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## EFFECT OF TECHNOLOGY ON SUPPLY CHAIN PERFORMANCE OF COURIER FIRMS IN NIGERIA: IMPLICATION FOR POST PANDEMIC ERA

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*The purpose of the study was to examine the effect of technology on Supply chain performance of courier firms in Nigeria: implications for the post pandemic era. The study adopted the cross-sectional survey research design. The population of the study comprised of all the 237 courier service firms registered with the courier regulatory department of the Nigerian postal service (NIPOST 2009). The sample size of this study was drawn from the two hundred and thirty-seven (237) courier service firms registered with the courier regulatory department of the Nigerian postal service. The sample size of this study was determined using the Yamane (1967) formula. This method was adopted to generate an appropriate sample size for the study from which generalization can be made on the entire population because the population is large. Thus, one hundred and forty-nine (149) courier service firms participated in the survey. Managers of these firms constitute the respondents of the study. Meanwhile, 104 copies of the questionnaire were returned usable indicating 70% response rate which is deemed well enough figure for the study. The hypotheses were tested using the Pearson product moment correlation coefficient with the aid of the Statistical Tool for Social Sciences (SPSS version 25.1). The study revealed that Cloud computing, E-Payment and Internet of things all were shown to have positive and significant effect on supply chain performance of courier firms in Nigeria especially in the post Covid era. As a result the study recommends that Managers should consider updating and constantly deploying these technologies into their supply chain operations to ensure delivery reliability and garner lead time.*

**Keyword:** Technology, Supply chain performance, Cloud computing, E-payments, Internet of things

## Introduction

In recent times mankind has experienced several pandemic namely the Spanish Flu, Asian flu, Hong Kong Flu, HIV/AIDS, SARS, Ebola, and Swine Flu. All of these had significantly impacted the global economy, the environment, social lifestyle, agricultural sector, manufacturing and service industries, hospitality and tourism, education sector, aviation industry etc. At present, humanity is facing another pandemic, the infection of the new coronavirus known as COVID-19. Sohrabi, Alsafi, O'Neil, Kerwan and Al-Jabir (2020) pointed out that the COVID-19 pandemic has created severe supply chain disruption (SCDs) in all manufacturing sectors. Supply Chain Disruptions referred to the unplanned and unpredicted events that disturb the flow of goods and services across the supply chain (Craighead, Blackhurst, Rungtusanatham, & Handfield, 2007). Government all over the world responded by restriction of movement along the border a move that led to temporary stoppage in human mobility and transportation activities, which resulted in unparalleled pressure on shipping and road freight, and created severe impediments for international trade. The role of technologies in supply chain has taken a dramatic leap following the outbreak of the COVID-19 pandemic. As a result of the shelter-in-place and lockdowns aimed at containing the spread of coronavirus, many brick and mortar retailers have been forced to close down physical stores and move more rapidly toward technology-based solutions such as online ordering and fulfillment, click and collect, and robot-assisted operations (Shankar, et al., 2020). It is against this backdrop that this study seeks to unravel the role of technology on the supply chain performance of courier firms operating in Nigeria.

It is common knowledge that the shutdown of businesses across the globe had a ripple effect on the supply chain. The pandemic meant that there were less operation and that led to layoffs and declaring bankruptcy (Business Insider, 2020). Scholars like Sarkis, Cohen, Dewick and Schroder (2020) noted that the pandemic revealed the unpreparedness of global enterprises for such an event and did not have any plan for recovery in this situation. Disruption is not only limited to consumers, it has changed the entire supply chain: sourcing, procuring, manufacturing and delivering systems. Indicating, the need for organizations to implement various strategies that; should appropriately fulfill the needs and wants of stakeholders during the pandemic and prepare them for post pandemic conditions, the pandemic has caused huge disruption that significantly affected supply chains and resulted in lack of accessibility to markets and materials. Since February 2020, world trade has been badly affected (WTO, 2020). New regulations, changing consumer preferences and restricted working have forced organizations to manage their Supply Chains (SCs) more effectively (Cohen, 2020). There are a variety of factors and sub-factors, which led to disruptions in courier service delivery, for instance, adverse weather mostly disrupted courier service delivery and adversely affected the supply chains (Sheffi, 2015). But a disruption like the COVID-19 pandemic is a potent risk to courier firms in their bid to offer prompt and effective service. As an outcome of the COVID-19, supply chains in the courier service sector, their operational capability have been hampered, though differently across air, rail, road, and sea. Therefore, there are various potential consequences for courier service delivery the pandemic. The fluctuating demand and supply practices need to be strengthened with advanced digital technologies, information management and data analytics during and post COVID-19 for appropriate decision-making (Cao & Duan, 2017; Lohmer & Lasch, 2020), as well as providing efficiency and effective service delivery. In view of the identified problem, this study seeks to examine the role of technology in enhancing supply chain performance of courier service firms in the post pandemic era.

