



## Supply Chain Information Technology (SCIT) and Organizational performance: Evidence from Nigerian Manufacturing Industry

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### ABSTRACT

*This research investigates how the dimensions of Supply Chain Information Technology (SCIT) affect the performance of the manufacturing industry, specifically focusing on selected Nigerian manufacturing companies. The study employed a targeted sampling technique to select 20 respondents from the Department of Procurement and Logistics of each of the five chosen manufacturing companies, resulting in a sample size of 100 respondents. Data was collected from the respondents using a structured questionnaire, and path analysis was employed to analyze the collected data. The findings demonstrate that SCIT dimensions, namely ERP, CRM, EDI, and AAS, have a positive and significant correlation with organizational performance. This association is observed in terms of strategic decision-making, improved understanding of customer preferences, needs, and behaviors, and enhanced data accuracy and order processing efficiency. It can be concluded that implementing SCIT in the manufacturing industry will result in increased operational efficiency, better decision-making, better collaboration, and greater supply chain transparency. This enables managers to proactively address challenges, optimize resources, and drive performance improvements across the supply chain.*



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### INTRODUCTION

Manufacturing plays an important role in both developed and emerging economies. The World Trade Organization (WTO) (2020) shows that manufacturing contributes significantly to the global economy, driving economic growth, employment and innovation. According to the World Trade Organization (WTO), manufacturing accounted for about 16% of global GDP in 2019. In the same year, it accounted for about 70% of the world's merchandise trade. Manufacturing activities create value-added products, export opportunities, and technological advances that benefit economies around the world. To support this claim, the U.S. Bureau of Economic

Analysis (2021) says manufacturing contributes to economic performance, job creation and technological progress. In 2020, manufacturing accounted for about 11.6% of US GDP and employed about 12.3 million workers. Similarly, the Office for National Statistics (2021) confirms that manufacturing accounts for around 10% of UK GDP and employed around 2.7 million people in 2020. In Nigeria, the sector also accounted for about 8.9% of the country's GDP in 2019 (National Bureau of Statistics, 2020). Despite laudable efforts to sustainably support the country's economy, the sector faces significant challenges due to the adverse macroeconomic conditions and the impact of the COVID-19 pandemic. This situation has always had a negative impact on the company's productivity and ability to generate profits. The Manufacturers Association of Nigeria (MAN) recognizes that these challenges have become more complex and serious than in previous years. According to the National Bureau of Statistics (2022), it is clear that there is a cause for concern as the output value of the sector has decreased from N3.73 trillion in the second half of 2021 to N2.68 trillion in the same period of 2022.

Manufacturers are facing a challenging situation that requires them to come up with strategies to prevent the industry from disappearing abruptly. One such strategy is the implementation of supply chain information technology (SCIT). SCIT involves the use of information and communication technology (ICT) tools and systems to enhance the efficiency and effectiveness of supply chain management processes. This involves integrating various technologies like enterprise resource planning (ERP) systems, customer relationship management (CRM) software, electronic data interchange (EDI), and advanced analytics. Previous studies have shown a strong connection between SCIT and organizational performance. For example, Chofreh et al. (2019) suggest that SCIT positively impacts supply chain agility, leading to improved performance and a competitive edge. Similarly, Oke et al. (2016) demonstrate that SCIT plays a crucial role for manufacturing companies in ensuring timely delivery of materials, cost minimization, and enhanced customer satisfaction. Melnyk et al. (2014) defines SCIT as the use of information and communication technology (ICT) tools and systems to optimize supply chain management (SCM) processes. Integrating ICT into SCM has recently gained importance and interest due to its many benefits. These benefits include improved visibility, coordination, and information sharing across the supply chain, ultimately leading to improved performance and competitive advantage in manufacturing (Chofreh et al., 2019; Oke et al., 2016; Hassab-Elnaby et al., 2012).

Lately, in developed nations, there has been a growing focus on SCIT tools (such as ERP CRM, EDI, and advanced analytics) and their impact on organizational performance. However, despite the available studies, there is a lack of empirical evidence establishing a connection between SCIT tools and organizational performance in developing countries, particularly within the Nigerian manufacturing industry. This indicates the need for research that acknowledges the influence of SCIT dimensions on the performance of manufacturing industries in developing nations. Hence, the objective of this study is to investigate the impact of SCIT dimensions (ERP CRM, EDI, and advanced analytics) on the organizational performance of the manufacturing industry, aiming to address the aforementioned research gaps.

