International Journal of Academic Information Systems Research (IJAISR)
ISSN: 2643-9026
Vol. 9 Issue 1 January - 2025, Pages: 51-59

Digital Transformation Strategy And Agile Supply Chain Management Of Manufacturing Industries In South-South States, Nigeria

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Abstract: *The objective of this study is to examine the Effect of Digital Transformation Strategy on Agile Supply Chain Management of Manufacturing Industry in South-South States, Nigeria. A descriptive research design was employed for the study and responses were collected with the aid of structured questionnaire of 5point-Likert scale model. A total of three hundred and eighty six copies of questionnaire were administered to staff of the selected manufacturing industries. . The geographical focus of the study includes twelve manufacturing industries across six states in South-South, Nigeria. Thus, the sample size used was determined using Taro Yamani formula. The data was analyzed with descriptive statistics, correlation and multiple regressions with the aid of SPSS version 23.0. The findings revealed that Cloud Computing, and Blockchain Technology have positive significant relationships with Agile Supply Chain Management. The study concluded that, overall, Digital transformation embodies competitive advantage, so companies in the manufacturing industry should recognize the opportunities presented by digital transformation and actively strengthen their collaborative relationships with supply chain partners. By effectively using digital technologies and optimizing supply chain management, companies will further enhance their competitive advantages, consolidate their market position, and achieve sustainable development goals. It therefore recommends that Efforts be made by Government and other stakeholders to extend research grants to R&D savvy SME's in the manufacturing industry*.

Keywords: Digital Transformation Strategy, Cloud Computing, Blockchain Technology, Agile Supply Chain Management and Manufacturing industry

1.1 Introduction

In today's dynamic and turbulent environments, supply chains must be able to reduce product development cycles, rapidly introduce new products, and respond swiftly to volatile demand and diverse customer requirements., (Christopher, 2020). As a result, it is considered essential that the supply chain satisfies these demands quickly for a firm's competitive advantage, to be in this sense, an Agile Supply Chain (ASC) is a supply chain strategy focused on the ability to understand and rapidly respond to market changes and customer demands (Christopher, 2020).Furthermore, the use of information technology is generally accepted to be one of the ways to deploy the aforementioned strategy and achieve supply chain agility.

payments. Digital payment is a form of e-commerce that has been introduced as a more convenient, efficient, and faster way of conducting financial transactions. Digital payment refers to various means of making payments using digital instruments. Digital transformation goes beyond the mere software and hardware updates to incorporate the evolution of both theinstitutional and operational ecosystems of the business entities, to be in-line with the growth of technology, new ways of thinking as well as benefiting from the digitization process (Kumar, 2019).

Digitalization refers to applying flexible business models such as digital payment methods like mobile money, electronic cars, working robots, and big data analytics. Technically, digital transformation involves the rearrangement of technology, business processes, and models, intending to deliver additional value to customers, employees, and stakeholders, within the changing digital environment. The major factor influencing the speed of digital transformation is customer demands. The supply chain management processes are altered, suchas reduction ofproduct design and amanufacturingperiod,fasterdeliveryofproducts to customers, easily meeting the preferences and demands of customers, and effective decision-making supported by big data and analytical decision techniques (Blanco, 2021). Additionally, digital transformation has played a critical role in increasing business operations efficiency and reducing the cost effect on business dealings.

Digital transformation is understood as the process of adoption and implementation of digital technologies by an organisation in order to create new or modify existing product, services and operations by the means of translating business processes into digital formats (George & Schillebeeckx, 2022). The goal of digital transformation implementation is to increase value through innovation, improve customer experience and

efficiency.