### Study Variables and Research Framework

Study variables reveal the direction of the research work. They serve as the skeletal structure upon which the entire work is built upon. This study has two major variables; technology which is the predictor variable with cloud computing, E-payment and Internet of things as its indicators while supply chain performance was treated as a single measure variable.

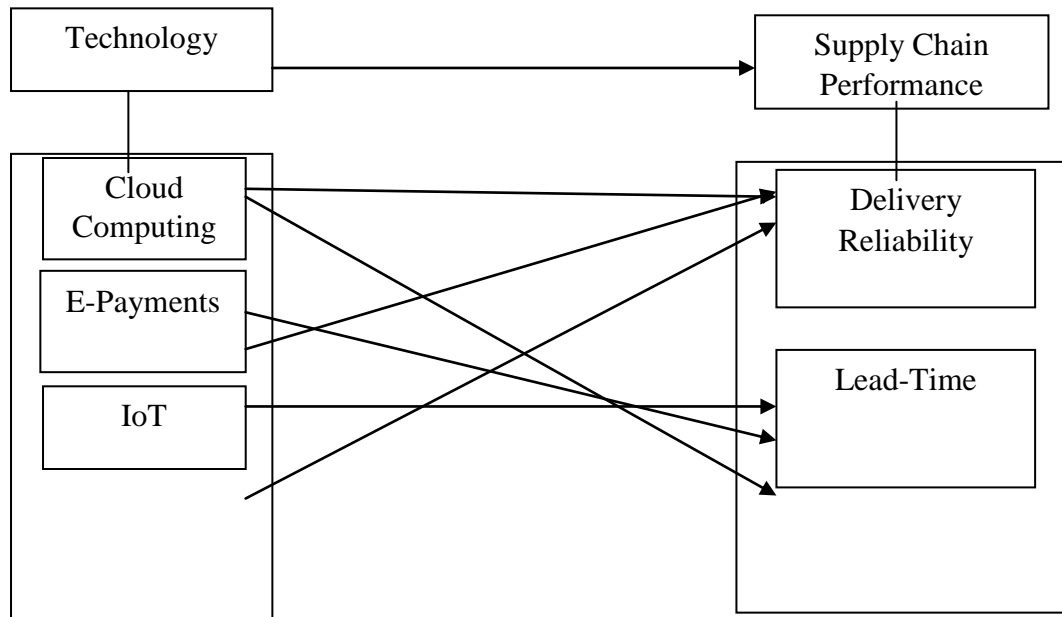


Fig 1.1 Conceptual framework for the study

Source: (dimensions were adapted from Sudan & Taggar 2021; Rajana, 2018; Toka & Aivazioou, 2013) while measure were adapted from Teresina et al 2020; Bushuew & Gullfrida 2018)

### Study Hypotheses

The following hypotheses were developed for the study:

- H0<sub>1</sub>: Cloud computing does not significantly relate to Delivery reliability in courier firms
- H0<sub>2</sub>: Cloud computing does not significantly relate to Lead-time in courier firms
- H0<sub>3</sub>: E-payment does not significantly relate to Delivery reliability in courier firms
- H0<sub>4</sub>: E-Payment does not significantly relate to Lead-time in courier firms
- H0<sub>5</sub>: Internet of Things does not significantly relate to Delivery reliability in courier firms
- H0<sub>6</sub>: Internet of Things does not significantly relate to Lead-time in courier firms

