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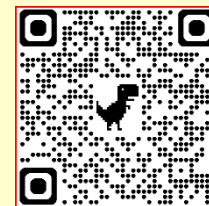
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EFFECT OF SUPPLY CHAIN MANAGEMENT PRACTICES ON PERFORMANCE OF PURE BIOTECH COMPANY LIMITED MAKURDI, BENUE STATE, NIGERIA

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ABSTRACT

The study examined the effect of supply chain management (SCM) on performance of Pure Biotech Company Limited, Makurdi, Benue State, Nigeria. Specifically, the study examined the effect of strategic supplier partnership, inventory management and transportation management on performance of Pure Biotech Company Limited, Makurdi with performance measured through cost efficiency and service delivery. The study adopted a case study research design with descriptive survey approach. The population of the study comprised 160 employees across procurement, finance, marketing, administrative, security, stores, and production departments. A sample size of 114 was arrived at using Taro Yamane's sampling formula. Data were collected using a validated and reliable structured questionnaire. Out of the 114 questionnaires administered, 103 were retrieved and analyzed. Descriptive and inferential statistics were conducted using SPSS v.25, with t-values and p-values in regression analysis employed to test the hypotheses. The results revealed that all three predictors had significant positive effects on performance. Strategic supplier partnership showed the strongest effect ($\beta = 0.580$, $t = 11.110$, $p = 0.000$), followed closely by inventory management ($\beta = 0.550$, $t = 9.580$, $p < 0.000$) and transportation management ($\beta = 0.520$, $t = 8.210$, $p < 0.000$). The study concluded that SCM is a critical driver of performance in biotechnology operations, and that improvements in suppliers relationship, digital inventory systems, and transport management directly translate into cost efficiency and better service delivery. The study recommended that Pure Biotech should institutionalize long-term supplier development framework, deploy technology-enabled inventory systems, and strengthen transport coordination and route optimization strategies.

KEY WORDS: Strategic Supplier Partnership, Inventory Management, Transportation Management, Cost Efficiency, Service Delivery, Biotechnology Industry

1.0 INTRODUCTION

1.1 Background of the Study

In today's interconnected and highly competitive global economy, the performance of organizations has become increasingly dependent on their ability to manage supply chains effectively. Disruptions such as the COVID-19 pandemic, geopolitical tensions,

fluctuating oil prices, and climate-related risks have exposed the vulnerability of global industries (including biotechnology) to inefficiencies in supply chain networks (Ivanov and Dolgui, 2021). Consequently, leading firms around the world are relying more on supply chain management (SCM) to strengthen resilience, reduce operational costs, and enhance service delivery performance. The

biotechnology sector, which is heavily innovation-driven and time-sensitive, has not been exempt from this reality. From vaccine development during the pandemic to agricultural biotechnology for food security, global biotech organizations now recognize SCM as a vital lever for sustaining effective performance and competitiveness.

Organizational performance comprises the actual output or results of an organization or achievement as measured against its intended goals and objectives (Nwankwo *et al.*, 2020). It is a means of getting better results by understanding and managing performance within an agreed framework of planned goals, standards, and competency requirements (Ugwude *et al.*, 2021). In this study, organizational performance is operationalized along two key dimensions: cost efficiency and service delivery performance, reflecting both internal productivity outcomes and external responsiveness. Cost efficiency captures how well a firm utilizes resources to minimize costs, optimize production processes, reduce waste, and achieve timely delivery of quality products an indicator of internal capability and process excellence (White and Green, 2020). Service delivery performance, on the other hand, reflects the extent to which the organization consistently provides timely, reliable, available, and responsive services to users and customers. In the biotechnology sector where products often bear clinical, agricultural, or environmental significance, service delivery performance emphasizes timeliness, accuracy, consistency of supply, and the ability to respond promptly to customer needs (Ali *et al.*, 2022). Together, cost efficiency and service delivery performance form indispensable indicators of performance because they determine not only profitability but also long-term competitiveness and organizational credibility.