## **Theoretical Framework and Hypotheses Development**

The theory underlying this work is Transaction Cost Economics (TCE), a theoretical framework developed by Oliver E. Williamson in the 1970s to analyze the efficiency and organization of economic transactions (Tobon et al., 2018; Gunasekaran, & Ngai, 2004). . Many studies have linked this theory to supply chain information technology and organizational performance (Oke et al., 2016; Umble et al 2003; Sahay et al., 2017; Li et al., 2017). Guevara et al. (2019) state that Transaction Cost Economics (TCE) examines the expenses involved in the exchange of goods and services among economic agents, like companies, and the factors influencing the choice of organizational structure for conducting transactions. Ghadge et al., (2018) suggests that TCE emerged to address the significant impact of transaction costs, which encompass search and information costs, bargaining costs, and enforcement costs, on economic outcomes. Chae et al. (2018) demonstrate that TCE offers a framework for analyzing the costs related to different sourcing options, such as vertical integration or outsourcing. This theory enables firms to evaluate the advantages and risks of maintaining in-house capabilities versus relying on external suppliers. By comprehending transaction costs, companies can make well-informed decisions regarding supplier selection, contract negotiation, and relationship management, resulting in enhanced efficiency within the supply chain (Benson et al., 2017). According to Mukerjee, and Singh (2018), the theory assists companies in creating effective contracts and governance structures to minimize transaction costs and align the interests of different parties. By including specific performance measures, penalties, and rewards in contracts, firms can decrease information imbalances and opportunistic behavior, which ultimately improves the overall performance of the supply chain (Liu et al., 2020).

Chopra and Sodhi (2019) emphasize that this theory enables organizations to play a crucial role in cost reduction by facilitating better coordination, communication, and information sharing among supply chain partners. As a result, the manufacturing industry should be aware of transaction risks such as supplier disruptions, quality issues, and price volatility. By understanding the expenses associated with these risks, companies can develop risk management strategies and enhance the resilience of their supply chains. This may involve practices like dual sourcing, maintaining inventory buffers, and exploring alternative sourcing options to minimize transaction costs arising from uncertainty (Ivanov et al., 2020).

### **Enterprise Resource Planning (ERP) and Organizational Performance**

Enterprise Resource Planning (ERP) systems are integrated software applications that are designed to manage and streamline various business processes within an organization. They are particularly relevant in the manufacturing industry, where complex operations require efficient coordination and control. The relationship between ERP systems and organizational performance in the manufacturing industry has been widely studied and recognized as having a significant impact on overall efficiency, productivity, and competitiveness (Tobon et al., 2018; Ifinedo, 2011; Gupta, & Kohli, 2006). A study conducted by Srinivasan, and Moorman (2021) reveals that ERP is significantly associated with operation performance. Another study carried out by Tobon et al. (2018) demonstrates that ERP is a major determinant of organizational success in terms of reduction in lead times, better resource allocation, and improved production scheduling. In a similar study, Khan et al. (2011) advocate that ERP systems provide real-time data and analytics that enable managers to make more informed and timely decisions. The availability of accurate and up-to-date information facilitates strategic planning, forecasting, and decision-making processes, leading to improved performance outcomes. Chen, and Paulraj (2004) also

attest that ERP systems facilitate better coordination and collaboration with suppliers, enabling more efficient supply chain management. This leads to reduced inventory holding costs, optimized procurement processes, and improved overall supply chain performance (Gunasekaran et al., 2006). Based on the above empirical findings, the following hypothesis is proposed:

H1: ERP has a significant relationship with organizational performance

### **Customer Relationship Management (CRM)**

The idea of CRM can be traced back to the 1990s when businesses started recognizing the importance of establishing strong connections with customers in order to increase sales and cultivate loyalty (Liu et al., 2020). Previous studies have shown that CRM software solutions enable the manufacturing industry to streamline their customer-related processes and improve customer service (Srinivasan & Moorman, 2021). According to Liu et al. (2020), CRM allows organizations to develop a deeper understanding of their customers' preferences, needs, and behaviors. By utilizing this information, companies can provide personalized experiences, customized products or services, and timely support, which ultimately leads to higher customer satisfaction. The authors further explained that satisfied customers are more likely to make repeat purchases, recommend the company to others, and contribute to the overall growth of the organization. Li et al. (2018) also confirm that CRM encompasses a range of processes, technologies, and strategies that aim to comprehend and fulfill customer needs and preferences. In a study conducted by Mukerjee and Singh (2018), it was demonstrated that CRM systems facilitate lead management, sales tracking, and contribute to improved sales performance and revenue growth. Another study by Liu et al. (2020) illustrates a strong correlation between CRM systems and organizational performance in terms of establishing robust customer relationships, driving sales, and fostering loyalty. Therefore, the emergence of the following hypothesis can be observed:

