**Table 6a. Descriptive Statistics on knowledge management, network coverage, subscriber base and service quality**

Variables	Mean	Std. Deviation	N
Knowledge Management	3.7759	1.16849	357
Network Coverage	3.4370	1.42197	357
Subscriber Base	3.4594	1.33730	357
Service Quality	3.3277	1.41685	357

Source: Author's Computation Using SPSS 20.0

The table 6a presents descriptive statistics for four variables: knowledge management, network coverage, subscriber base, and service quality. The average score for knowledge management is 3.7759, and the measure of the dispersion of scores around the mean is 1.16849. The average score for network coverage is 3.4370, and the standard deviation is 1.42197. The average score for subscriber base is 3.4594, and the standard deviation is 1.33730. The average score for service quality is 3.3277, and the standard deviation is 1.41685. The mean scores provide an indication of the central tendency for the variables.

**Table 6b. Correlations result on the relationship between knowledge management, network coverage, subscriber base and service quality of MNOs**

Variables		Knowledge Management	Network Coverage	Subscriber Base	Service Quality
Knowledge Management	Pearson	1	.284**	.348**	.323**
	Correlation Sig. (2-tailed)		.000	.000	.000
	N	357	357	357	357
Network Coverage	Pearson	.284**	1	.396**	.288**
	Correlation Sig. (2-tailed)	.000		.000	.000
	N	357	357	357	357
Subscriber Base	Pearson	.348**	.396**	1	.573**
	Correlation Sig. (2-tailed)	.000	.000		.000
	N	357	357	357	357
Service Quality	Pearson	.323**	.288**	.573**	1
	Correlation Sig. (2-tailed)	.000	.000	.000	
	N	357	357	357	357

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

Source: Author's Computation Using SPSS 20.0

The table 6b presents correlation results, indicating the relationships between knowledge management, network coverage, subscriber base, and service quality of (MNOs). The result shows that there is a positive and statistically significant correlation (R = 0.284, p < 0.01) between knowledge management and network coverage. This suggests that as knowledge management practices improve, there is a tendency for network coverage to also improve. There is a positive and



statistically significant correlation ( $R = 0.348$ ,  $p < 0.01$ ) between knowledge management and subscriber base. This indicates that as knowledge management practices improve, there is a tendency for the subscriber base to increase. There is a positive and statistically significant correlation ( $R = 0.323$ ,  $p < 0.01$ ) between knowledge management and service quality. This implies that as knowledge management practices improve, there is a tendency for service quality to also improve. There is a positive and statistically significant correlation ( $R = 0.396$ ,  $p < 0.01$ ) between network coverage and subscriber base. This suggests that as network coverage improves, there is a tendency for the subscriber base to increase. The results also show that there is a positive and statistically significant correlation ( $R = 0.288$ ,  $p < 0.01$ ) between network coverage and service quality. This indicates that as network coverage improves, there is a tendency for service quality to also improve. There is a positive and highly statistically significant correlation ( $R = 0.573$ ,  $p < 0.01$ ) between subscriber base and service quality. This implies that as the subscriber base increases, there is a strong tendency for service quality to improve.

## DISCUSSION OF FINDINGS

Finding revealed that knowledge application has a significant positive influence on customer satisfaction levels within the context of MNOs. This supports the study of Abubakar *et al.* (2017) which asserted that knowledge application leads to a superior level of performance. The profound influence of knowledge application on customer satisfaction levels emerges as a key determinant of success. The ability of MNOs to not only accumulate knowledge but also effectively apply it in addressing customer needs and concerns demonstrates the dynamic interplay between organizational strategies and customer experiences. MNOs that effectively apply their knowledge can tailor their products and services to meet the specific needs and preferences of individual customers. For example, understanding the usage patterns and preferences of different customer segments allows MNOs to design customized data plans, pricing models, and value-added services. This personalized approach creates a sense of relevance and value for customers, contributing to higher satisfaction levels. Finding revealed that information gathering and analysis have significant positive effects on the competitive advantage of MNOs. This aligns with the assertion of Bandari (2020) that accurate and relevant information can make a significant difference in staying ahead of the competition. The process of information gathering and analysis emerges as a linchpin for gaining a competitive advantage. Hlásny *et al.* (2021) also point out that information gathering and analysis is critically important to management. This finding demonstrates the pivotal role played by data-driven insights and strategic analysis in shaping the success and sustainability of MNOs operating in a region marked by diverse demographics and cultural intricacies. Understanding the preferences of different customer segments, the penetration of mobile devices, and the emergence of new technologies allows MNOs to make informed decisions about service offerings, marketing strategies, and network infrastructure investments. MNOs that invest in robust analytical tools and methodologies can extract valuable patterns, trends, and correlations from the collected information. This analytical prowess empowers MNOs to make strategic decisions that optimize resource allocation, enhance operational efficiency, and respond proactively to market dynamics.