Supply chain management is echoed to provide the backbone for achieving such outcomes. SCM is the coordinated management of activities involved in sourcing, procurement, conversion, and logistics, as well as collaboration with channel partners to deliver value to end users (Christopher, 2016; Mentzer *et al.*, 2021). Supply chains are the essence of any organization through their role in connecting suppliers, producers, and end customers in a network of creating and delivering products and services (Ikegbunam and Onuoha, 2023). SCM is better understood through dimensions such as strategic supplier partnership, inventory management, and transportation management (Chopra and Meindl, 2021). Strategic supplier partnership emphasizes long-term cooperation with suppliers to ensure reliable access to quality raw materials (Birahanu and Akililu, 2021). Inventory management concerns the planning and control of stock levels using policies and analytics that balance service levels with cost, prevent stockouts and overstocking, and align supply with demand (Gupta and Chopra, 2021). Transportation management ensures the cost-effective and timely movement and storage of materials and finished products (Ivanov *et al.*, 2021).

Globally, SCM have been shown to enhance firm performance by improving both cost efficiency and service-related outcomes. In the United States and Europe, biotechnology firms that implemented lean replenishment, safety-stock optimization, and AI-powered demand forecasting reported reduced lead times, lower inventory carrying costs, and enhanced production flexibility (Chopra and Meindl, 2020). In Asia, particularly India and China, the integration of blockchain and advanced traceability within biotech supply chains has reduced counterfeiting and improved product tracking, thereby strengthening service reliability (Zhao *et al.*, 2021). Across Africa, South Africa and Kenya have leveraged digital logistics and cold-chain management to stabilize temperature-sensitive flows, compress cycle times, and improve delivery reliability in agri-

biotech value chains (Nwankpa and Datta, 2021). Nigeria has also recorded promising developments: Chekkit Technologies, based in Lagos, employs blockchain to verify the authenticity of pharmaceutical products, thereby improving stakeholder confidence (Umeh, 2023). Collectively, these experiences underscore how supplier partnering, robust inventory management, and transportation management can translate into efficiency gains and superior service delivery.

Pure Biotech Company Limited Makurdi, Benue State provides a suitable context for this investigation. The company operates within an environment characterized by both opportunities and constraints: Benue State, known as the “food basket of the nation,” offers abundant agricultural inputs for biotech production. Yet Pure Biotech Company Limited appears to face procurement inefficiencies, inventory planning and control challenges, high transportation costs, and logistical limitations that constrain cost efficiency and service delivery performance. Customers often experience delays in product availability, long waiting times, and limited responsiveness; all of which indicate deficiencies in service delivery performance. Despite the firm’s strategic importance in the region, no empirical study has examined how SCM, conceived through strategic supplier partnership, inventory management, and transportation management affects its performance.

The motivation for this study stems from the limited empirical research on SCM in Nigeria’s biotechnology sector. While many studies have examined SCM’s role in traditional manufacturing (Aminu and Abdullahi, 2014; Mogaji and Gbadamosi, 2020), relatively few have focused on biotechnology, a sector increasingly vital for national healthcare, agricultural productivity, and environmental sustainability. The lack of context-specific insights has created a knowledge gap, leaving biotechnology firms without adequate guidance on how to deploy SCM dimensions—particularly inventory management in concert with supplier partnerships and transportation management—to enhance performance. Addressing this gap is not only academically relevant but also practically essential for sectoral growth in Nigeria.

