

# Technological Innovations, Entrepreneurial Innovativeness, and Supply Chain Management of Some Selected Smes in Lagos State. Nigeria

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**Abstract-** The emergence of COVID-19 and other global challenges have compelled Small Medium and Enterprises (SMEs') globally to be technologically inclined in all their operations, supply chain inclusive, to enhance their development and competitive edge. Thus, the study examined the impact of technological innovation and supply chain management on selected SMEs in Lagos State. The objectives were to determine the relationship between technological innovation variables (i.e. marketing innovation, transportation technology, and information technology) and supply chain efficiency of SMSs in Lagos State and determine to what extent entrepreneurial innovativeness moderates the effect of technological innovations on supply chain efficiency. The sample size was 30 carefully selected SMEs in the manufacturing sector, representing 10 SMEs each from the three senatorial zones in Lagos State., Out of 150 questionnaires distributed, only one hundred and twenty-three (123) respondents duly completed their instruments, while PPMCC was used to analyse the hypotheses. The study revealed that technological innovations as measured by marketing, transportation, and information technology have a significant relationship with supply chain efficiency as measured by inventory turnover and transportation costs. It also revealed that entrepreneurial innovativeness significantly moderates the relationship between technological innovations and the supply chain efficiency of SMEs. The study concluded that technological innovations are critical to supply chain efficiency. Hence, the study recommended that SMEs adopt all necessary innovations to further improve their supply chain management and invest in robust technological innovation to enhance the supply chain capacity.

**Keywords-** Entrepreneurial Innovativeness, Increase Efficiency Market Innovations Supply Chain Efficiency, Technological innovations.

## I. INTRODUCTION

The dynamic nature of the business environment allows for frequent changes in business phenomena which come and go from time to time. The business world either in developed or developing nations irrespective of the size is not immune to any of these business phenomena or challenges that could positively or negatively impact it (Adewoye, Salau, & Adesokan, 2023). Business enterprises as the most powerful economic force to mankind are confronted with some challenges that have the potential to make it relevant or otherwise, such challenges include lack of finance, economic problems, lack of skilled labor, lack of technological innovations, marketing problems, and others. Without any iota of doubt, the absence of technological innovation is one of such phenomena that impede the growth of business globally. According to Adewoye, et al., (2023), rigorous pursuit or adoption of technological innovation by SMEs remains one of those strategies that can sustain it to meet up with the desired growth and further advance its cause into the international business arena. Therefore, rigorous pursuit or adoption of technological innovation by SMEs in its operations, and supply chain inclusive remains one of those strategies that can sustain it to meet the desired growth and further advance its cause into the international business arena.

The rapid growth in the business world has made technological innovations an indispensable tool for improving supply chain efficiency. From artificial intelligence (AI) and automation to cloud computing and the Internet of Things (IoT), businesses are constantly exploring new technologies to streamline their operations and stay competitive in the market. While technology offers tremendous potential to improve supply chain efficiency, transparency, and cost reduction, it also has its potential drawbacks such as loss of privacy, yet unspecified regulations, and loss of jobs (Druehl, Carrillo & Hsuan, 2017). Supply chain efficiency, which is viewed as a company's ability to use resources, technology, and expertise to minimize logistics costs and maximize profits, has

gone a long way to improve business operations and performance.

Moreover, in modern business operations, supply chain efficiency is a critical factor in meeting consumers' demands at the right time and the right place, it further enhances customer satisfaction, cost-effectiveness, and overall competitiveness. Efficient supply chains are the lifeblood of businesses, encompassing the smooth flow of materials, information, and services from suppliers to end customers. According to Christopher (2016), supply chain efficiency directly influences a company's bottom line, affecting costs, lead times, and overall responsiveness to customer demands. Achieving efficiency in supply chains enables companies to maximize their competitiveness by offering products at competitive prices and delivering them in a timely and dependable manner. Ensuring the efficiency of a company's activities in today's highly competitive global markets is characterized by the need to organize a marketing and logistics system amenably with the latest technology conditions and trends supporting strategic business goals and objectives (I-Ababneh, et al., 2023).

