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DIGITAL INNOVATION AND SUPPLY CHAIN MANAGEMENT (A STUDY OF SHOPRITE ENUGU)

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ABSTRACT: *The convergence of technology and logistics has enabled businesses to streamline operations, reduce costs, and enhance efficiency. For companies in the retail sector, such as Shoprite, digital innovation has become a crucial factor in maintaining competitiveness, optimizing inventory management, improving customer satisfaction, and ensuring timely delivery. This study examined digital innovation and supply chain management in Shoprite, Enugu. The population of the study is made up of the technical staff of Shoprite, Enugu, Nigeria. The population size for the study is one thousand ninety-nine (1099). The sample size was determined to be two hundred and eighty-five (285) using Cochran sample size formula. The data was collected with the aid of a questionnaire that is properly drafted using the 5-point Likert scale for the questionnaire. Data collected from the questionnaire were analyzed, summarized, and interpreted accordingly with the aid of descriptive statistical techniques such as simple percentage. Based on the survey responses, the findings suggest a strong positive perception of digital technologies in enhancing various aspects of Shoprite's supply chain. It is therefore the recommendation of the study that Shoprite Enugu expand its use to cover more aspects of the supply chain, such as supplier performance analysis, real-time stock tracking, and dynamic pricing strategies.*

KEYWORDS: Data analytics, Digital technology, Internet of things, Machine learning, Technology.

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INTRODUCTION

In the modern global economy, digital innovation has revolutionized business operations across industries, and its role in transforming supply chain management (SCM) cannot be overstated. The convergence of technology and logistics has enabled businesses to streamline operations, reduce costs, and enhance efficiency. For companies in the retail sector, such as Shoprite, digital innovation has become a crucial factor in maintaining competitiveness, optimizing inventory management, improving customer satisfaction, and ensuring timely delivery (Felicetti, Corvello & Ammirato, 2024).

The retail sector, particularly supermarkets like Shoprite, relies heavily on an intricate supply chain that spans multiple stakeholders, including suppliers, distributors, transporters, and logistics providers. Effective SCM ensures that goods are procured, stored, and delivered in an efficient, cost-effective manner while meeting consumer demand. However, as businesses grow and the demands of the consumer market evolve, traditional supply chain processes face challenges such as inefficiencies, poor communication, and slow response times. These challenges are further exacerbated in emerging markets like Nigeria, where infrastructural constraints, fluctuating economic conditions, and supply chain disruptions are common (Kumar et al., 2023).

Digital technologies such as enterprise resource planning (ERP) systems, artificial intelligence (AI), machine learning (ML), blockchain, and the Internet of Things (IoT) have shown immense potential in addressing these challenges. These technologies enable real-time tracking, data-driven decision-making, predictive analytics, and enhanced transparency within supply chains. For instance, IoT can help track inventory levels in real time, while AI can forecast demand, ensuring better stock management. Blockchain technology can ensure transparency and traceability in transactions, which is particularly important in countries with complex regulatory environments (Vhatkar et al., 2024).

Shoprite, as one of the largest retail chains in Africa, operates in a competitive environment where supply chain optimization is essential for meeting customer expectations and maintaining profitability. With its expansion into Nigeria, Shoprite faces unique challenges, including dealing with unreliable infrastructure, fluctuating demand, and rising operational costs. Digital innovation has the potential to improve Shoprite's SCM processes by enabling faster and more accurate procurement, delivery, and inventory management, which can significantly enhance customer experience and business performance (Cambaza, 2024).

Despite the benefits, the implementation of digital technologies in supply chain management in Nigeria is not without its challenges. Issues such as high initial costs, technological infrastructure deficits, and resistance to change within organizations can hinder the adoption of digital tools. Additionally, the varying levels of digital literacy among supply chain stakeholders may pose further barriers. Therefore, understanding how digital innovation can be effectively integrated into the supply chain management practices of a major retailer like Shoprite in Enugu, Nigeria, which is critical for both academic research and practical implementation (Hugos, 2024).