### Concept of Technology

Shankar, et al (2020) stated that technology has several description based on the root of the author. Some scholars have described it as the application of scientific knowledge for practical purposes, while others view it as the process or tool that aids the production of goods and services better, faster and cheaper. A third group of scholars view technology in terms of information and communication which are systems used for storing, retrieving, processing and sending information. The twenty first century has witnessed tremendous advancement in technology. This advancement has greatly reshaped the mode of conducting business and has created avenues for expansion as well better interaction between organizations and its customers (Newnam 2017). The role of technology in supply chain has taken a dramatic leap forward following the outbreak of the COVID-19 pandemic. The prevailing technologies that are reshaping the supply chain landscape as well as the emerging technologies and how they have impacted the management of the supply chains particularly

in the pandemic and post pandemic era. Include but not limited to cloud computing, Robotic, E-payments and Internet of things as the technological tool that is affecting supply chain performance.

**Cloud Computing:** The application of cloud computing in supply chain activities can be felt more in forecasting and planning, sourcing and procurement and logistics. Schramm, Nogueira and Jones (2011) argued that the activity of forecasting and planning in a supply chain, cloud-based platforms are designed to assist companies to improve their service levels by coordinating the supply chain network's partners (retailers, suppliers and distributors) that play pivotal role in demand forecasting. Cloud computing is also useful for inventory, warehouse and transportation management, as it offers logistics tracking operations to multiple supply chain partners. Processes such as replenishment planning, order processing, fleet management, transportation route planning as well as global trade compliance can migrate to the cloud (Schramm et al., 2011).

**E-Payments:** Fatonah, Yulandari and Wibowo (2018) described e-payment as the value of a payment from the payer to the receipt through an electronic mechanism. Hidayanto, Hidayat, Sandhyaduhita and Handayani (2015) described electronic payments as "an electronic value transfer of a payment from the payer to the recipient through an electronic payment mechanism. The e-payment service comes with a web-based user interface that allows customers to access, manage their bank accounts and transactions remotely." Jumadi (2015) stated that e-payment refers to electronic payment in the context of e-commerce online transactions conducted over the internet. Scholars are in consensus that e-payment is a system that provides tools for payment of services or goods carried on the internet as it has been noted to create ease of transaction processing in e-commerce between consumers and sellers (Gandawati 2007; Junadi 2015). Using the e-payment system has many benefits for both payers, payees, e-commerce, banks, organizations and government.

**Internet of Things (IoT):** Mehl (2018) described Internet of Things a technological concept in which multiple devices are connected that have the possibility of switching on and off the web in order to use software and automation process for smart application. Ben-Daya, Hassini, and Bahroun (2019) described IoT as a network of physical object that are digitally connected to sense, monitor and interact within a company and between a company and its supply chain enabling agility, visibility, tracking and information sharing to facilitate timely planning, control and coordination of supply chain process. Extant literature revealed that IoT can be useful in product tracking (Aggarwal et al 2013; van Edirisinghe, 2019; Maksimovic et al. 2015) in order to locate product, material an asset and know their current status and environmental condition. This position is also supported by several scholars who investigated the potential of RFID for supply chain traceability, stating that RFID provides increased visibility, and tracking and enhanced communication throughout the supply chain (Musa, et al, 2016; Park, Koh & Nam, 2010).

### **Supply Chain Performance (SCP)**

Supply chain performance has been described as capacity of the supply chain to deliver the right product to the correct location at the appropriate time at the lowest cost of logistics (Zhang, Okoroafo 2015). The focus of the definition is the time of delivery, cost and value for the end customers. Leonczuk (2016) described supply chain performance as the ability (of the entire supply chain) to meet end-customer needs, associated with ensuring the availability of product, deliver it on time in the right way and ensure appropriate inventory levels. It also exceeds the functional boundaries of organizations, i.e. production, distribution, marketing