Finding reveals a positive and statistically significant correlation between knowledge management and network coverage in the telecommunications sector. This correlation highlights the interdependence of effective knowledge management practices and the extent of network coverage, suggesting that a well-informed organizational approach positively impacts the geographical reach of services. Another significant finding unveils a positive and statistically significant correlation between knowledge management and the subscriber base of MNOs. This connection emphasizes that MNOs fostering robust knowledge management systems tend to attract and retain a larger subscriber base. The research demonstrates a positive and statistically significant correlation between knowledge management and service quality within MNOs. This connection elucidates that organizations prioritizing knowledge management practices tend to deliver higher service quality, indicating the integral role of informed decision-making in enhancing customer experiences. Finding indicates a positive and statistically significant correlation between network coverage and the subscriber base of MNOs. This finding suggests that the geographical extent of network coverage directly influences the size of the subscriber base, showcasing the importance of expansive and reliable network infrastructure. The study brings to light a positive and statistically significant correlation between network coverage and service quality in the realm of MNOs. This correlation demonstrates that an extensive network coverage positively contributes to the overall service quality offered by MNOs, emphasizing the critical role of infrastructure in delivering satisfactory services. Notably, finding reveals a positive and highly statistically significant correlation between the subscriber base and service quality within MNOs. This robust correlation implies that a larger subscriber base is intricately linked to higher service quality, showcasing the importance of scalable and efficient service delivery mechanisms in maintaining customer satisfaction.

## Conclusion

Managing knowledge is crucial for the performance of Mobile Network Operators in North Central Nigeria. It is clear from a number of service delivery aspects that knowledge application has a substantial beneficial effect on customer satisfaction in the context of MNOs. A customer-centric strategy is shaped by the actual application of knowledge, which can range from personalised products and effective problem resolution to technological innovation and cultural sensitivity. Customer satisfaction is the key differentiator in a competitive market; therefore, MNOs in North Central Nigeria that prioritise and acknowledge the active application of knowledge are not only better positioned to fulfil the changing requirements of their consumers but also thrive in it. The profoundly favourable effects of information collection and analysis on MNOs' competitive advantage in North Central Nigeria highlight the revolutionary potential of data-driven decision-making. Information collection and analysis is a process that is involved in every aspect of MNO operations, from risk reduction and strategic distinction to operational efficiency and culture adjustment. MNOs who acknowledge the strategic importance of information will not only survive in a cutthroat market but also establish themselves as leaders in a sector where wise decision-making is essential to long-term survival as the telecom landscape changes. This study highlights the critical roles of knowledge management, network coverage, subscriber base, and service quality while shedding light on a

broad web of interrelationships within the telecommunications industry. A symbiotic relationship that greatly affects the success of MNOs is indicated by the positive and statistically significant correlations that were found between these essential components. An informed organisational strategy is critical to expanding the geographic reach of services, as demonstrated by the association between network coverage and knowledge management. Analogously, the relationship between knowledge management and the subscriber base highlights the importance of strong knowledge systems for drawing in and keeping a wider customer base. Furthermore, the positive relationship that exists between information management and service quality highlights the crucial role that well-informed decision-making plays in improving customer experiences. Beyond this, however, the relationship between subscriber base and network coverage highlights how a large-scale infrastructure directly affects customer base size. Also, the relationship between service quality and network coverage highlights how important dependable infrastructure is to providing excellent services. The need for scalable and effective service delivery systems is further highlighted by the highly substantial connection found between the subscriber base and service quality. This correlation highlights the essential relationship between a larger customer base and improved service quality.

### Recommendations

Based on the findings of the study, the study makes the following recommendations that:

- i. Policy makers should prioritize the practical implementation of knowledge within their operations. They should formulate policy that empowers teams to apply knowledge in addressing customer needs, streamlining processes, and enhancing service offerings. Developing customer-centric solutions based on informed decision-making will not only positively impact customer satisfaction but also contribute to building long-term relationships and loyalty.
- ii. MNOs should invest in robust data analytics capabilities and strategic information management. They should leverage advanced analytics tools, adopt data-driven decision-making processes, and continually monitor market trends. Creating a dedicated team for data analysis and fostering a culture of data-driven decision-making will enable MNOs to extract actionable insights. By staying ahead of industry trends, understanding customer behaviors, and anticipating market shifts, MNOs can gain a sustainable competitive advantage, enhancing their agility and strategic positioning in the dynamic telecommunications landscape.
- iii. MNOs should integrate a holistic knowledge management strategy into their organizational framework. They should prioritize knowledge management initiatives that foster collaboration across departments, enhance technical capabilities, and facilitate the exchange of insights. A comprehensive knowledge management approach will not only positively impact network coverage, subscriber base, and service quality individually but also create a synergistic effect that strengthens the overall competitive position of the MNO. This integrated strategy will enable MNOs to leverage their knowledge assets effectively and enhance their performance across critical dimensions, contributing to sustained success in the telecommunications sector.

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