This study explored the impact of digital innovation on the supply chain management practices of Shoprite in Enugu, Nigeria. It examined how the integration of digital technologies can address operational challenges, enhance supply chain efficiency, and contribute to the overall business success of Shoprite. The research also investigated the barriers to the adoption of

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digital tools and offered recommendations for overcoming these obstacles, providing valuable insights for both the retail sector and policymakers interested in fostering digital transformation in Nigeria's supply chain landscape.

LITERATURE

Conceptual Literature

Digital Innovation/Transformation

Innovation is a fundamental part of progress and economic growth – any firm that seeks to maintain profits must innovate (Smith, 2019). In his works, Schumpeter described innovation as a fundamental driver of competitiveness and creative destruction that profoundly changes societal structures that incessantly destroys the old one, and incessantly creates a new one (Smith, 2019). His ideas were rediscovered with the growth of knowledge economies and became even more relevant in the wake of The Great Recession of the late 2000s (Śledzik, 2017). Since so much of the contemporary economy is intangible and globalized, the traditional barriers for competition (e.g., regulatory or geographical) are eroding, giving way to fierce global competition. As a result, firms are increasingly forced to seek new ways of innovation.

The phenomenon of digital innovation has captured the attention of scholars and practitioners alike (e.g., Holmstrom et al., 2021) across multiple disciplines such as economics, strategy, and marketing (e.g., Autio et al., 2018; Beltagui et al., 2020; Konya-Baumbach et al., 2019). The ubiquity of digital technology has not only changed the way we strategize and organize to create innovation (Bharadwaj et al., 2013; Lyytinen et al., 2016), but carrying out "new combinations of digital and physical components to produce novel products" (Yoo et al., 2010: 725) has changed the nature of innovation itself (Nambisan et al., 2020).

Digital innovation offers new opportunities for companies to increase the value created for their clients through novel products and services (Yoo et al., 2010; Åström et al., 2022), generating new business models (Richter et al., 2015) and enhancing their long-term success (Nylén & Holmström, 2015; Soluk & Kammerlander, 2021). Entrepreneurial firms can use digital search to identify new opportunities for innovation and how this can impact their performance (Ardito & Capolupo, 2023). Innovation can help entrepreneurial firms create shared value, driving sustainable growth and achieving long-term success (Rubio-Andrés et al., 2022). However, entrepreneurs face challenges in identifying potential opportunities and pursuing them effectively due to limitations in knowledge, resources, and networks. These barriers need to be addressed for entrepreneurship to drive digital innovation in firms (Khanin et al., 2022). The fields of entrepreneurship and digital innovation involve the combination of digital technologies with traditional entrepreneurship and innovation practices and results. Digital entrepreneurship can be considered as a subcategory of entrepreneurship, involving the digitization of some or all aspects of a traditional organization (Hull, et al., 2017). The advent of new digital technologies has fundamentally modified the nature of the entrepreneurial process and its resulting outcomes, prompting significant questions at the intersection of digital technologies and entrepreneurship (Nambisan, 2017). Scholars suggest that digital technologies break down traditional barriers and change the way entrepreneurship and innovation processes and outcomes occur, making current theories potentially outdated and

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leading to the need for investigation of these intersections as new phenomena (Berger et al., 2021).

Supply Chain Management

The management of resources, information, and financial flows in a network made up of suppliers, manufacturers, distributors, and customers is the focus of supply chain management. In order to deliver goods to clients, a wider network of external companies—including vendors, shipping companies, call centres, warehouse operators, and others (The Hofmann, 2022). Supply chain management's primary goal is to link all supply chains so they cooperate to maximize productivity, create value, cut costs, and raise customer happiness, all of which increase an organization's competitiveness (Amos, 2018). As per the Council of Supply Chain Management Professionals (CSCMP, 2018), supply chain management (SCM) encompasses two main functions: organizing, coordinating, and managing the main activities that generate and provide value for the final consumer (such as manufacturing, procurement, and logistics); and integrating and coordinating related business processes both within and between organizations. The coordination of procedures and systems to facilitate the alignment of material, financial, and information flows along the SC is the "technical" implementation of these flows, whereas integration refers to the administrative and organizational issues of creating a network of primarily autonomous enterprises (Salviotti, 2018).