and sales, research and development. Estampe (2014) identified three basic criteria for supply chain performance: Efficacy: this refers to relationship between the achieved result and the pursued objectives; it is related to the level of customer satisfaction with respect to the resources committed for this purpose. While Efficiency: here efficiency refers to the relationship between efforts and resources involved in the operation and the actual utility value as a result of the action; it is usually linked to the achievement of objectives at a lower cost and Effectiveness relates to the satisfaction with the results. Supply chain performance is the ability (of the entire supply chain) to meet end-customer needs, associated with ensuring the availability of product, deliver it on time in the right way and ensure appropriate inventory levels. It also exceeds the functional boundaries of organizations, i.e. production, distribution, marketing and sales, research and development. The functioning of the supply chains should be constantly improved. Therefore, measures to support the improvement of the performance of the global supply chain should be used, not only those that relate to the individual companies and their functions (Hausman 2004). Performance measurement is defined as the process of quantifying the efficiency and effectiveness of the undertaken actions. Effectiveness is understood as the degree of fulfilment of customer expectations, while efficiency is a measure of the extent to which business assets are used to provide a given level of customer satisfaction (Neely et al. 1995). In turn, the performance measuring system should be understood as a set of indicators used to quantify the efficiency and effectiveness of operations (Shepherd, Günter 2012)

### **Cloud Computing and Supply Chain Performance**

Bruque-Camera, Moyano-Fuentes and Maquiera-Marin (2016) conducted a study on supply chain integration through community cloud computing: Effects on operational performance. The purpose of the study was to evaluate the effect of supply chain integration via cloud computing on operational performance. The study adopted the factor analysis and structural equation modelling to test the hypotheses. The study revealed that community cloud computing exerts a positive and significant effect on both integration and supply chain and operational performance.

Ali (2013) conducted a study titled “cloud computing and its impact on supply chain performance. The focus of the study was to examine the adaptability of cloud computing in manufacturing industry and its impact on demand and distribution management to achieve sustainable supply chain performance. The study revealed that cloud computing gave firm the competitive advantage in reaching customers and suppliers. As real time demand information and inventory problems were resolved by having a cloud computing technology.

In the light of these revelations from literature we therefore hypothesized that:

H<sub>01</sub>: There is no significant relationship between cloud computing and delivery reliability

H<sub>02</sub>: There is no significant relationship between cloud computing and lead Time.

### **E-Payment and Supply Chain Performance**

Alademomi, Rufaai Teye, Sungug and Ashu (2019) conducted a study on the usage of E-payment on bus rapid transit (BRT): An empirical test, public acceptance and policy implication in Lagos state Nigeria. The aim of the study was to test the role of trust as a mediator factor in determining acceptance of electronic payment in BRT system. The result indicated strong support for the effects of perceived security and perceived ease of use while perceived usefulness did not find support on the outcome. Most importantly, trust was found to significantly influenced acceptance of electronic payment system. The research findings

suggest a positive means to encourage acceptance of electronic payment system for BRT users.

Athiambo and Mburu (2017) conducted a study on the influence of electronic payment system in procurement performance in public entities in Nairobi city county Kenya. The objective of the study was to evaluate influence of electronic payment systems in procurement performance in public entities in Nairobi City County. The study deployed a consensus to select 101 respondent, multiple regression analysis was used to test the hypotheses developed for the study. The findings revealed that electronic payment had a positive and significant influence on procurement performance in public entities.

In the light of these revelations from literature we therefore hypothesized that:

H<sub>03</sub>: There is no significant relationship between E-payment and delivery reliability

H<sub>04</sub>: There is no significant relationship between E-payment and lead Time.

### **Internet of Things (IoT) and Supply chain performance**

Mostafa, Hamdy and Alawady (2019) conducted a study on impact of internet of things on supply chains: A framework for warehousing. The purpose of the study was to evaluate the impact of internet of things on supply chain performance with reference to warehousing. The study showed that the deployment of internet of things in the warehouse activities provides real-time visibility of everything in the warehouse, increasing speed and efficiency, and preventing inventory shortage and counterfeiting. The study also observed that IoT enables the connection of several objects through collecting real-time data and sharing them; the resulting information can then be used to support automated decision-making. De Vass, Shee and Miah (2018) conducted a study titled the effect of internet of things on supplychain integration and performance: An organizational capability. The purpose of the study was to examine the effect of IoT on multi dimensions of supply chain process integration, and in turn supply chain performance. The study adopted the cross-sectional survey research design 227 firms participated in the survey. The hypotheses were tested using the structural equation model (SEM). The finding indicates that IoT capability has a positive and significant effect on internal, customer-, and supplier-related process integration that in turn positively affects supply chain performance and organizational performance.