1.2 Statement of the Problem

Ideally, biotechnology firms are expected to operate with highly efficient supply chain systems that ensure cost efficiency and timely service delivery. Such firms should maintain strong and collaborative relationships with suppliers, implement effective inventory control mechanisms to avoid stockouts and overstocking, and deploy reliable transportation systems that guarantee uninterrupted production and prompt product distribution. When these supply chain practices function optimally, biotechnology firms can minimize operational costs, sustain consistent production cycles, and meet customer demands efficiently, thereby enhancing overall organizational performance. However, the practical reality in many Nigerian biotechnology firms deviates significantly from this ideal. At Pure Biotech Company Limited in Makurdi, performance has continued to be constrained by persistent supply chain-related challenges. These include high procurement costs, delays in production cycles, weak inventory tracking systems, recurrent incidences of stockouts and excess inventory, and inefficient transportation arrangements. These inefficiencies escalate operational costs, disrupt product availability, and undermine the company’s ability to deliver services in a timely and reliable manner. As a result, the firm struggles to achieve the expected balance between cost efficiency and service delivery, which are critical indicators of performance in the biotechnology sector.

Although supply chain management (SCM) is widely recognized as

a strategic tool for improving organizational performance, most empirical studies in Nigeria have concentrated on manufacturing, pharmaceuticals, and general production sectors (Aminu & Abdullahi, 2014; Mogaji & Gbadamosi, 2020). While these studies confirm that strategic supplier partnerships, sound inventory management, and efficient transportation systems enhance performance, there is limited empirical evidence focusing specifically on biotechnology firms. Existing studies that touch on biotechnology remain scarce (Johnson & Davis, 2022; Nwogwugwu & Aliu, 2022) and often emphasize performance indicators such as profitability and operational efficiency, with insufficient attention to cost efficiency and service delivery, which are particularly critical in biotechnology operations characterized by time-sensitive inputs and specialized logistics. This gap in sector-specific evidence leaves biotechnology firms particularly Pure Biotech Company Limited without sufficient empirical guidance on how SCM can be leveraged to strengthen their performance. No known study has examined how strategic supplier partnership, inventory management, and transportation management jointly influence cost efficiency and service delivery within a biotechnology context in Nigeria. This study is therefore motivated to fill this practical gap in the organization and the knowledge gap in existing literature by empirically assessing the effect of supply chain management on the performance of Pure Biotech Company Limited.

1.3 Objectives of the Study

The primary objective of this study is to examine the effect of supply chain management practices on the performance of Pure Biotech Company Limited Makurdi, Benue State. Specifically, the study sought to:

- i. assess the effect of strategic supplier partnership on the performance of Pure Biotech Company Limited Makurdi, Benue State;
- ii. examine the effect of inventory management on the performance of Pure Biotech Company Limited Makurdi, Benue State; and
- iii. evaluate the effect of transportation management on the performance of Pure Biotech Company Limited Makurdi, Benue State.

1.4 Hypotheses

The study tested the following hypotheses:

- Ho₁:** Strategic supplier partnership has no significant effect on the performance of Pure Biotech Company Limited Makurdi, Benue State.
- Ho₂:** Inventory management has no significant effect on the performance of Pure Biotech Company Limited Makurdi, Benue State.
- Ho₃:** Transportation management has no significant effect on the performance of Pure Biotech Company Limited Makurdi, Benue State.

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

The study adopts the **Systems theory** introduced by Ludwig von Bertalanffy in 1968. This theory provides a comprehensive framework for understanding how the various components of a system or organization interact and depend on one another to achieve common objectives. Several fundamental assumptions underpin Systems Theory. First, it assumes interdependence, meaning that all parts of a system are interconnected and rely on one

another for optimal functioning. Second, the theory is grounded in holism, which asserts that the system as a whole is greater than the sum of its individual components. Third, it recognizes the importance of feedback mechanisms, which allow systems to adjust and adapt based on internal and external inputs. Fourth, the theory assumes that systems are dynamic and continuously evolve in response to environmental changes. Lastly, Systems Theory posits that organizations must be viewed as open systems, interacting with their environments to acquire resources, adapt to challenges, and sustain their operations over time.