With the dynamics and competitive nature of the market environment coupled with the complex process of product development of product, it is important to understand that the information and knowledge needed to deliver value to the customers must be a real-time process that allows for immediate updates and actions. The sharing of information among supply chain networks allows the supply chain drivers to work together with the goal of integrated and coordinated supply chains for effective supply chain efficient. Transportation technology which are refers to as the technological techniques, for moving humans, and products from one destination to another, is essential for ensuring the efficient flow of goods and services across the supply chain, thereby enables businesses to meet customer demand at minimal cost. The COVID-19 pandemic has helped to improve the transportation technology system, because of the injection of new technologies. Such as AGVs (Automated Guided

Vehicles), Pick-by-vision systems, and other robotic transportation modes.

The constant rise in customer expectations and competitive pressures, combined with the increasing complexity and global nature of modern supply chains, have made it challenging for organizations to achieve and maintain optimal supply chain efficiency. Despite advancements in technology and process innovations, many companies are still confronted with inefficient supply chain operations, resulting in high logistics costs, long lead times, Low inventory turnover, and others, which hinder business growth, erode customer satisfaction, and negatively impact the environment.

Therefore, it is essential to investigate the impact of technological innovations on supply chain efficiency. However, while significant attention has been directed toward understanding the direct impact of technological innovation on firms' supply chain efficiency, there exists a notable gap in acknowledging and exploring the potential moderating effect of entrepreneurial innovativeness on this relationship. The current body of literature tends to overlook the nuanced influence that entrepreneurial innovativeness initiatives may exert in enhancing the connection between technological innovation on firms' supply chain efficiency. By this, it is also essential to investigate the moderating role of entrepreneurial innovativeness on the relationship between technological innovation and supply chain efficiency.

### **Objectives of the Study**

The objectives were

- To determine the relationship between technological innovation variables (i.e. marketing innovation, transportation technology, and information technology) and supply chain efficiency of SMEs in Lagos State and
- Determine to what extent entrepreneurial innovativeness moderates the effect of technological innovation on the supply chain efficiency of SMEs in Lagos state

## **II. LITERATURE REVIEW**

### **1. Technological Innovation**

In the present globally competitive environment, firms' survival is closely related to their ability to either develop or adopt innovations that are in alignment with the client's needs and to achieve and maintain optimal supply chain efficiency. According to Afuah (2020), innovation is the application of modern technological, organizational information and skills in providing new products and services to clients. So also, thus Wibawa, Widjanarko, Utomo, Suratna & Wahyurini (2020) state that innovation is defined as the development of a new or improved product, process, or service for businesses. Innovation has remained the foundation upon which entrepreneurship is formed because of its comparative advantages and its contributions to the growth and promotion of SMEs and business generally (Salau, 2022a). According to Azubuike (2013), technological innovation is a concept developed within the scientific field of innovation studies, which explains the nature and rate of technological change. Therefore, technological innovation is an important source of growth and a key determinant of competitive advantage for many organizations (Adewoye, et al., 2023).

The omnipresent nature of technological innovation makes it applicable in many stages of business operations, supply chain inclusive. Innovation in the supply chain refers to the introduction of new ideas, technologies, and practices that revolutionize traditional processes of goods and services distribution. Embracing innovation in the supply chain offers several benefits, including enhanced operational efficiency, improved customer satisfaction, reduced costs, and increased competitiveness (Okwuball, Olannaye, Okpighe, & Negbe, 2023), it also enables businesses to adapt to changing market demands, and improve collaboration with suppliers and partners, and achieve sustainable growth. Implementing technological innovation requires significant investments in technology, infrastructure, and training for effective supply chain efficiency. It is crystal clear that technological innovation has

become a key driver of competitive advantage in today's evolving business landscape, it further plays a pivotal role in enhancing supply chain efficiency.