Simultaneously, supply chain management, traditionally regarded as the backbone of any business, has undergone its own evolution. The globalization of markets, the rise of ecommerce, and growing consumer expectations have necessitated supply chain agility, visibility and resilience. The efficient flow of goods and information across supply networks has emerged as a critical determinant of competitiveness and profitability (Koot, 2021). A digital supply chain (DSC) electronically delivers products from origin to destination and helps increase responsiveness, flexibility, and agility by using new and emerging technologies to create a transparent, secure, and reliable supply chain management (SCM) system. These emergent technologies enable firms to achieve customer‟s dynamic needs on time with various benefits which include cost-effective services and value-added operations and can be used by many ecosystem actors (Pagono & Liotine, 2020).

Given the interconnections between the two technological variables and their importance to supply chain management, this research studies the impact of Cloud Computing, Big Data Analytic, Blockchain and Internet of Things on the performance of the Twelve selected echelon manufacturing industries supply chain management in the six states of south-south region, Nigeria, which are Akwa-Ibom, Bayelsa, Cross-river, Delta, Edo, and River state.

1.2 Statement of the Problem

Supply chain management has traditionally been a complex and multifaceted disciplinethat orchestrated the flow of goods, 3 information and finances across the supply chain, from raw material suppliers to end-consumers. Historically, supply chain management relied heavily on manual processes, spread sheet and disjointed systems, which often resulted in inefficiencies, bottlenecks, and limited visibility into critical supply chain data.

Many organizations experienced shortages in the procurement of raw materials. Consequently, several organizations faced stock-outs as they were unable to matches supplies with demand. The environmental uncertainties were significantly related with demand and organizations are looking for the most effective approaches for dealing with uncertainties. Accordingly, many enterprises and industries failed to survive due to their inability to respond to the dynamics of the business environment. Specifically, some manufacturing industries are more vulnerable to supply chain disruptions caused by the pandemic due to their limited distribution expertise.

These challenges have made it abundantly clear that the status quo is no longer sustainable for businesses striving and to remain competitive. Digital transformation, driven by technological innovations such as the Internet of Things, Bigdata analytic, Blockchain and Cloud Computing offers a compelling solution to the shortcomings of conventional supply chainmanagement.Embracingdigitaltransformationempowerorganisationstore-imagine and re-invent their supply chain processes. It promises a real-time visibility into inventory levels, demand fluctuations and production status, enabling proactive decision-making. It also facilitates seamless collaboration with suppliers, partners and customers, fostering agility and adaptability in the face of disruptions.

However, while businesses recognize the potential benefits of digitizing their supply chain management processes, they often struggle with various issues that hinder successful implementation and realisation of the full advantages. Key challenges include; out-dated legacy systems, data silos, lack of integration, cyber security threats and resistance to change among employees and stakeholders. These obstacles collectively hinders the optimization of supply chains, reduce operational efficiency, increase costs, and limit the ability to respond swiftly to market fluctuations and customer demands. As a result, there is an urgent need to address these challenges and devise effective strategies for the successfuldigitaltransformationofSCMprocessesinordertoremaincompetitiveand adaptive in an increasingly digital and interconnected business landscape.

1.3 Research Questions

This study is guided by the following research questions;

i To what extent does Cloud Computing affect Agile Supply Chain Management?

ii What is the effect of Block Chain Technology on Agile Supply Chain Management.?

1.4 Objectives of the Study

The general objective of the study is to examine the effect of Digital Transformation Strategy on Agile

Supply Chain Management. The specific objectives are to:

i. Ascertain the effect of Cloud Computing on Agile Supply Chain Management.
ii. Explore the effect of Blockchain Technology on Agile Supply Chain Management.