Systems Theory is highly relevant to studying the effect of supply chain management on the performance of biotechnology companies, such as Pure Biotech Company Limited. Biotechnology supply chains are inherently complex and require high levels of precision, collaboration, and coordination. Systems Theory provides a framework for analyzing how various supply chain components such as procurement, strategic supplier partnership, inventory management, and transportation management interact to achieve organizational goals. It underscores the importance of seamless communication and integration across all supply chain functions, ensuring that processes are aligned and resources are utilized efficiently. Additionally, Systems Theory highlights the role of feedback mechanisms, such as supplier evaluations and customer feedback, in helping organizations adapt to changing market conditions and enhance cost efficiency and service delivery. Systems Theory offers a robust and dynamic framework for understanding and managing complex organizational processes. Its holistic approach, emphasis on interdependence, and adaptability make it particularly well-suited for analyzing supply chains in the biotechnology sector. By applying the principles of Systems Theory, Pure Biotech Company Limited can optimize its supply chain operations, enhance cost efficiency, and achieve sustainable improvements in service delivery in an increasingly dynamic and competitive market.

2.2 Conceptual Framework

The conceptual framework for this study outlines the relationship between Supply chain Management on Performance practices of Bio-Technology with a focus on Pure Biotech Company Limited. The framework is designed to provide a clear understanding of the variables involved and how Supply Chain Management practices (SCM, as an independent variable, influences Performance of Bio-Technology, the dependent variable. This section explains the underlying concepts, links them to the study objectives, and highlights how they will be measured. The relationships between the variables are further illustrated in Figure 1.

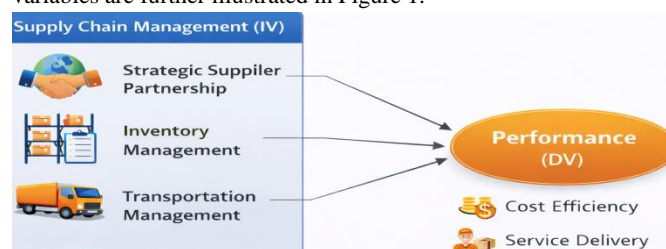


Figure 1: Conceptual Framework

Source: Researcher's Conceptualization (2026)

2.2.1 Supply chain management practices

Supply Chain Management (SCM) is a strategic approach that integrates and coordinates the flow of goods, information, and finances across the supply chain, from the procurement of raw materials to the delivery of finished products to end consumers. It

aims to optimize processes, reduce costs, and enhance customer satisfaction by ensuring the smooth and efficient operation of all supply chain components (Christopher, 2016). SCM has evolved from traditional logistics management into a sophisticated discipline that encompasses procurement, production, inventory management, distribution, and customer relationship management, among other functions.

Modern SCM emphasizes the importance of technology in managing complex supply chain networks. Technologies such as enterprise resource planning (ERP) systems, artificial intelligence (AI), blockchain, and the Internet of Things (IoT) have revolutionized SCM by providing real-time data, improving transparency, and enabling predictive analytics (Ivanov *et al.*, 2021). For example, blockchain technology enhances traceability and trust within the supply chain by recording every transaction in a decentralized and immutable ledger. These advancements enable companies to respond quickly to disruptions and adapt to changing market demands. Furthermore, AI-powered demand forecasting tools allow organizations to anticipate customer needs more accurately, thereby reducing overstocking and stockouts.

In the biotechnology sector, SCM plays a critical role in ensuring the timely delivery of high-quality products while complying with stringent regulatory requirements. Biotechnology companies rely on specialized raw materials, advanced technologies, and highly skilled labor, making SCM essential for achieving operational efficiency and innovation. Effective SCM enable biotechnology firms to manage costs, enhance product development, and maintain a competitive edge in a rapidly evolving industry. For instance, the integration of cold chain logistics is critical in ensuring the efficacy of temperature-sensitive biopharmaceutical products.

Despite its benefits, SCM faces several challenges. The globalization of supply chains has increased complexity, making coordination and communication more difficult. Cultural and regulatory differences across regions can create barriers to seamless operations. Furthermore, technological advancements, while beneficial, also require significant investments in infrastructure and training. Small and medium-sized enterprises (SMEs) often struggle to adopt advanced SCM due to resource constraints (Christopher, 2016). Addressing these challenges requires a strategic approach that balances innovation with practicality.