According to Wiley (2012), the ability of businesses, whether they be public, private, or military, to effectively control the flow of resources—including money, information, and materials—into, out of, and into their organizations is essential to their success. We call this kind of flow a supply chain management or distribution. We commonly observe issues with the operation of the supply chains because they may be lengthy, complex, and involve a variety of different business partners. These issues could cause hold-ups, unhappy customers, missed revenue, and expensive repair costs once the issues arise. Product distribution or supply to customers in the marketplace is necessary when production and pricing are completed. Distributing and supplying goods are what all organizations do. Because it supplies the commodities and services that consumers want, the distribution function is essential to the economic health of society. Time, place, and ownership are common ways that economists define the value of distribution. By delivering the goods to the customer at the ideal time and location and by offering a means of ownership transfer, the marketer adds value to the product. Businesses that struggle to efficiently carry out the distribution role typically collapse. There are job chances through distribution as well. In distribution, there are salespeople, warehouse managers, truck drivers, stevedores, and forklift operators.

Supply chain management is a network of facilities that produce raw materials, transform them into intermediate goods and then final products, and deliver the products to customers through a distribution system. It spans procurement, manufacturing and distribution (Lee & Billington, 2015), since the basic objective of supply chain management is to “optimize performance of the chain to add as much value as possible for the least cost possible”. In other words, it aims to link all the supply chain agents to jointly cooperate within the firm as a way to maximize productivity in the supply chain and deliver the most benefits to all related parties (Finch, 2016). Adoption of supply chain management practices in industries has steadily increased since the 1980s. A number of definitions are proposed and the concept is discussed from many perspectives. However, Cousins et al. (2016), Sachan and Datta (2005), and Storey et al. (2006) provided an excellent review on supply chain management literature. These papers define the

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concept, principals, nature, and development of SCM and indicate that there is intense research being conducted around the world in this field that critically assessed developments in the theory and practice of supply management.

Theoretical Review

This study is anchored on three theories namely; resource-based view, stakeholder theory and institutional theory.

Resource-Based View (RBV)

The resource-based view (RBV) of the firm indicates that firm behavior may be interpreted as a look for competitive gain. Within the competitive market structure parties in the supply chain seek to have an impact on over the elements of production, those can offer them with an aggressive facet over their closest competitors (Ahuja, 2000). In strategic management literature, the RBV of the firm plays a dominating role (Halawi et al., 2005). Mitra et al. (2017) state that the implementation of a value creating method via a company affords a competitive benefit when its current or capacity competition simultaneously does not put into effect a value creating strategy. This aggressive gain may be sustained as the popularity of a degree of overall performance is no longer simultaneously imitated with the useful resource of the by way of any current or feasible competition (Bromiley & Rau, 2016).

Stakeholder Theory (ST)

The stakeholder management rationale for supply chain formation envisions firms in the center of an association of stakeholders. A firm's stakeholders are any group of those who can have an effect on or are laid low with the firm (Freeman, 1994), along with its investors, suppliers, employees, customers, competitors, neighborhood groups wherein it operates, regulatory agencies, and so forth (Touboulic & Walker, 2015). In this context, Jensen and Meckling (1976) consult with a firm as a "nexus of contracts" among itself and its stakeholders. Those contracts are each formal written documents and casual agreements primarily based on expectancies (Jones, 1995). Top managers are the primary contracting marketers for the company because they agree with stakeholders, either without delay or not directly, and because of their relative positions with regard to the control of organizational resources. Stakeholders are treasured in that they help a firm reap its objectives (Freeman, 1984).

Institutional Theory (IT)

Institutional theory suggests that institutional environments impose pressures on corporations to seem valid and comply with prevailing social norms. Making use of this idea in an enterprise context, institutional pressures presumably motivate companies to pursue goals on the way to growth their legitimacy and cause them to appear to be in agreement with the prevailing guidelines, requirements, and norms of their business environments (Oliver, 1990; Touboulic & Walker, 2015). One way that corporations can do this is through participation in supply chain relationships. For example, a small firm can increase its visibility, reputation, image, and prestige via partnerships with larger, higher mounted businesses. In practice, the payoff for this sort of strategy may be very significant.