Research Hypotheses

This study is anchored on the following research hypotheses;
HO1: There is no significant relationship between Cloud Computing and Agile Supply Chain management

HO2: There is no significant relationship between Blockchain Technology and Agile Supply Chain Management

Review of Related Literature

2.1 Digital Transformation Strategy

Digital transformation strategy is a structured plan for firms to harness digital technology and innovations to improve operations, enhance customer experiences, and stay competitive by embracing efficiency, agility, and innovation so as to fulfill customer expectations in the digital era. It also involves the deliberate integration of digital technology, processes and cultural transformations throughout the firm (Berg, &Josefsson, 2022). Digital transformation plan comprises certain changes that can affect the full firm and its strategic decisions which in the long run lead to the creation of competitive advantage in the market. Digital transformation further necessitates modifications in the current organizational business paradigm and shift to develop new organizational culture that will define the way organizations operate after performed digital transformation. To achieve digital transformation, the organization must ensure technical and technological competency because without such skills organizations cannot incorporate technologiessuch as Internet of Things (IoT), Artificial Intelligence (AI), Big Data, etc. (Kresmir, & Kovacic, 2020).

Digital transformation (DT) is crucial for all organizations, regardless of their size and industry of activity. Beyond the dematerialization of work processes, this strategy helps firms to optimize their operations, and gain in performance, efficiency, and competitiveness through the adoption of a new management mode, new tools, new styles of work and even new reflections and organizations. Digital transformation (DT) has become a significant topic of concern and a strategic issue for all organizations as it offers new potential for enterprises, beyond their core activities by accelerating their growth and establishing permanent competitive advantages and security of operations. The DT enhances the profitability of the organization by streamlining processes and interactions inside the company (Agrawal, Garza-Reyes, & Kumar, 2023).

2.1.2 Cloud Computing(CC)

This is an internet-based information service that permits anyone to access and exchange computer sources on requests from computers and other devices. It permits consumers to keep their files in their individual computers rather than in data centres. This can further enable consumers to access their stored data from wherever without necessarily using their original equipment. Applications such as Microsoft Office and ITunes have insured that software is distributed via the web browser rather than downloading them in computers wikipedia.com (Haris & Khan, 2018).

With the fact that the entire computational process is handled bya distant server or a cloud server, the resources can be accessed using any device with high-speed network connectivity from anywhere and the services are offered to the user at a very cheap priceon demand and are billed at the time when resources are released. The three basic paradigms of cloud computing are Software as a service (SaaS), Platform as a service (PaaS), and Infrastructure as a service (IaaS) these models offer an alternative, cost- effective approach (Fonseca & Sakellariou, 2019). Essentially, cloud deployment models highlight the different cloud environments that corporations, users, and organizations can choose from and can be characterized by ownership, scale, and access (Modisane & Jokonya, 2021). Some benefits of Cloud Computing (CC) include decreases in the total costs ofacquisition orownership (TCO) of equipment, software, and trained resources. CC is inexpensive since it relies on a pay as you go method and has no physical infrastructure to maintain. The idea was put forward that businesses would profit from simplicity of use, and IT professionals would be more productive if they adopted cloud computing.

Cloud Service Providers (CSPs) (e.g., Google, Microsoft, Amazon) are vendors whosupply to their clients the facilities of cloud computing resources and services that are dynamically engaged based on customer‟s demand according to a defined business model. Services in various industries such as business, education and

governance are supplied to the consumers online and are accessed via internet using a web browser, while data and software programs are preserved on the cloud servers positioned in the data centres (Arkorful, 2020). Cloud processing is the on-demand availability of computer system resources, especially data storage and processing capacities, without direct active monitoring by the user. It relies on pooling of resources to accomplish coherence and generally uses a pay-as-you-go method, which can benefit in minimizing capital expenses but may also lead to unplanned running expenses for users.