## **2. Marketing Innovation**

Today's business development is fast and needs to be followed up quickly to adapt to recent occurrences, marketing innovation is vital and has become the current concern of all businesses in following up the trend in business. For every business to expand its sales growth, assets, profit, and market size sales improvement is important. Marketing innovation is key to expanding firms' sales growth. Some strategies such as marketing innovations, promotional strategies, distributional strategies, product quality, supply chain, and others are devised to attract and retain customers to improve sales and remain on a profitable path. Driessen, Hillebrand, & Molner, (2021) broadly define market innovation as purposive actions by market stakeholders that result in a distinctively new or altered form of the market. Marketing innovation is the generation and implementation of new ideas for creating, communicating, and delivering value to customers and managing customer relationships (Tinoco 2005). However, marketing innovation plays a critical role in a firm's total performance as marketing is key to value generation (Bartoloni and Baussola, (2016). Dobbs and Hamilton (2007) also opined that it is only through continuous product innovation that SMEs can increase their competitive advantages and cope with market opposition. According to Salau, (2022b) firms need to embark on intensive marketing innovation to increase their turnover and enjoy the efficiency of the supply chain.

## **3. Transportation Technology**

Transportation has been a crucial aspect of human civilization by facilitating the movement of people, goods, and services from one point to another. It has over time evolved significantly transforming the way we transport man, goods, and services. from manufacturers to consumers. Transportation is the physical movement of goods, connecting suppliers, manufacturers, and consumers. Transportation technology refers to the technological improvements, tools, or techniques, for moving

humans, and products from one destination to another. Some notable examples of transportation technology include land vehicles, pipelines, spacecraft, aerial vehicles, rail vehicles, watercraft, and others.

Transportation is essential for ensuring the efficient flow of goods and services across the supply chain, it enables businesses to meet customer demand while optimizing cost and time efficiency. Transportation technology plays a crucial role in modern society, enabling the movement of people and goods. However, it faces several challenges that hinder its efficiency and sustainability. However, there were serious disruptions during the COVID-19 pandemic, which drastically affected the movement of goods and services across the world. Other challenges that concern may include traffic congestion, infrastructure limitations, safety concerns, environmental impact, and regulatory requirements.

## **4. Information Technology**

Ensuring the efficiency of a company's activities in today's highly competitive global markets, real-time and online information is key, this will give us an insight into how information technology harnesses supply chain efficiency and improves performance. Firms that develop the competency of managing information and knowledge resources transcending organizational borders will be rewarded with higher economic benefits (Van de Ven 2005).

In supply chains, the use of information and communication technologies has been shown to exert great impact on supply chain operational efficiency (Niu. 2010). Information technologies used for supply chain management which includes, internet/Web, electronic data interchange, and mobile technologies, allow firms to exchange timely information, carry out plans precisely and perform various supply chain functions and activities efficiently, thereby improving its efficiency, growth, and performance. Information technology refers to the use of computers, software, networks, and other digital technologies to manage, process, and store various types of data.

The information processing method used for supply chain and other operational activities of firms is at a snail's speed, prone to errors, and manipulations during the paper-based transaction and communication age. The advent of information technology and globalization has brought tremendous and positive changes to information processing, thereby forcing companies to adopt and implement communication method that can improve their decision-making process and customer satisfaction. Information technology enables organisations to gather urgent and vital information needed in the supply chain process, respond, and make timely predictions on the market and environmental changes, thereby gaining a competitive advantage. The exponential growth of information technology with communication technology in supply chain management is playing a critical role in optimising the benefits and gains of supply chain efficiency, which further gives competitive advantages to firms via improvements in higher service levels, supply chain costs, lowering inventory, and reducing electronic risks.

### **5. Supply Chain Efficiency**

In recent decades, the globalized economy and increased international trade have expanded supply chains across the globe, which unavoidably has brought about new dependencies. Supply chain management plays a crucial role in the success of businesses across industries. It involves coordinating and integrating various activities, from procurement to production to distribution, to ensure the seamless flow of goods and services. Supply chain efficiency refers to the optimization of supply chain operations to achieve faster, more accurate, and more cost-effective delivery of products or services. It further depicts how well the company's supply chain is working to meet the needs of its customers.