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Empirical Review

In this section of the study, past and related studies carried out on the concept under investigation was reviewed.

Liu and Chui (2022) investigated the relationships between digitization, supply chain integration, and firm performance. Data are analyzed by the partial least square structural equation modeling (PLS-SEM). The results revealed that both digitization in the supply chain and supply chain external integration positively affected company performance. Further, supply chain external integration partially mediated the relationship between supply chain digitization and firm performance. In addition, it was found that financial performance is enhanced through different paths for large enterprises and SMEs. Large enterprises improve financial performance through supply chain integration after efforts spent on the digitization of their supply chain, while SMEs improve financial performance directly through supply chain digitization. These findings provide insights for managers and policymakers of large enterprises and SMEs in formulating appropriate implementation strategies for digital transformation.

Wang and Kuzmin (2022) conducted a systematic literature review to analyze how digital technologies, particularly the Internet of Things (IoT) and Artificial Intelligence (AI), impact supply chain efficiency in the Manufacturing Industry. The study also identifies some challenges of digital supply chain (DSC) implementation. Analysis of this study is based on a systematic literature review of 59 studies that were selected using a combination of relevant keywords and specified inclusion and exclusion criteria. The results show that both IoT and AI are the closest technologies related to the autonomy and predictive power of future supply chain expectations. The convergence of the two technologies optimizes all aspects of manufacturing and opens up more possibilities for smart factories. This research also explored DSC challenges and problems that take into consideration to expand the approaches to DSC success factors derived from existing literature. Many papers have discussed DSC technology from the perspective of the ap-plication. They demonstrate the positive impact of those digital technologies to successfully achieve digital and intelligent supply chains on firm performance by improving the efficiency of SCM.

Ikegwuru and Elvis (2023) carried out a study on supply chain digitization and sustainable competitiveness of listed oil and gas firms in Nigeria. The population of the study comprises eleven (11) oil and gas companies which are quoted on the Nigerian Stock Exchange. The sample size is also 11 listed oil and gas companies, since it is less than 30. The simple random sampling technique was adopted for the study, and the number of participants was three hundred and thirty (330) management staff, on a sample frame of thirty (30) respondents per firm. The primary data collected for the study consists of information obtained from original materials such as questionnaires. A 5-point likert-scale questionnaire was administered to 330 respondents. Of the 330 copies of questionnaire that were distributed to the respondents, 270 copies were returned, yielding a response rate of 82 percent. Besides, of the 270 copies of the questionnaire returned, the usable copies numbered 202 leading to a response rate of 75%. The simple regression technique was used to test the stated hypothesis. The results revealed that supply chain digitization has a strong, positive, and significant influence on productivity. The study therefore concludes that, supply chain digitization significantly influences sustainable competitiveness of listed oil and gas firms in Nigeria, and recommends that, management of

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listed oil and gas firms in Nigeria should implement adequate supply chain digitization programs to connect with sustainable competitiveness through productivity in their businesses.

Ikegwuru and Nwokah (2022) examined the influence of digital supply chain implementation on supply chain collaboration in oil and gas companies in Rivers State using a population of 295 oil and gas companies in Rivers State, and deriving sample size of 169 oil and gas companies through the Krejcie and Morgan's formula. The study adopted the simple random sampling technique to draw two (2) management staff from each of the 169 companies studied, to attain 338 management staff as respondents. 338 copies of the structured questionnaire were distributed to the respondents, of which 246 (88%) of the questionnaire were appropriately filled and afterward used for analysis. The simple regression method was used to test the hypothesis at 0.05 level of significance and it was discovered that digital supply chain implementation moderately, positively and significantly influences supply chain collaboration. The study therefore concludes that digital supply chain implementation significantly influences supply chain collaboration of oil and gas companies in Rivers State, and recommends that, the management of oil and gas companies should examine the value creation capacity in their existing supply chain by a thorough review process that will detect digital supply chain advantages on presently perceived ways to boost supply chain collaboration and best practices in their industry. Further, the oil and gas companies should consider adopting DSC in their occupational practices to remain reliable in the competitive market by providing good supply chain collaboration and best business practices simultaneously.