Supply chain management is a comprehensive and dynamic approach that integrates various activities and stakeholders to optimize supply chain performance. Its emphasis on technology, sustainability, and collaboration makes it a vital tool for organizations seeking to navigate the complexities of modern business environments. By adopting effective SCM, companies can achieve operational excellence, enhance customer satisfaction, and build resilient supply chains capable of withstanding disruptions. In the biotechnology sector, where precision and efficiency are paramount, SCM is indispensable for driving innovation and maintaining a competitive advantage.

In the context of this study, supply chain management refers to the deliberate coordination of interconnected activities, resources, and relationships that enable Pure Biotech Company Limited to transform raw materials into finished biotechnology products and deliver them efficiently to end-users. It embodies both a strategic and operational process that integrates procurement, production, logistics, and information flows across organizational boundaries with the aim of optimizing efficiency and maximizing customer satisfaction. SCM in this study is viewed not merely as a cost-

cutting mechanism, but as a driver of competitive advantage, particularly in biotechnology where product quality, timeliness, and responsiveness are essential to meeting market demands and sustaining firm performance.

2.2.2 Dimensions of supply chain management practices

Scholars generally conceptualize supply chain management (SCM) as a multidimensional construct encompassing strategic, operational, and technological perspectives. Mentzer *et al.* (2001) emphasized SCM as a systemic and strategic coordination of traditional business functions across firms to improve long-term performance, while Chopra and Meindl (2021) highlighted its role in optimizing flows of products, information, and finances across the chain. Building on these foundations, recent literature has identified core dimensions that drive supply chain performance, including supplier relationship management, inventory practices and transportation management (Christopher, 2016; Heizer *et al.*, 2020). Consistent with these perspectives, this study adopts three key dimensions; strategic supplier partnerships, inventory management and transportation management because they reflect relational and operational levers critical to enhancing cost efficiency and service delivery in biotechnology firms. Their adoption therefore provides a holistic framework for examining the performance of Pure Biotech Company Limited within the evolving context of global supply chain practices.

i. Strategic Supplier Partnership

Strategic supplier partnership is defined as the long-term relationship between the organization and its suppliers (Birahanu and Aklilu, 2021). It is designed to leverage the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits. A strategic partnership emphasizes direct, long-term association and encourages mutual planning and problem-solving efforts. Such strategic partnerships are entered into to promote shared benefits among the parties and ongoing participation in one or more key strategic areas such as technology, products, and markets (Sukati *et al.*, 2021). Strategic partnerships with suppliers are organized efforts to create and maintain of a network of qualified suppliers. This effort includes all activities that are needed to improve the current performance of suppliers. Strategic partnership emphasizes direct relationship and long-term and encourages mutual planning and efforts to resolve problem (Aboneh, 2017). Supplier organizations can work together more closely and eliminate useless time and effort (Li *et al.*, 2019). Strategic supplier partnerships, as applied in this study, denote long-term, trust-based relationships between Pure Biotech Company Limited and its key suppliers, designed to ensure a steady flow of high-quality raw materials and components essential to biotechnology production. These partnerships extend beyond transactional exchanges to involve collaboration in planning, quality assurance, and innovation, thereby reducing uncertainty and enhancing mutual growth. In the biotechnology context, where product safety and regulatory compliance are critical, supplier partnerships foster reliability, cost efficiency, and risk sharing, which directly translate into improved operational efficiency and higher customer satisfaction.

ii. Inventory Management

Inventory management is a core aspect of supply chain management that significantly influences the performance of biotechnology organizations. It involves planning, controlling, and monitoring inventory levels to ensure the availability of raw materials and finished products while minimizing holding costs. According to

Gupta and Chopra (2021), inventory management enhances operational efficiency by reducing waste, ensuring timely production, and avoiding stockouts or surpluses. In biotechnology firms, where materials like biological samples and chemicals are time-sensitive, effective inventory management ensures product quality and compliance with regulatory standards (Smith and Brown, 2020).