According to Lambert, Pohlen, & Vohra, (2018), it encompasses a comprehensive set of strategies, processes, and activities designed to streamline the flow of products, information, and finances across the entire supply chain network. Several factors influence supply chain efficiency, ranging from the

complexity of the supply chain network, digital transformation, and the integration of technology to demand variability and external disruptions. Fawcett et al. (2019) underscores the importance of collaboration with suppliers, accurate demand forecasting, and the strategic positioning of inventory along the supply chain. Supply chain efficiency remains an essential aspect of contemporary business operations, influencing an organization's ability to compete in a global marketplace. The integration of technology and a focus on sustainability will likely shape the future of supply chain efficiency, making it an ever-evolving field of strategic importance. The study measures supply chain efficiency with inventory turnover and transportation costs. A high turnover rate indicates that a company is selling products quickly, minimizing holding costs and the risk of obsolescence. On the other hand, a low turnover rate may suggest overstocking, leading to increased carrying costs, storage space requirements, and potential losses. Therefore, inventory turnover is vital for ensuring that a company can meet customer demand, reduce costs, and optimize the utilization of working capital. As noted by Stevenson (2018), it directly influences financial performance, cash flow, and profitability. The need for effective and efficient management of transportation activities becomes inevitable due to cost pressures, the need for customer satisfaction, the need to attain better logistics efficiency, reduce operation costs, and promote service quality of firms. An inefficient transportation system may lead to the firm incurring high costs to deliver products to customers, and this may lead to loss for the firm; and the transport system must be able to address the major issues of mode selection, route selection, and fleet size because it is the vital force for competition for the firm (Goldsby et al., 2014).

### **6. Innovativeness**

Innovativeness and supply chain efficiency are closely linked concepts that have gained significant attention from various scholars in recent years. Innovativeness, therefore, refers to the ability of firms to initiate, pursue, and implement new ideas, products, processes, or business models that create value for customer satisfaction and drive business

growth. The adoption of technology remains a transformative force in our modern world since it is instrumental in shaping the way individuals and organizations operate. According to Bala Subrahmanya (2011), the success of small firm innovation invariably revolves around the personality of the entrepreneurs and the characteristics of the firm. Managers are key decision-makers in their firms, they make decisions that enhance performance in sales, customer satisfaction, inventory turnover, transportation costs, and profitability. According to Adewoye, et al., (2023), those managers with innovative ideas and creativity are prone to accepting and implementing technologically innovative ideas faster than others. Entrepreneur innovativeness is the process of seeking new opportunities and products and the elimination of obsolete operations ahead of competitors (Wambugu and Gichira, 2015). The efforts of SMEs to use technology to achieve desired results depend on the manager's initiative in learning and adopting technological innovation (Galloway, 2007). Entrepreneur innovativeness, therefore, determines how soon and frequently firms embrace technological innovation and what type of innovation is brought to bear; this will thereby determine the success and growth of the business (Salau, Opele & Ogundehinde, 2023). To dig deep into this, the study tried to exert the moderating relationship between entrepreneurial innovativeness technological innovation, and supply chain efficiency.

### **III. THEORETICAL REVIEW**

#### **1. Supply Chain Innovation**

Lavastre, Ageron, and Spalanzani (2011) define supply chain innovation as a set of methods and tools that were previously nonexistent in companies or their subsidiaries that will be generated, developed, and deployed within supply chains to tackle different supply chain issues such as quality, costs, and lead-time. Some of the supply chain innovations include logistics network reconfiguration, Just in Time (JIT), mass customization, reverse logistics, integration, and outsourcing. These practices are unique and

difficult to imitate by competitors, they enable the firm to gain a competitive edge through utilizing its core competence. Innovative supply chain practices enable companies to create value for their customers and improve their competitiveness and the performance of the whole supply chain (Chan & Qi, 2003). The importance of innovative supply chain practices is that they assist the organization in creating value for their customers and improve the competitiveness and performance of the whole supply chain. Organizations use innovative supply chain practices to be the best and unique in the market by providing competitive products and services that are flexible, differentiated, cost-friendly, and value-adding to meet customer expectations.