Lee et al. (2022) studied the effect of digital supply chain on the supply chain and organization performance and as well assesses the mediating effect of supply chain performance in the relationship between digital supply chain and the organizational performance in the Malaysia manufacturing industry using a quantitative research design. Data was composed by means of an emailed online survey questionnaire to 1160 manufacturing companies listed in the Federation of Malaysian Manufacturers (FMM) directory, and using stratified sampling technique attained 56 (5.43%) valuable responses for data analysis. Data was analyzed with the Partial Least Square Structural Equation Modeling (PLS-SEM), and all hypotheses were supported. The study concludes that manufacturing companies in Malaysia can contemplate adopting digital supply chain in the business procedure to stay dependable in the competitive market by making accessible good supply chain performance and most outstanding organizational performance in entirety.

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METHODOLOGY

Research Design

Research design is a plan and structure that guides the investigator in the process of data collection, analysis and interpretation. It is a logical model or proof that permits the researcher to draw inferences concerning causal relationship among variables being investigated (Njoku, 2014). The study adopted a descriptive survey design. The method ensured that the researcher collects his data at a particular period from the selected sample to describe a large population at that particular point in time. The method was employed because it enabled the researcher to use the sample drawn to represent the diverse elements of the population under study.

Area of the Study

The area of study for this research is Enugu metropolis. Enugu metropolis is located in the South-Eastern geopolitical zone of Nigeria. It is situated between latitudes 6°27N and 7°28N and longitudes 7°30E and 8 0 19E (Fig. 1). The area is roughly 72.8 square kilometers with the rural environs covering an additional area of about 200m^2. Enugu metropolis comprises three Local Government Areas, namely: Enugu North, Enugu East and Enugu South. This case study for the study is Shoprite Enugu.

Population of the Study

The target population of this study consists of the staff of the Shoprite in Enugu state. Table 1. Below is a display of the total population distribution of the study.

Table 1: Population of Shoprite Staff

Organization	Staff Size
Shoprite	1099
Grand Total	**1099**

Source: *Firms' Human Resource Department, 2024.*

Sample Size Determination

For this research, the sample size was derived using Cochran sample size formula. This is given as:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} \qquad \text{.................................... (3.1)}$$

Where:

n_o = Representative sample for proportions

n = Sample Size

N = Population Size

e = Allowable sampling error taken at 5% = 0.05

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p = Proportion of success in the population from pilot survey = 0.50

q = proportion of failure in the population from pilot survey = 0.50

However:

$$n_0 = \frac{Z^2 pq}{e^2} \quad \text{..... (3.2)}$$

Where; Z^2 is the abscissa of the normal curve (1.96), q is 1-p and e is the allowable sample error (0.05). Substituting these values into equation 3.2, we have:

$$n_0 = \frac{Z^2 pq}{e^2} = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2} = 385 \quad \text{..... (3.3)}$$

Substituting n_o = 385 from equation 3.3 into equation 3.1, we have:

$$n = \frac{385}{1 + \frac{(385-1)}{1099}}$$

$$n = \frac{385}{1 + 0.3494085532}$$

$$n = \frac{385}{1.3494085532} = 285$$

Having applied the Cochran sample size derivation statistic, the value derived was two hundred and eighty-five (285).

Sampling Technique

The researcher in the course of conducting this study used the simple random sampling techniques. Simple random sampling was used as the sampling technique for the reason that the method ensures equal chance of selection among the respondents but also, the method avoids and minimizes bias hence enhances validity and reliability.