An integral part of inventory management is demand forecasting, which helps predict material requirements based on market trends and customer needs. Accurate forecasts enable firms to maintain optimal inventory levels, preventing overstocking or understocking (Anderson *et al.*, 2022). Additionally, advancements in technology, such as Enterprise Resource Planning (ERP) systems and Artificial Intelligence (AI), have streamlined inventory tracking, stock replenishment, and warehouse management. These tools have proven to be instrumental in improving inventory accuracy and operational flexibility (Kumar and Singh, 2021). Inventory management, within the scope of this study, represents the systematic planning, monitoring, and control of raw materials, semi-finished products, and finished goods to balance cost efficiency with service reliability in biotechnology operations. For Pure Biotech Company Limited, inventory management is not limited to storage but involves decisions on optimal stock levels, lead times, and replenishment policies that prevent both stock-outs and overstocking. Effective inventory management ensures continuous production, minimizes waste from expired materials, and guarantees product availability, which are vital in biotechnology where products are often perishable and highly sensitive, thus directly affecting performance outcomes.

iii. Transportation Management

Transportation and logistics management are critical functions within supply chain management, responsible for ensuring the efficient flow of goods, services, and information from the point of origin to the final consumer. These functions are interconnected and play a pivotal role in the overall operational success of businesses, particularly in industries like biotechnology, manufacturing, and retail, where timely delivery and quality assurance are paramount. Logistics encompasses the planning, execution, and management of processes related to transportation, warehousing, inventory management, and order fulfillment, while distribution focuses on the strategic movement of finished products to end-users or retailers (Christopher, 2016). One of the key objectives of logistics is to optimize the transportation of goods while minimizing costs and maintaining service quality. This involves selecting appropriate transportation modes such as air, sea, road, or rail based on factors like delivery timelines, cost, and product characteristics. For instance, biotechnology companies handling sensitive pharmaceutical products often rely on cold chain logistics to maintain the integrity of temperature-sensitive goods during transit. This requires specialized equipment, real-time temperature monitoring, and adherence to stringent regulations, ensuring that products reach their destinations in optimal condition (Ivanov *et al.*, 2021). Transportation management, in this study, refers to the integrated planning and execution of the physical movement of biotechnology products, information flows, and associated support services from suppliers to the company and from the company to end-customers. It encompasses transportation mode selection, warehousing, distribution, and last-mile delivery. For Pure Biotech Company Limited, effective logistics management ensures timely delivery of sensitive products under the right conditions, which is crucial for maintaining product integrity and customer trust. By

reducing delays, optimizing routes, and ensuring compliance with handling standards, logistics management contributes to both operational efficiency and enhanced customer satisfaction.

2.2.3 Concept of performance

The performance of biotechnology companies is a critical measure of their ability to achieve strategic goals, sustain growth, and create value in a highly competitive and dynamic industry. Biotechnology companies operate in an Innovation-driven environment, requiring continuous investment in research and development (R&D), technological advancements, and compliance with stringent regulatory frameworks. Their performance is evaluated through various dimensions, including innovation productivity, market responsiveness, cost efficiency, regulatory adherence, financial stability, and sustainability. According to Pisano (2006), success in the biotechnology sector largely depends on a firm's ability to innovate, bring new products to market, and maintain excellence in the management of costs and resources in the face of complex challenges. In this study, organizational performance refers to the overall effectiveness with which biotechnology firms such as Pure Biotech Company Limited achieve their goals and objectives, encompassing cost efficiency and service delivery outcomes.

Cost efficiency denotes the organization's ability to convert resources into outputs at the lowest feasible cost while maintaining quality and compliance standards. In biotechnology, this involves disciplined procurement, optimized production scheduling, inventory control, and cost-conscious transportation management. Effective cost efficiency reduces waste, avoids excess inventory, minimizes stockouts, and limits overheads, ensuring that the firm operates profitably without compromising product quality (Smith & Brown, 2020). Practices such as lean manufacturing, process optimization, and resource planning enhance cost efficiency, enabling firms to deliver products economically while sustaining competitiveness (Kumar & Singh, 2021; Johnson *et al.*, 2022). For Pure Biotech Company Limited, cost efficiency is reflected in metrics such as procurement cost per unit, production cost per batch, inventory carrying costs, logistics cost as a share of revenue, and process cycle times, which are directly influenced by SCM.