H2: CRM is significantly associated with organizational performance

### **Electronic Data Interchange (EDI)**

Electronic Data Interchange (EDI) is the practice of exchanging standardized electronic business documents between different organizations (Luthra et al., 2014; Senthil & Deepak, 2021). According to Shahzad et al. (2019), EDI facilitates the seamless transmission of various information, such as purchase orders, invoices, and shipping notifications, among trading partners, thereby improving organizational performance. In the same direction, Damodaran and Olhager (2008) reiterate that EDI plays a crucial role in enhancing data accuracy, order processing efficiency, and overall performance, as it eliminates the need for manual data entry, paper-based processes, and human intervention. Pal et al. (2018) also claim that EDI eliminates the need for manual data entry, paper-based processes, and human intervention, enabling organizations to streamline their operations and improve overall efficiency. A study conducted in Malaysia by Chong, and Tan (2018) demonstrated a positive and significant relationship between the adoption of EDI in the manufacturing industry and organizational performance. In another study, conducted in India by Kaur and Sood (2019) showcases that implementation of EDI by Indian manufacturing firms has a significant influence on organizational performance. Similarly, Tsai and Yang (2016) validate the positive link between EDI and logistics performance.

This means that implementing EDI in the manufacturing industry offers many benefits, including increased efficiency, reduced costs, improved supply chain collaboration, improved data accuracy and security, and streamlined order-to-cash and procure-to-pay processes. These benefits contribute to improved business performance and enable manufacturers to remain competitive in today's dynamic business environment. Hence, the following hypothesis emerged:

**H<sub>3</sub>:** EDI is significantly related with organizational performance

### **Advanced Analytics and Organizational Performance**

The emergence of advanced analytics in manufacturing can be attributed to a combination of factors. These factors include exponential data growth, advances in computing power, the development of advanced algorithms, and the growing demand for data-driven decision-making in manufacturing operations (Cervone, 2016). According to Corte-Real et al. (2017), advances in digitization have increased the automation and connectivity of manufacturing processes. As a result, a large amount of data is generated from sources such as sensors, manufacturing facilities, supply chain systems, and customer interactions. This data, often referred to as “big data,” contains valuable insights that can be used to optimize processes and improve performance (Elgendy & Elragal, 2016). A study by Kache and Seuring (2017) shows a positive association between advanced analytics and business performance. (2017) confirm that advanced analytics is a powerful predictor of business performance. Similarly, Mousannif et al. (2016) found a positive association between advanced analytics and organizational performance. Furthermore, Lam et al. (2016) confirm the important role of advanced analytics in improving quality control processes in the manufacturing industry. This means that implementing advanced analytics in manufacturing can improve performance, reduce costs, increase uptime, improve product quality, and drive continuous improvement in manufacturing. Therefore, the following hypothesis is formulated:

**H<sub>4</sub>:** There is a significant association between advanced analytics and organizational performance

### **Conceptual Model**

The following conceptual model is formulated to illustrate the mediating effect of pension contribution scheme on the relationship between job satisfaction and organizational commitment (see figure 1)

**Independent variables**

**Dependent Variable**

31



*Figure 1: Conceptual Model*

## METHODOLOGY

**Research Design:** A cross-sectional survey design was employed for this study to examine respondents' views on the influence of SCIT dimensions on the performance of manufacturing industry.

**Sampling Technique and Sample Size:** A targeted sampling technique was used for selection of 20 respondents each from the Department of Procurement and Logistics of Procter and Gamble, Dangote Cement Plc, Flour Mills of Nigeria Plc, Nigerian Breweries Plc, Nigerian Bottling Company, Unilever Nigeria, Guinness Nigeria, BUA Foods Plc, Honeywell Flour Mills Plc and PZ Cussons Nigeria Plc totaling 100 respondents as a sample size for the study.

### Items measurement

The scales for the study comprised of the ERP scale, CRM scale, EDI scale and Advanced Analytics Scale, These scales anchored on the likert 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The following scales are measured as follows:

**ERP Scale (ERPS):** This scale was developed and validated by Tobon et al. (2018) and has a total of 5 items used to measure the ERP. Sample items for the construct are “Overall, the ERP implementation in our organization has improved operational efficiency and productivity. ERP software effectively integrated various departments and functions within the organization, resulting in better coordination and collaboration. Also, the training and support for ERP implementation ensured that our employee was well prepared to use his ERP.” The authors reported a reliability value of 0.814 for the EPR.