Instrument for Data Collection

For the purpose of this study, primary data was employed. The data was collected with the aid of a questionnaire that is properly drafted using the 5-point Likert scale for the questionnaire. The questionnaire was adopted because it has the following advantages, such as it allows for large number of information to be collected from a large number of people in a short time period, the results of the questionnaire can be quickly and easily quantified by the researcher, it can be analyzed scientifically and when the data has been quantified, it can be used to compare and contrast other researches.

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Method of Data Analysis

Data collected from the questionnaire were analyzed, summarized, and interpreted accordingly with the aid of descriptive statistical techniques such as simple percentage and regression analysis were used to measure the impact/effect of the independent variables on the dependent variables.

RESULTS AND DISCUSSION

Questionnaire Return Rate

In the course of the study, questionnaires were distributed to the technical staff of Shoprite and given the uncertainties because of survey studies, not all questionnaires distributed were returned and properly filled. Two hundred and eighty-five (285) copies of the questionnaire were distributed and two hundred and seventy-four (274) were returned.

Analysis of Research Questions

Table 2: Data Analytics on Supply Chain Management in Shoprite in Enugu, Nigeria

Question	SA	A	N	D	SD
Data analytics has improved the accuracy of demand forecasting in Shoprite Enugu's supply chain operations.	61%	32%	-	4%	3%
The use of data analytics has enhanced inventory management and stock replenishment at Shoprite Enugu.	58%	29%	5%	3%	5%
Data analytics has enabled better decision-making for procurement and supplier selection at Shoprite Enugu.	71%	18%	3%	4%	4%

Source: *Field Survey, 2024*

Interpretation and Analysis

Table 2 presents responses to the role of data analytics in supply chain management at Shoprite Enugu, Nigeria, based on a survey conducted in 2024. The findings offer a positive outlook on the impact of data analytics in improving various aspects of the supply chain.

Firstly, a significant 93% of respondents, comprising 61% who strongly agree and 32% who agree, believe that data analytics has improved the accuracy of demand forecasting in Shoprite Enugu's supply chain operations. This indicates that the application of data analytics in forecasting customer demand has been highly effective, enabling Shoprite to better predict needs, manage inventory efficiently, and minimize stock-related issues such as overstocking or stockouts. Only 7% of respondents disagreed, with 4% indicating disagreement and 3% strongly disagreeing.

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In terms of inventory management and stock replenishment, 87% of respondents, including 58% who strongly agree and 29% who agree, also view data analytics positively. These responses suggest that data analytics plays a crucial role in optimizing inventory levels and ensuring timely restocking of products. The low percentage of disagreement (8%) reflects the general consensus that the integration of data analytics in these areas has led to more efficient operations and better product availability at Shoprite Enugu.

Moreover, when evaluating the role of data analytics in procurement and supplier selection, 89% of respondents, including 71% who strongly agree and 18% who agree, affirm that data analytics has enhanced decision-making in these areas. This underscores the effectiveness of data-driven approaches in selecting the right suppliers, improving procurement strategies, and optimizing overall supply chain performance. Only 8% of respondents expressed disagreement, with 4% disagreeing and 4% strongly disagreeing, which suggests that while most respondents are satisfied, a small number may not fully perceive the benefits of data analytics in these areas.

Overall, the findings from the survey indicate that data analytics is having a significantly positive impact on the supply chain management practices at Shoprite Enugu. The overwhelming majority of respondents agree that data analytics improves demand forecasting, inventory management, and procurement decision-making. This reflects the company's successful integration of data-driven technologies to enhance operational efficiency, reduce costs, and ensure a smoother, more responsive supply chain system

Table 3: Machine Learning on Supply Chain Management in Shoprite in Enugu, Nigeria

Question	SA	A	N	D	SD
Machine learning has helped Shoprite Enugu optimize delivery routes and reduce transportation costs.	73%	18%	2%	3%	4%
The application of machine learning models has improved the efficiency of supply chain forecasting at Shoprite Enugu.	65%	21%	-	9%	5%
Machine learning has contributed to the automation of routine supply chain tasks, increasing productivity at Shoprite Enugu.	56%	41%	-	3%	-

Source: ***Field Survey, 2024***

Interpretation and Analysis: Table 3 presents responses regarding the role of machine learning in supply chain management at Shoprite Enugu, Nigeria. The findings show a generally positive view of how machine learning is contributing to the optimization of supply chain processes.