#### **2. Just-In-Time (JIT) Theory**

The Just-In-Time (JIT) theory is a concept that originated in Japan and was popularized by Taiichi Ohno, the proponent of IT and the Toyota Production System (TPS) (Ohno, 1988). JIT is a production and inventory management approach that aims to minimize waste, reduce carrying costs, and improve overall efficiency in the supply chain. Taiichi Ohno, an engineer at Toyota, is credited with developing the JIT philosophy in the 1950s and 1960s. He sought to address the challenges of overproduction, excess inventory, and inefficient processes in manufacturing. The core idea behind JIT is to produce and deliver products only as they are needed, precisely when they are needed, in the exact quantity required.

A core tenet of JIT is the meticulous removal of waste, which Taiichi Ohno identified as the "Seven Wastes" or "Muda." These encompass overproduction, idle waiting times, superfluous transportation, excessive processing, surplus inventory, needless motion, and defects (Ohno, 1988). Ohno's conviction was that through the systematic elimination of these inefficiencies, businesses could attain heightened efficiency and cost-effectiveness.

The Just-In-Time (JIT) theory of supply chain management, while highly effective when implemented correctly, has faced criticism, and

encountered certain challenges over the years. Critics argue that JIT can be vulnerable to disruptions in the supply chain. Since it relies on minimal inventory levels, any unforeseen disruptions, such as natural disasters or supply chain interruptions, can quickly lead to production stoppages and shortages (Pagh & Cooper, 1998). Moreover, JIT requires a high level of coordination and synchronization among suppliers, manufacturers, and distributors. Achieving this level of collaboration can be challenging, especially for organizations with complex supply chains and multiple partners (Bromiley & Cummings, 1995). Additionally, implementing JIT effectively often requires significant upfront investments in technology, process reengineering, and employee training. Smaller businesses with limited resources may find it challenging to adopt JIT practices (Christopher, 1992). Just-in-time theory has proven to be a valuable approach for reducing waste and improving efficiency in supply chain management, it is not without its critics and challenges. Organizations must carefully consider these criticisms and challenges when implementing JIT and tailor the approach to their specific circumstances and capabilities.

## IV. EMPIRICAL REVIEW

### 1. Technological Innovation in Focus

Humdan, Shi, Behina, Chowdhury, and Shakil Mahmud, (2023) investigate the conditional indirect effect of innovativeness on performance via supply chain agility in the service industry at higher and lower collaborative relationships. Data were obtained from Australian service firms via LinkedIn and analyzed using structural equation modeling and fuzzy set qualitative comparative analysis (fsQCA). The study revealed that Supply Chain Agility significantly mediates the relationship between innovativeness and performance. It further revealed that the configuration of both innovativeness and agility better predicts performance.

In a related Nigerian context, Adewoye, Salau & Adeshokan, (2023) examined the effect of technological innovations on sales growth in some

SMEs in Lagos State. One hundred and seventy-eight out of two hundred and five questionnaires distributed to SME owners/managers only were completed and returned. The study revealed that all the measurements of technological innovation measurement (i.e., marketing innovation, entrepreneur innovativeness, and business environment) have a positive significant relationship with SME sales growth in Lagos state. It was therefore recommended that SME owners/managers should develop a management technological innovation culture and model that suits the organisation taking into cognizance the cost, benefits, customers need, and the industry.

Focusing on information technology, Mongare, and Nasidai, (2014) investigate the impact of technology on inventory control systems in Kenya ferry services. The study adopted descriptive research with a survey of a total of 220 and applied a stratified random sampling technique to select a sample size of 60 respondents. Questionnaires were used for data collection. The study revealed that information technology has had a bigger impact on inventory control in terms of efficiency, ease of accessing information, and accuracy thereby affecting organizational performance. The study recommends that modern inventory control systems should be well implemented. It further recommends that organization should integrate all its inventory management functions with information communication technology as well.