2.1.3 Blockchain Technology (BCT)

Blockchain is a distributed ledger system that is shared and agreed upon a peer-to-peer network that keeps a single record of data that is saved in blocks on every participant's node. Each block corresponds to a time stamped record that is confirmed through a defined consensus method of the blockchain network and safeguarded via public-key cryptography („hashing") (Singh, Rajesh & Mhesh, 2019). This Blockchain encrypted approach, fundamentally eliminates the demand for a trustworthy central organization. Blocks are chained via their hash codes; information on the blockchain is immutable and thus allows the user to obtain provenance information and to trace status change over time. A Blockchain technology executes computational logic in the form of smart contracts"(often referred to as chain code). A smart contract is a trusted application that is deployed on the nodes of the blockchain with respect to access privileges and can be distinguished. Both of these types can be either private or public dependent on the ownership over data and infrastructure (Agrawal, &Narian,2018).There are two basic types of blockchains: permissioned-private and permission less-public. Permissioned-privateblockchains(e.g.HyperledgerFabric)however,usersneedtoregister and be granted access by a network administrator based on a pre-defined approval process. Permissionless-public blockchains are publicly accessible over the internet (e.g. Bitcoin blockchain), Although BCT enforces openness, it provides for pseudonymity since transactions are resolved between 30-plus-character alphanumeric addresses. Block Chain Technology (BCT) is not restricted to financial transactions related to Bitcoins but any asset both tangible (physical good) and intangible (property right or financial claims) that entails value can be transferred onto or off the ledger Council of Supply Chain Management Professionals (CSCMP, 2018).

2.2 Empirical Review

The study of Bryan, (2023) carried out was to examine empirical literatures that add to the future directions of Agile Supply Chain Management, Selection and classification of the respective articles which was based on graduate-level literature review, The review was limited to referenced journals (i.e., does not include popular business journals, unpublished dissertations, etc.), yielding approximately 36 topic-relevant papers. The three-step review procedure(i.e., thorough material search, descriptive analysis and classification, theoretical and content analysis). Several additional non-refereed articles were used to supply facts and contextualize some of the key sources. The study found that cutting edge technologies such as cloud computing, big data analytics, Blockchain, Internet of things, are facilitators of Agile Supply Chain Management.

Mochammad, (2022), undertook a research to analyze the relationship between digital transformation characteristics and quality of health services in the heath business in the era of disruption. The design of the research was a literature review and data was gathered through the database, the researcher applied the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analysis) approach to get the necessary articles studied. Thematic analysis was applied for the inquiry. The result suggests that hospitals need to be driven to immediately pursue digital transformation in their administration in order to reach optimal data integration.

Maiurova, Kurniawan, Othman (2022), performed a study on Promoting digital transformation in waste collection service and waste recycling in Moscow, Russia. The study objective was to assess the present waste management facilities in Moscow with respect to inadequacies and the ways forward to decrease the bottlenecks. In the paper, case-study was utilized as the research approach to provide a means to analyze a complex garbage problem in Moscow and Berlin (Germany). It was evident from a cleaner productionparadigmthatdigitaltechnologymaylimittheamountofrecycledMSW, while protecting raw resources and reducing operational cost and GHG emissions. It was further shown that Digitalization boosts cities' resilience by increasing local waste management procedures to adapt to the Covid-19 global pandemic.

3.0 Methodology

A descriptive survey research design method was employed for this study. This design method was chosen because it is suitable for answering a wide range research questions relating to quantitative issues; who, what, when, where and how, associated with a particular research. The population for this study was derived from

the twelve selected manufacturing industries‟ employees in four states of South-South, Nigeria which are; Bayelsa, Delta, Edo, and River states out of the six states in south-south region, Nigeria. This adjustment was necessitated due to financial constraint that limits the researcher's capability in reaching out all the states of the region. A total of Nine thousand, six hundred and fifty employees who are knowledgeable about the effects of digital transformation strategy on agile supply chain management took part in the study. The sample size of 386 members was determined using the Taro Yamani formula. A stratified sample approach was employed for this study and this method divides the target population into homogeneous, non-overlapping strata that are mutually exclusive. The main instrument used to gather data for this inquiry is a structured questionnaire. The structured questionnaire has two parts (A, B). The section A aimed to gather the general bio-data of each respondent or the demographic aspect, whilst part B addresses the data requirements for each of the generated hypotheses. For the questions, the five-point liker-scale formula was used. Content validation was carried out to see that the questionnaire's content is acceptable and relevant to the goal of the study. Reliability testing was carried out using Crombach‟s Alpha-Based test and Kaiser-Meyer- Olkin (KMO) Battelle test for sampling adequacy. With a Cronbach Alpha coefficient value of 0.7744, roughly 0.8 bigger than 0.7, as the minimal reliability threshold, the table below shows that the variables are reliable following a pilot test. Primary sources and secondary sources were the two main sources of information employed in this research study. The data analysis tools that was utilised to analyse the collected data are regression and correlation. Prior to doing regression and correlation analysis with SPSS software version 23, the data was extrapolated from the distributed questionnaire and was coded. Regression analysis was used to determine the connection between two or more variables and to make predictions about one variable based on the other(s), for which correlation was employed to measure the strength of the link between the variables.