Firstly, a substantial 91% of respondents, including 73% who strongly agree and 18% who agree, believe that machine learning has helped optimize delivery routes and reduce transportation costs at Shoprite Enugu. Only 7% of respondents expressed some level of disagreement, with 3% disagreeing and 4% strongly disagreeing. These results suggest that machine learning is significantly enhancing the efficiency of logistics operations, leading to cost savings and more streamlined transportation routes.

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In terms of improving supply chain forecasting, 86% of respondents, comprising 65% who strongly agree and 21% who agree, reported that machine learning models have increased the efficiency of forecasting at Shoprite Enugu. This indicates that machine learning has contributed to more accurate predictions of supply chain demands, helping to optimize inventory levels and improve overall supply chain management. However, 14% of respondents expressed disagreement, with 9% disagreeing and 5% strongly disagreeing, suggesting that some may not fully recognize or experience the benefits of machine learning in this area.

Regarding the automation of routine supply chain tasks, 97% of respondents, including 56% who strongly agree and 41% who agree, view machine learning as having a positive impact. The large proportion of positive responses indicates that machine learning has played a significant role in automating tasks, which has likely led to increased productivity and reduced human error in supply chain operations. No respondents strongly disagreed, and only 3% disagreed, further reinforcing the positive impact of machine learning in automating supply chain processes.

Overall, the results from the survey indicate that machine learning is perceived to be a key factor in enhancing the efficiency of Shoprite Enugu's supply chain management. The vast majority of respondents agree that machine learning optimizes delivery routes, improves forecasting, and automates routine tasks, contributing to reduced costs and increased productivity within the supply chain. These findings highlight the valuable role of machine learning in transforming and improving operational practices in retail supply chains.

Table 4: Internet of Things (IoT) on Supply Chain Management in Shoprite in Enugu, Nigeria

Question	SA	A	N	D	SD
IoT-enabled tracking systems have improved the visibility of products across Shoprite Enugu's supply chain.	61%	32%	-	4%	3%
The use of IoT devices has reduced supply chain disruptions by providing real-time data on stock levels and shipments at Shoprite Enugu.	58%	29%	5%	3%	5%
IoT has facilitated proactive maintenance of equipment and machinery within Shoprite Enugu's supply chain system.	71%	18%	3%	4%	4%

Source: *Field Survey, 2024*

Interpretation and Analysis: The table presents responses regarding the role of the Internet of Things (IoT) in supply chain management at Shoprite Enugu, Nigeria. The findings suggest a generally positive perception of how IoT contributes to enhancing visibility, reducing disruptions, and facilitating maintenance within the supply chain.

Firstly, 93% of respondents, including 61% who strongly agree and 32% who agree, believe that IoT-enabled tracking systems have improved the visibility of products across Shoprite Enugu's supply chain. This suggests that IoT technology has significantly enhanced the monitoring of product movement, allowing for better tracking and management of inventory. Only 7% of respondents expressed disagreement, with 4% disagreeing and 3% strongly

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disagreeing, indicating that the majority view IoT as an effective tool for increasing supply chain transparency.

In terms of reducing supply chain disruptions, 87% of respondents, including 58% who strongly agree and 29% who agree, believe that the use of IoT devices has helped by providing real-time data on stock levels and shipments at Shoprite Enugu. The positive response indicates that IoT has played a critical role in preventing or minimizing disruptions by ensuring that accurate, real-time information is available, which is crucial for effective decision-making and response actions. However, 13% of respondents disagreed, with 3% disagreeing and 5% strongly disagreeing, suggesting that some may not fully perceive the effectiveness of IoT in reducing disruptions.