In the light of these revelations from literature we therefore hypothesized that:

H<sub>05</sub>: There is no significant relationship between Internet of things and delivery reliability

H<sub>06</sub>: There is no significant relationship between Internet of things and lead Time.

### **Methodology**

This study adopted the cross-sectional survey research design. This research design enabled the researcher to collect unprejudiced data from the study targets and describe the relationship between the variables. The population of the study comprised of all the 237 courier service firms registered with the courier regulatory department of the Nigerian postal service (NIPOST 2009). The sample size of this study was drawn from the two hundred and thirty-seven (237) courier service firms registered with the courier regulatory department of the Nigerian postal service. The sample size of this study was determined using the Yamane (1967) formula. This method was adopted to generate an appropriate sample size for the study from which generalization can be made on the entire population because the population is large. Thus, one hundred and forty-nine (149) courier service firms participated in the survey. Managers of these firms constitute the respondents of the study. Meanwhile, 104 copies of the questionnaire was return usable indicating 70% response rate which is deemed

well enough figure for the study. The hypotheses were tested using the Pearson product moment correlation coefficient with the aid of the Statistical Tool for Social Sciences (SPSS) version 25.1

**Table 1: Description on Levels of Relationship between Variables**

**Decision Rule**

Reject the null hypothesis (H0) if  $PV < 0.05$  for 2-tailed test and conclude that significant relationship exists.

**Table 1: Correlation Analysis on Cloud Computing and Delivery Reliability Correlations**

	Cloud Computing		Cloud Computing	Delivery Reliability
Pearson Correlation r	Cloud Computing	Correlation Coefficient	1.000	.932**
		Sig. (2-tailed)		.000
		N	104	104
	Delivery Reliability	Correlation Coefficient	.932**	
		Sig. (2-tailed)	.000	
		N	104	104

\*\* . Correlation is significant at the 0.01 level (2-tailed).  
 Source: (SPSS Output 2021).

Table1 above shows that the Pearson Correlation Coefficient ( $r = 0.932^{**}$ ), this value is very high, implying that a very strong relationship exists between cloud computing and delivery reliability. The positive sign of the correlation coefficient indicates a positive relationship. That is to say that an increased investment on cloud computing infrastructure would enhance the delivery reliability of the studied courier service firms in Nigeria. As shown in Table 1, the probability value is  $(0.000) < (0.05)$  level of significance; hence the researcher rejects the null hypothesis and concludes that there is a significant relationship between cloud computing and delivery reliability, an antecedent of supply chain performance.

**Table 2: Correlation Analysis on Cloud Computing and lead Time Correlations**

	Cloud Computing		Cloud Computing	Lead Time
Pearson Correlation r	Cloud Computing	Correlation Coefficient	1.000	.991**
		Sig. (2-tailed)		.000
		N	104	104
	Lead Time	Correlation Coefficient	.991**	
		Sig. (2-tailed)	.000	
		N	104	104

\*\* . Correlation is significant at the 0.01 level (2-tailed).  
 Source: (SPSS Output 2021).

Table 2 above shows that the Pearson Correlation Coefficient ( $r = 0.991^{**}$ ), this value is very high, indicating the existence of a very strong relationship between cloud computing and lead time. The positive sign of the correlation coefficient indicates a positive relationship. That is to say that an increased investment on cloud computing infrastructure would create adequate lead time for the studied courier service firms in Nigeria. As shown in Table 2, the

probability value is  $(0.000) < (0.05)$  level of significance; hence the researcher rejects the null hypothesis and concludes that there is a significant relationship between cloud computing and lead time, an antecedent of supply chain performance.

**Table 3: Correlation Analysis on E-Payment and Delivery Reliability Correlations**

		E-Payment		Delivery Reliability	
Pearson Correlation r	E-Payment	Correlation Coefficient	1.000		.984**
		Sig. (2-tailed)			.000
		N	104		104
	Delivery Reliability	Correlation Coefficient	.984**		
		Sig. (2-tailed)	.000		
		N	104		104

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

Source: (SPSS Output 2021).