Service delivery represents the degree to which Pure Biotech Company Limited reliably provides products and services that meet stakeholders' expectations for availability, quality, timeliness, and responsiveness. In biotechnology, where products are often critical to healthcare, agriculture, or environmental applications, service delivery underscores the firm's ability to fulfill orders on time, maintain product integrity, and provide consistent support. Service delivery is influenced by supplier reliability, inventory availability, and the efficiency of transportation management systems (Harris & Brown, 2019; Wang & Li, 2020). In this study, service delivery captures the external manifestation of organizational performance, reflecting how internal SCM efficiency translates into reliable and trustworthy service outcomes for all stakeholders.

2.3 Review of Related Empirical Studies

Adebayo (2024) carried out an extensive empirical investigation to determine how supply chain integration contributes to organizational performance among medium-scale manufacturing firms in Southwest Nigeria. The study adopted a quantitative survey design and collected data from production managers, procurement officers, warehouse supervisors, and logistics personnel across 42 firms. Data was gathered using structured questionnaire while descriptive and inferential statistics were used for data analysis. Using multiple regression analysis, the study established that both internal integration and external supplier integration significantly enhanced

cost efficiency, reduced operational redundancies, and improved coordination across functional units. The findings demonstrated that firms that shared real-time information with suppliers, harmonized production schedules, and aligned procurement decisions with inventory levels experienced smoother operations and lower total supply chain costs. This study concluded that integration remains a powerful driver of organizational performance because it promotes better planning, faster decision-making, and optimal resource utilization. However this study covered 42 firm and failed to give a contextual detail hence the current study is focused on one biotechnonology company.

Chukwuma (2023) examined the effect of transportation management on performance outcomes among consumer goods distribution companies operating in Anambra State. The research used a cross-sectional survey method involving 318 logistics and distribution staff drawn through stratified random sampling. Transport-related variables such as fleet condition, route planning, vehicle scheduling, and driver management were measured using validated Likert-scale instruments. Data were analyzed using regression and correlation techniques, and the findings revealed that firms with structured transport frameworks recorded significantly lower delivery delays, reduced fuel consumption, and better cost efficiency. The study emphasized that an effective transport management system enhances the reliability and predictability of goods movement, which in turn supports higher organizational performance, especially in competitive distribution environments where timely delivery is critical. However, the study focused on consumer goods firms, neglecting biotech companies.

Mohammed (2023) conducted an empirical assessment of how inventory control practices shape organizational performance among selected small and medium manufacturing firms in Kaduna State. Utilizing a descriptive survey research design, the study sampled 265 employees involved in procurement, production, and warehouse management. Key inventory control mechanisms—such as economic order quantity (EOQ), safety stock determination, perpetual inventory monitoring, and stock classification—were examined for their effects on cost efficiency and general performance. Through multiple regression and ANOVA, the study revealed that firms implementing structured inventory systems experienced reduced incidences of overstocking and stockouts, minimized carrying costs, and improved production continuity. The study concluded that inventory control is a central driver of organizational performance because it ensures balance between inventory availability and cost minimization, thereby fostering smoother operations and improved resource management. However, the study focused on one variable and so failed to provide the integrated effect of all the 3 variables captured in the current study.