Regarding the proactive maintenance of equipment and machinery, 89% of respondents, including 71% who strongly agree and 18% who agree, reported that IoT has facilitated this process within Shoprite Enugu's supply chain. This indicates that IoT is seen as an important tool in maintaining operational efficiency by enabling early detection of potential issues and minimizing equipment downtime. Only 8% of respondents disagreed, with 4% disagreeing and 4% strongly disagreeing, further emphasizing that the majority recognize ITs positive impact on maintenance practices.

SUMMARY, CONCLUSION, AND RECOMMENDATION

The study on digital innovation in supply chain management at Shoprite Enugu focused on the role of data analytics, machine learning, and the Internet of Things (IoT) in improving operational efficiencies. Based on the survey responses, the findings suggest a strong positive perception of these digital technologies in enhancing various aspects of Shoprite's supply chain.

Data Analytics: The majority of respondents (93%) believe that data analytics has significantly improved demand forecasting and inventory management at Shoprite Enugu. Furthermore, 89% of respondents agree that data analytics has positively impacted decision-making in procurement and supplier selection. These findings indicate that data analytics plays a critical role in enhancing accuracy, optimizing stock levels, and improving procurement strategies.

Machine Learning: Respondents overwhelmingly recognize the role of machine learning in optimizing delivery routes (91%) and improving supply chain forecasting (86%). Additionally, 97% of respondents see machine learning as contributing to the automation of routine tasks, boosting productivity. This highlights how machine learning supports more efficient logistics and forecasting, as well as streamlining supply chain operations.

Internet of Things (IoT): IoT has been perceived as a key technology in improving product visibility (93%) and reducing supply chain disruptions by providing real-time data on stock levels and shipments (87%). Furthermore, 89% of respondents believe IoT facilitates proactive maintenance of equipment and machinery, which enhances overall operational efficiency. These findings demonstrate the positive impact of IoT on transparency, real-time data monitoring, and maintenance management in Shoprite's supply chain.

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CONCLUSION

The findings from this study underscore the significant impact of digital innovations—specifically data analytics, machine learning, and IoT—on the supply chain management of Shoprite Enugu. These technologies have been perceived as highly effective in improving demand forecasting, inventory management, decision-making in procurement, delivery route optimization, supply chain forecasting, and automating routine tasks. Additionally, IoT has enhanced product visibility, reduced disruptions, and facilitated proactive maintenance of equipment. Overall, the study shows that Shoprite Enugu is successfully integrating digital technologies into its supply chain operations, leading to greater efficiency, reduced costs, and more effective decision-making. The positive responses from survey participants highlight the value of these innovations in transforming and optimizing supply chain processes, positioning Shoprite Enugu as a forward-thinking leader in the retail sector in Nigeria.

RECOMMENDATIONS

i. Given the positive impact of data analytics on demand forecasting, inventory management, and procurement decision-making, it is recommended that Shoprite Enugu further invest in advanced data analytics tools. By incorporating predictive analytics and more sophisticated machine learning algorithms, Shoprite can enhance the precision of its demand forecasting, optimize inventory levels even further, and improve the efficiency of procurement strategies. This could lead to more accurate stock replenishment, cost savings, and reduced waste.

ii. The study found that machine learning has been effective in optimizing delivery routes, improving forecasting, and automating routine tasks. To further leverage machine learning, it is recommended that Shoprite Enugu expand its use to cover more aspects of the supply chain, such as supplier performance analysis, real-time stock tracking, and dynamic pricing strategies. By continuously improving machine learning models and integrating them into all stages of the supply chain, Shoprite can further increase operational efficiency and respond more effectively to market demands.

iii. The findings indicate that IoT has significantly improved product visibility, reduced supply chain disruptions, and facilitated proactive maintenance of equipment. To build on this success, Shoprite Enugu should invest in expanding its IoT infrastructure, incorporating more IoT-enabled devices and sensors across the entire supply chain, from warehousing to transportation. Enhanced real-time monitoring and predictive maintenance capabilities can reduce equipment downtime, improve supply chain responsiveness, and ensure smoother operations. By further integrating IoT into its processes, Shoprite can gain a more comprehensive understanding of its supply chain, leading to more informed decision-making and increased operational resilience.

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