Shifting attention to transportation technology, Arsova, & Temjanovski, (2023) appraised the logistic costs and their impact on performance. The study observed that logistics costs depend on the activities that the entity undertakes in its operations, that is, which part of the logistics it has in its operations. It was further revealed that the lower costs largely mean a greater competitive advantage for the company as well as a higher profit.

Supply chain efficiency in developed nations, Yin, & Tian, (2021) delves into the roles of supply chain efficiency and effectiveness management in decision support systems. It focused on strategic

thinking and planning, where various process improvement mechanisms are developed. Therefore, in this study, data envelopment analytics has been utilized to enhance supply chain efficiency and effective management. The study explores an optimal productivity model that evaluates supply chain efficiency and effectiveness management. This paper discusses the policy preparation demands of the decision support systems and develops a framework that organisations can use to control the implementation process.

In addition, Fikri, & Rini, (2022) studied the effect of supply chain innovation performance on satisfaction with supply chain results with supply chain innovativeness capability as moderating. This study uses primary data obtained from owners of Micro, Small, and Medium Enterprises (MSMEs) in the trade sector in the Province of the Special Region of Yogyakarta with a total of 55 respondents. The results of this research analysis revealed that supply chain innovation performance has a positive effect on satisfaction with supply chain results and, innovativeness capability as a negative moderating variable, the effect of supply chain innovation performance on supply chain innovation performance was negative.

Redirecting focus to inventory turnover, Jorgen, Nils, Sverre, & Oystein, (2023) examined how environmental factors, firm size, and time trends are linked to inventory performance. Location data, demographic data, and 16 years financial accounting data from small and medium-sized home improvement retailers were used to explain inventory performance at a chain and a regional level. The study revealed that efficiency in inventory performance varies depending on local market conditions and store location. This study recommended that retail managers should consider including environmental factors as part of their analysis when using inventory turnover as an efficiency benchmark.

Furigana (2022) analyzed the inventory management and inventory turnover ratio case of ADMA. Data was collected using a questionnaire, from a total population of 200 Persons, the study

arrived at 103 sample respondents calculated using the Yamane formula. The purposive sampling technique was used to select the participants. The study revealed that there is a significant change in the inventory turnover ratio due to the change in Lean manufacturing. Also, there is a significant change in the inventory turnover ratio due to the Bulk purchase change.

In synopsis, the reviewed studies provide a comprehensive idea of technological innovations and supply chain efficiency in both developed and developing countries, offering insights into their benefits to both the firms and customers as it relates to cost reduction, inventory turnover growth, increase in profit and customers' satisfaction and the need to imbibe the spirit of innovativeness in entrepreneurship with a view to further satisfy customers and enhances performance.

### Conceptual Model

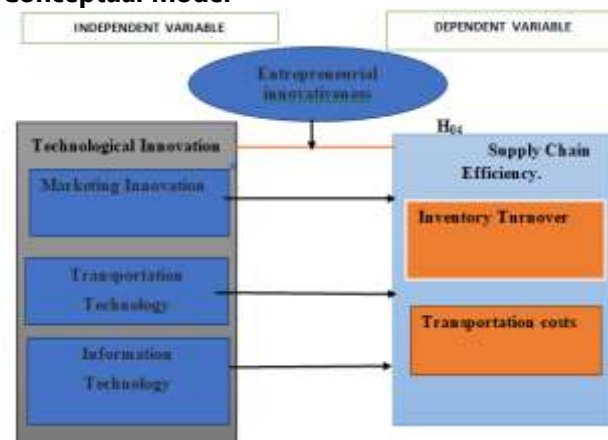


Figure 1: Conceptual Model

Conceptual Links technological innovation and supply chain efficiency

## V. METHODOLOGY

This research was conducted using a quantitative approach, which aims to determine the causal effect among the variables studied. The population of the study is made up of small and medium enterprises in the manufacturing sector in Lagos, Lagos State, Nigeria. The sample population of 150 respondents from 30 selected manufacturing