**CRM Scale (CRMS):** This scale was developed and validated by Liu et al. (2020) and contains a total of 6 items for measuring CRM. Examples of items include: ` A company's CRM system helps improve customer satisfaction, a company's CRM system enables personalized

communication with customers, and a company's CRM system solves customer problems efficiently. The authors reported a reliability value of 0.822 for the CRM.

**EDI Scale (EDIS):** This scale was developed and validated by Luthra et al., (2020) and has a total of 6 items used to measure EDI. Sample items for the construct are “EDI has greatly improved the efficiency and accuracy of our business processes, reduced the organization's total cost of ownership, and increased the speed and timeliness of our communications and transactions with our trading partners.” The authors reported a reliability value of 0.809 for the EDI.

**Advanced analytics Scale (AAS):** This scale was developed and validated by Mousannif et al. (2016) and has a total of 6 items used to measure EDI. Sample items for the construct are “Advanced analytics play a key role in extracting actionable insights from large and complex datasets. I believe that the adoption of advanced analytics can greatly improve the decision-making process within an organization, and advanced analytical techniques such as machine learning and predictive modeling are key to innovation and competitiveness in today's business environment. It's essential to driving your advantage.” The authors reported a reliability value of 0.821 for the advanced analytics.

**Organizational Performance Scale:** This scale was developed and validated by Sajuyigbe et al. (2021) and has a total of 7 items used to measure organizational performance. Sample items for the construct are “I believe that our organization's manufacturing processes are efficient and streamlined, that the quality control measures implemented in our organization are effective in ensuring product quality, and that our organization We believe in promoting a culture of continuous improvement where employees are encouraged to bring forward innovative ideas and ideas.” The authors reported a reliability value of 0.831 for the Organizational performance.

#### **Exploratory factor analysis (EFA)**

EFA was used to test the validity and feasibility of the maximum likelihood method, and Promax rotation measurements were used to determine the underlying factors/structures of various measurement variables.

*Table 1: Exploratory Factor Analysis for Testing Validity of the Constructs*

Enterprise Resource Planning (ERP)	1	2	3	4	5
ERPSQ1	.820				
ERPSQ2	.819				
ERPSQ3	.825				
ERPSQ4	.827				
ERPSQ5	.818				

Customer Relationship Management (CRM)					
CRMSQ1		.807			
CRMSQ2		.816			
CRMSQ3		.829			
CRMSQ4		.822			
CRMSQ5		.795			
CRMSQ6		.811			
Electronic Data Interchange					
EDISQ1			.878		
EDISQ2			.819		
EDISQ3			.815		
EDISQ4			.827		
EDISQ5			.809		
EDISQ6			.814		
Advanced Analytics					
AASQ1				.825	
AASQ1				.841	
AASQ1				.799	
AASQ1				.808	
AASQ1				.815	
Organizational Performance					
OPSQ1					.792
OPSQ2					.788
OPSQ3					.824



OPSQ4					.819
KMO = 0.898 Bartlett's Test of Sphericity ( $X^2$ ) = 1508.091, 0.000. Total Variance Explained = 87.9%					

According to the information provided in Table 1, all the variables have a community value higher than 0.50. Additionally, the KMO test yields a value of 0.878, and the Bartlett test for Sphericity is significant at a 1% level. These indicators collectively indicate that the survey can be factored.

**Method of Data analysis:** Path analysis was employed to analyze the data

### **Ethical Considerations**

The purpose of this study is to follow the ethical guidelines of behavioral science. Participant privacy was protected to ensure confidentiality.

**Table 2: Results of Path Analysis (Direct Effect)**

Path	Coef.	T-value	P> z	Hypothesis
OP <- ERP	.4608	5.87	0.000	<b>H<sub>1</sub></b> : Confirmed
OP <- CRM	.2878	3.30	0.001	<b>H<sub>2</sub></b> : Confirmed
OP <- EDI	.3833	4.05	0.000	<b>H<sub>3</sub></b> : Confirmed
OP <-AAS	.4462	5.38	0.000	<b>H<sub>4</sub></b> : Confirmed
_cons	.7775	2.88	0.004	

Table 2 depicts the results of the path analysis of the independent variables (ERP, CRM, EDI and AAS and dependent variable (OP). The results show that the coefficients of the model are 0.7775, 0.4608, 0.2878, 0.3833 and 0.4462 for constant, ERP, CRM, EDI and AAS respectively. The coefficients obtained from the path analysis model were substituted in the hypothesized model to get:

$$OP = 0.7775 + 0.4608_{ERP} + 0.2878_{CRM} + 0.3833_{EDI} + 0.4462_{AAS} \quad (i)$$