Results and Discussion

4.1 Data Presentation

This chapter documents the findings of this study. It is of two divisions- descriptive statistics and inferential statistics. The descriptive statistics summarized the demographic characteristics of the respondent and described data collected on the predictor and the criterion variables. The inferential statistics was used to test the hypotheses. The adopted inferential statistics was regression analysis. Four hundred and twenty questionnaires were distributed for this study out of which, four hundred and eight copies were returned, twenty two copies were wrongly filled and were rejected while three hundred and eighty six copies of the questionnaire were duly utilised for the study.

4.2 Data Analyses

Statistics on Table shows the mean, standard deviation, and the correlation coefficients of the study variables. The statistics revealed that cloud computing has a mean of 3.82 (SD.79), block chain technology 3.96 (SD .82), and agile supply chain management 3.70 (.78). The mean statistics ranged between 3.64 to 4.30 and indicates moderate response to the scale items. It also indicates that on the average the respondents were positively disposed to the scale items. The correlation coefficients show that of the 10 pairs of relationship 5 were significant (.05) and5werenotsignificant.Morealso, the relationship between with cloud computing and internet of things were negative. All the independent variables were positively and significantly related to the dependent variable. The highest relationship was between cloud computing and agile supply chain management.

Table 4.2: Mean, Standard Deviation and Correlation Coefficient on the Study Variables.

S/n	Variables	Mean	Sd	1	2	3
1	Cloud computing	3.82	.79	1		
2	Blockchain technology	4.30	.81	-.07	1	
3	Agile supply chain management.	3.96	.82	.21**	-.10	1

Source: Researcher's Field Survey Data Analyses, 2025

Data for this study are quantitative and was collected with five-point Likert scale format. Tables 4.2.1, 4.2.2, and 4.2.3, shows how the participants responded to each of the items of the five focal variables (cloud computing, blockchain technology and supply chain management) of the current study respectively. The

responses are presented in descriptive statistics that cover frequency and percentage. For the cloud computing measure, the statistics indicate that overall, most of the respondents chose "agree" response option. This was followed by "strongly agree", "disagree", and "strongly disagree" responses in that descending order.

4.3 Testing of Hypotheses

Multiple Regression Analysis predicting CC, BT from ASCM.

Model	B	SE(*B*)	*B*	T	Sig	Partial correlation	Part correlation	Tolerance	VIF
Constant	1.76	.39		4.51	.001				
Cloud computing	.15	.05	.15	3.01	.003	.15	.14	.94	1.06
Block Chain	.15	.05	.15	3.01	.003	.15	.14	.93	1.02
Blockchain technology	.09	.04	.09	1.95	.05	.09	.09	.94	1.05
	R=.25, R^2=.06, adjustedR^2=.05,*F*=6.68, p .001.								

Source: Researcher's Computational Data, 2025

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Cloud Computing(CC) and Blockchain Technology (BT) and Agile Supply Chain Management (ASCM).

The table shows multiple regression analyses on the predictive relationship between CC, BT and ASCM. The statistics revealed that CC is a significant predictor of ASCM ($\beta = .15$, $t = 3.01$, $p < 0.001$). These statistics confirmed Hypothesis 1. The B statistic indicates that a one-unit increase in CC leads to a .15 unit increase in ASCM. The square of part correlation (semi-partial correlation) of.02 indicates that CC accounted for a 2% variance in ASCM.