Table 3 above shows that the Pearson Correlation Coefficient ( $r = 0.984^{**}$ ), this value is very high, indicating the existence of a very strong relationship between E-Payment and Delivery Reliability. The positive sign of the correlation coefficient indicates a positive relationship. That is to say that an increase in the use of e-payment platform enhances delivery reliability in the studied courier service firms in Nigeria. As shown in Table 3, the probability value is  $(0.000) < (0.05)$  level of significance; hence the researcher rejects the null hypothesis and concludes that there is a significant relationship between E-Payment and delivery reliability, an antecedent of supply chain performance.

**Table 4: Correlation Analysis on E-Payment and Lead Time Correlations**

		E-Payment		Lead Time	
Pearson Correlation r	E-Payment	Correlation Coefficient	1.000		.953**
		Sig. (2-tailed)			.000
		N	104		104
	Lead Time	Correlation Coefficient	.953**		
		Sig. (2-tailed)	.000		
		N	104		104

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

Source: (SPSS Output 2021).

Table 4 above shows that the Pearson Correlation Coefficient ( $r = 0.943^{**}$ ), this value is very high, indicating the existence of a very strong relationship between E-Payment and lead time. The positive sign of the correlation coefficient indicates a positive relationship. That is to say that an increase in the use of e-payment platform enhances delivery reliability in the studied courier service firms in Nigeria. As shown in Table 4, the probability value is  $(0.000) < (0.05)$  level of significance; hence the researcher rejects the null hypothesis and concludes that there is a significant relationship between E-Payment and delivery reliability, an antecedent of supply chain performance.



**Table 5: Correlation Analysis on Internet of Things (IoT) and Delivery Reliability Correlations**

			IoT	Delivery Reliability
Pearson Correlation r	IoT	Correlation Coefficient	1.000	.953**
		Sig. (2-tailed)		.000
		N	104	104
	Delivery Reliability	Correlation Coefficient	.953**	
		Sig. (2-tailed)	.000	
		N	104	104

\*\* . Correlation is significant at the 0.01 level (2-tailed).  
 Source: (SPSS Output 2021).

Table 5 above shows that the Pearson Correlation Coefficient ( $r = 0.953^{**}$ ), this value is very high, indicating the existence of a very strong relationship between internet of things and delivery reliability. The positive sign of the correlation coefficient indicates a positive relationship. That is to say that an increase in the deployment of internet of things by the courier firms would enhance delivery reliability. As shown in Table 5, the probability value is  $(0.000) < (0.05)$  level of significance; hence the researcher rejects the null hypothesis and concludes that there is a significant relationship between internet of things and delivery reliability, an antecedent of supply chain performance

**Table 6: Correlation Analysis on Internet of Things (IoT) and Lead Time Correlations**

			IoT	Lead Time
Pearson Correlation r	IoT	Correlation Coefficient	1.000	.943**
		Sig. (2-tailed)		.000
		N	104	104
	Lead Time	Correlation Coefficient	.943**	
		Sig. (2-tailed)	.000	
		N	104	104

\*\* . Correlation is significant at the 0.01 level (2-tailed).  
 Source: (SPSS Output 2021).

Table 6 above shows that the Pearson Correlation Coefficient ( $r = 0.943^{**}$ ), this value is very high, indicating the existence of a very strong relationship between internet of things and delivery reliability. The positive sign of the correlation coefficient indicates a positive relationship. That is to say that an increase in the deployment of internet of things by the courier firms would enhance delivery reliability. As shown in Table 6, the probability value is  $(0.000) < (0.05)$  level of significance; hence the researcher rejects the null hypothesis and concludes that there is a significant relationship between internet of things and delivery reliability, an antecedent of supply chain performance

### Conclusion and Recommendations

The study rejected all the null hypotheses and endorsed the alternate hypotheses, and concludes by stating that, technology has a very strong and positive relationship with supply chain performance in courier service firms in Nigeria as was evidenced from the results of the data analyzed. The study recommends that managers of courier service firms continue to adopt and upgrade the technology in all of their operations as it has been shown to foster excellent delivery reliability and ensure prompt lead time.

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