Equation 1 predicts that changing the ERP units will result in a 46% positive change in organizational performance. This suggests that ERP is a strong predictor of business performance. This makes sense, because a good ERP implementation facilitates the strategic planning, forecasting, and decision-making process, leading to improved performance. This

study is consistent with previous studies that found ERP to be an important factor in business performance (Tobon et al., 2018; Ifinedo, 2011; Gupta & Kohli, 2006). The results also show that changing the units in CRM results in a 28.78% positive change in organizational performance. This means that CRM is one aspect of SCIT that impacts business performance by better understanding customer preferences, needs and behaviors. Using this information, businesses can provide personalized experiences, customized products and services, and timely support, ultimately leading to increased customer satisfaction. Previous research has shown that CRM software solutions can help manufacturers streamline customer-facing processes and improve customer service (Srinivasan & Moorman, 2021). Hence, **H<sub>2</sub>** is confirmed.

Changing the units of EDI was shown to result in a 38.33% positive change in organizational performance. This indicates that EDI is an indicator of organizational performance in the manufacturing industry. This finding is consistent with that of Shahzad et al. (2019) argue that EDI facilitates the seamless transmission of various information such as orders, invoices, and shipping notices between trading partners, thereby improving organizational performance. Damodaran and Olhager (2008) similarly agree that EDI eliminates the need for manual data entry, paper-based processes, and human intervention, and is therefore critical to improving data accuracy, order processing efficiency, and overall performance. Therefore, **H<sub>3</sub>** is confirmed.

There is evidence that AAS unit changes produce a 44.62% positive significant change in organizational performance. This means advanced analytics will have a major impact on automating and connecting manufacturing processes and performance. This study is consistent with that of Corte-Real et al. (2017) Advances in analytics have boosted manufacturing performance. A study by Kache and Seuring (2017) shows a positive correlation between advanced analytics and business performance. Similarly, Mousannif et al. (2016) also found a positive association between advanced analytics and organizational performance. Furthermore, Lam et al. (2016) confirm the important role of advanced analytics in improving quality control processes in the manufacturing industry. This means that implementing advanced analytics in manufacturing can improve performance, reduce costs, increase uptime, improve product quality, and drive continuous improvement in manufacturing. Hence **H<sub>4</sub>** supported.

## CONCLUSION

This research investigates how the dimensions of Supply Chain Information Technology (SCIT) affect the performance of the manufacturing industry, specifically focusing on selected Nigerian manufacturing companies. The study employed a targeted sampling technique to select 20 respondents from the Department of Procurement and Logistics of each of the five chosen manufacturing companies, resulting in a sample size of 100 respondents. Data was collected from the respondents using a structured questionnaire, and path analysis was employed to analyze the collected data. The findings demonstrate that SCIT dimensions, namely ERP, CRM, EDI, and AAS, have a positive and significant correlation with organizational performance. This association is observed in terms of strategic decision-making, improved understanding of customer preferences, needs, and behaviors, and enhanced data accuracy and order processing efficiency.

It can be concluded that implementing SCIT in the manufacturing industry will result in increased operational efficiency, better decision-making, better collaboration, and greater supply

chain transparency. This enables managers to proactively address challenges, optimize resources, and drive performance improvements across the supply chain.

### **Managerial Implications**

This study provides the business impact on manufacturing industry performance when supply chain information technology (SCIT) is implemented. First, SCIT enables real-time tracking and monitoring of supply chain activity, giving managers better insight into goods movements, inventory levels, and production processes. This enhanced visibility helps you make better decisions, improve resource allocation, and quickly identify and resolve supply chain issues and bottlenecks.

Second, SCIT facilitates collaboration and communication between various parties in the supply chain, such as suppliers, manufacturers, distributors, and customers. Managers can use the SCIT to share real-time information, share data, and coordinate activities with the partners in the supply chain. This enhanced collaboration to align goals, reduce lead times, and improve performance across the supply chain. Third, SCIT helps managers identify and mitigate risks within their supply chains. This enables supervisors to monitor supplier performance, evaluate alternative suppliers, and respond quickly to supply chain disruptions and changes. SCIT can also facilitate the implementation of contingency plans such as alternate sourcing strategies to improve supply chain resilience and minimize the impact of disruptions on manufacturing operations.

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