companies representing 10 firms from each of the three senatorial districts was determined using the purposive sampling technique, with the criteria that SMEs had been running their business for at least 5 years. One hundred and twenty-three were returned and correctly filled. This was to ensure that SME actors had experience with the dynamics of technological innovation and supply chain. Data was collected with the help of questionnaires, then the questionnaires were measured using a 5-point Likert scale, with a scale of 1 indicating that the respondent strongly disagreed, and a scale of 5 indicating that the respondent strongly agreed. Furthermore, the data analysis process was carried out using the Linear Regression Method and PPMC.

## VI. DATA ANALYSIS AND DISCUSSION OF FINDINGS

### 1. Discussion of Findings

Technological Innovation Variables (marketing innovation, transportation technology, and information technology) and Supply Chain Efficiency

In Table 1, a robust positive correlation is evident between marketing innovation and supply chain efficiency ( $n=123$ ,  $r=.651$ ,  $p=0.000$ ). Consequently, we reject the null hypothesis (H01), which posits no significant relationship between marketing innovation and supply chain efficiency. Thus, the results of hypothesis one affirms a significant positive impact of marketing innovation and supply chain efficiency. The present study result is in consonant with the empirical studies of Mostaghel, Oghazi, Patel, Parida, and Hultman, (2019) who asserted that increasing manufacturing marketing coordination, higher market intelligence quality, or higher supply chain intelligence quality are positively associated with product innovation performance. kintokunbo, & Adim, (2020) also concluded that supply chain innovation significantly influences and predicts the marketing performance of organizations. However, the results in Table 1 further indicate that there is a positive correlation between transportation technology and supply chain efficiency ( $n=123$ ,  $r=.578$ ,  $p=0.000$ ) which is significant and, therefore, rejects the null

hypothesis two (H02) that stated that significant relationship does not exist between transportation technology and supply chain efficiency. Therefore, transportation technology has a positive relation with supply chain efficiency.

Table 1: Pearson Product Moment Correlation Table  
Showing the Relationship between marketing innovations, transportation technology, information technology, and supply Inventory Turnover.

	Supply Chain Efficiency	Marketing Innovation	Technological Innovation	Information Technology
Supply Chain Pearson Correlation Efficiency. Sig. (2 tailed) N	1 123			
Marketing Pearson Innovations. Correlation. Sig. (2 tailed) N	.651** .000 123	1 .000 123		
Transport Pearson Innovations Correlation. Sig. (2 tailed) N	.578** .000 123	.574 .000 123	1 .000 123	
Information Pearson Technology Correlation. Sig. (2 tailed) N	.759** .000 123	.686** .000 123	.683** .000 123	1 .000 123

Kolasińska-Morawska, Sułkowski, & Morawski, (2019) concluded that enterprises that skillfully use modern technical and technological solutions in transport management will gain the technological advantage and thus the competitive advantage in the demanding transport services market. Also, Mongare, and Nasidai, (2014) concluded that technology has had a bigger impact on inventory control in terms of efficiency. Ali Fikri, & Rini, (2022) further emphasised that supply chain innovation

performance has a positive effect on satisfaction with supply chain results. Furthermore, Table 1 reveals a substantial positive correlation between information technology and supply chain efficiency ( $n=123$ ,  $r=.759$ ,  $p < 0.05$ ). As a result, we reject the null hypothesis ( $H03$ ), which suggests no significant relationship between information technology and supply chain efficiency. Instead, we assert that there is a robust positive, and significant relationship between information technology and supply chain efficiency. This aligns with the empirical studies of Mongare, and Nasidai, (2014) who opined that information technology has had a bigger impact on inventory control in terms of efficiency, ease of accessing information, and accuracy thereby affecting organizational performance.