Furthermore, BCT positively and significantly predicts ASCM (β=.09, t =1.95, p <0.05), these statistics offered support for hypothesis 3. The B statistic indicates that a one-unit increase in BCT leads toa.09-unit increase in ASCM. The square of part correlation of.01 indicates that BCT accounted for 1% variance in ASCM.

4.4 Test of Hypotheses

This finding did not support the hypothesis which states that there is has no significant relationship between cloud computing and agile supply chain management. In other words, the finding 2 indicates that there is a positive and significant relationship between cloud computing and agile supply chain management and therefore the null hypothesis was rejected.

This study data analysis revealed that Blockchain Technology significantly and positively affected Agile Supply Chain Management. This finding contradicts hypothesis 3 which states that blockchain technology has no significant relationship with agile supply chain management therefore the hypothesis was rejected. Same existing empirical studies also reported similar result.

4.5 List of the Research Hypotheses and Findings

Hypothesis	Level of sig.	Decision
Hypothesis One: There is no significant effect of cloud computing on agile supply chain management.	.01	Rejected
Hypothesis Two: There is no significant effect of blockchain technology on agile	.02	Rejected

Source: Researcher's Field Survey Computational Data Analysis, 2025

4.6 Discussion of Findings

This study investigated the effect of Cloud Computing and Blockchain on Agile Supply Chain Management in manufacturing Industries in South-South geopolitical zone of Nigeria, with 386 participants drawn with a combination of probability and non-probability sampling techniques. The purpose was to identify the direction and extent of impact of cloud computing and blockchain technology independently has on agile supply chain management. Demographic statistics revealed that mean scores of 3.82 and 3.96 for cloud computing, blockchain technology and agile supply chain management respectively. The mean statistics ranged between 3.82 to 43.96 and indicate moderate response to the scale items. It also indicates that on the average the respondents were positively disposed to the scale items. The mean statistics also show that the sampled organizations have adopted the various technologies represented by the independent variables of this study at a moderate level.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the objectives and the findings of this study, the following conclusions were drawn;

i. It was revealed from the study that cloud computing have a significant and positive relationship with agile supply chain management. Several features of cloud computing as it relates to agile supply chain management offered explanation for the observed result. For instance, cloud computing improves supply chain performance with few programs installed in the company's computer's memory. The result agreed with extant literature which states that adopting cutting-edge technologies such as cloud computing significantly affects upply chain management and it provides opportunities for integrating systems in manufacturing industries. The findings further proves the efficacy of this research as it was revealed from his work that organization willing to introduce digital change strategy will be more competitive and achieve higher market share.

The study further revealed that Blockchain Technology has plausible explanations for the positive and significant effect on Agile Supply Chain Management, its finding proves that block chain technology is a verified solution to improving transparency and accountability in governance and has the inherent potential to enable faster and more cost- efficientdeliveryof products ,enhance products traceability, improve coordination between partners and aid access to financing. It also provides an accurate method of measuring product qualityduring transportation. Blockchain makes tracking of items and transactions in the supply chain radically faster and simpler by an estimated 85 per cent when used in conjunction with IoT technology, cutting administrative and logistics timelines.

Recommendations

In view of the conclusions drawn from the various findings of the study, the following recommendations were made:

i. The research finding indicates that the Cloud Computing has a substantial impact on Agile Supply Chain Management in manufacturing firms studied. It is therefore, recommended that manufacturing managers should prioritize the cloud computing strategies into its supply chain management

ii.The study findings also indicated that there is significant impact of blockchain technology on Agile Supply

Chain Management. The results identified variables like (transparency in supply chain, Traceability and visibility of products, secured sensitivity of data and collaboration among different data) to have a significant impact on agile supply chain management. Hence it recommends that blockchain technology be introduced in process of the supply chain unit.

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