Table 2: Pearson Product Moment Correlation Table Shows the Relationship between marketing innovation, transportation technology, information technology, and supply chain efficiency.

Moderating Effect of entrepreneurial innovativeness on the relationship between technological innovation and supply chain efficiency. To assess whether entrepreneurial innovativeness indeed moderates the relationship involving technological innovation variables (i.e. marketing innovation, transportation technology, and information technology) and supply chain efficiency, the analysis was conducted. The results indicate an  $R^2$  (regression value) of 0.602, suggesting that 60.2% of the variance in supply chain efficiency can be explained by technological innovation. The R-value is 62.3%, with a significant value for training and development at 0.002. Consequently, it is concluded that entrepreneurial innovativeness has a moderating effect on the relationship between technological innovation and supply chain efficiency. Therefore, the null hypothesis, which revealed no significant moderating effect of entrepreneurial innovativeness on the relationship between technological innovation and supply chain efficiency, is rejected. The study's findings align with empirical research by Al Humdan, Shi, Behina, Chowdhury, and Shakil Mahmud, (2022) who opined that the configuration of both innovativeness and agility better predicts

performance. So also, thus Ali Fikri, & Rini, (2022) who delve into the effect of supply chain innovation performance on satisfaction with supply chain innovativeness capability as moderating, opined that supply chain innovativeness capability moderates the positive effect of supply chain innovation performance on satisfaction with supply chain results, which means that the second hypothesis is rejected Salau (2022), who asserted the significant moderating effect of training and development on the relationship between entrepreneurial orientation variables and SME performance, concluded that training and development do have significant moderating effect on the relationship between entrepreneurial orientation variables and SMEs performance.

Table 3: Multiple regression showing the moderating effect of entrepreneurial training and development on entrepreneurial competency and SME performance.

Standardized Coefficients			Unstandardized Coefficients		
Model	B	Std. Error	Beta	t.	Sig.
(Constant)		1.528	.265	5.954	.000
Marketing Innovation	.112	.136	.136	1.322	.006
Technological Innovation	.058	.076	.094	.824	.008
Information Technology	.156	.081	.204	1.652	.012
Entrepreneurial innovation	.190	.101	.216	2.090	.002

Dependent Variable: SCEFF

R	$R^2$	Adj. $R^2$	Std. Error Est	F
.623	.602	.574	25428	5.023

## VII. CONCLUSION & RECOMMENDATIONS

The research was carried out to examine the effect of technological innovation on supply chain efficiency, it further examined the moderating effect of entrepreneurial innovativeness on the relationship between technological innovation and

supply chain efficiency. The result of the study showed a strong positive significant relationship between the technological innovation variables (i.e. marketing innovation, transportation technology, and information technology) and supply chain efficiency, it further showed that entrepreneurial innovativeness moderates the relationship between technological innovation and supply chain efficiency. The results of this study further showed that technological innovation measured by marketing innovation, transportation technology, and information technology guaranteed an increase in supply chain efficiency.

Based on the findings in the literature, the following recommendations were presented by the study: SMEs should endeavor to invest and adopt all necessary innovations in modern technologies (i.e. marketing, transportation, information, and others) that will further improve their supply chain efficiency and capacity. Also, there is a need for increased capacity for training and development programs for employees to maximize the benefits accruable to supply chain efficiency; the government should also invest in infrastructural development and also make policies to encourage investment in the logistic sector; SMEs should be encouraged to develop and implement a dynamic transportation strategy for their supply chains that must be responsive, both to service and cost demands; and SMEs should be cultured to imbibe the habit of innovativeness and adoption of modern technology.

### **Contribution to Knowledge**

This study contributes to the growing literature on technological innovation and supply chain efficiency by measuring technological innovation with a trio of marketing innovation, transportation technology and information technology and further extends the relationship between entrepreneurial innovativeness, technological innovation, and supply chain efficiency by testing and validating the moderating effects of innovativeness on technological innovation and supply chain efficiency.

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