Johnson and Davis (2022) examined the extent to which supply chain management affects organizational performance. The study focused finding out how technological innovations in supply chain enhances the performance of small biotechnology firms, using a mixed-method design that combined survey questionnaires with focus-group discussions. Their study sampled 120 respondents from small biotechnology firms in the United States using purposive techniques. Quantitative data were processed using correlation analysis, while qualitative narratives were subjected to thematic interpretation. Their findings indicated that adopting digital tools such as blockchain systems for improved transparency, Internet of Things (IoT) sensors for real-time tracking, and data analytics for precise demand forecasting significantly strengthened operational responsiveness, inventory accuracy, product traceability, and

customer satisfaction. The study emphasized that firms leveraging these innovations were able to cut lead times, improve yield consistency, and enhance strategic decision-making. They recommended broader adoption of digital ecosystems within biotechnology supply chains. However, their analysis was set in a technologically advanced environment and overlooked the constraints typical of developing nations, such as infrastructural fragility, inconsistent power supply, and limited financing. This limitation provides a gap, and the present study seeks to address it by examining how biotechnology firms in Nigeria especially Pure Biotech Company Limited can leverage technologically feasible solutions within resource-constrained settings.

Nwogwugwu and Aliu (2022) explored the role of transport and logistics in improving supply chain performance within Nigerian food and biotechnology firms, using a descriptive survey design. The study targeted managers and supply chain professionals from 15 firms in Lagos and Abuja, selecting 100 participants via stratified random sampling. Structured questionnaires were employed for data collection, and correlation and regression analyses were used to determine the relationship between logistics practices and supply chain performance. The findings revealed that efficient logistics practices including transportation optimization, inventory management, and timely product delivery positively influenced overall firm performance, whereas poor logistics infrastructure led to delays, product spoilage, and reduced customer satisfaction. The study recommended that firms invest in improved logistics networks and modern technologies to enhance supply chain efficiency. Nevertheless, it did not specifically consider the needs of smaller biotechnology firms or the role of technology in logistics management, a gap addressed in the current study with a focus on Pure Biotech Company Limited in Benue State.

Okoro (2021) carried out an evaluative study on how supply chain strategies influence the competitive positioning of firms across Nigeria's manufacturing and service sectors. Using a descriptive survey design, the study sampled 250 managers and executives through stratified random procedures and collected data via structured questionnaires. Multiple regression analysis was employed to test the link between supply chain strategies and firm competitiveness. The findings showed that firms implementing strong supplier-relationship structures, lean production techniques, and just-in-time inventory systems achieved superior cost efficiency, faster delivery cycles, and improved product quality, thereby outperforming competitors in their markets. The study further reported that firms leveraging technology such as enterprise resource planning (ERP) platforms benefited from better coordination and reduced operational redundancies. The study recommended widespread adoption of globally aligned supply chain strategies that consider local infrastructural and environmental challenges. While informative, the study did not explore biotechnology firms whose supply chain characteristics differ considerably due to regulatory strictness, product sensitivity, and stringent storage demands. This limitation makes the study especially relevant to the current research, which extends the discussion to a biotech-specific context through the case of Pure Biotech Company Limited.

Alabi and Ojo (2020) explored logistics and distribution difficulties confronting biotechnology firms in Nigeria using a qualitative case-study design that involved 10 biotechnology firms in Abuja and Lagos. Data were gathered exclusively through in-depth interviews with senior logistics and operations managers and analyzed thematically. Their findings unveiled persistent challenges such as inadequate cold chain systems, unreliable transport networks, high

distribution costs, and regulatory delays all of which undermined the stability, quality, and timeliness of biotechnology product movement. They further observed that these challenges escalated operational costs, compromised product integrity, and strained customer relationships. Alabi and Ojo recommended investment in specialized logistics solutions, strengthened cold chain infrastructure, and more predictable regulatory processes. However, the study did not quantitatively establish how such logistical constraints affect firm-level performance outcomes. The present study fills this empirical gap by examining the performance implications of logistics challenges in Pure Biotech Company Limited.

Mburu and Kagai (2019) investigated supply chain challenges faced by biotechnology SMEs in Kenya and their effect on business performance, using a descriptive survey of 150 SMEs selected through stratified random sampling. Structured questionnaires and interviews were employed, with descriptive statistics and correlation analysis for data interpretation. The study identified constraints such as inadequate infrastructure, limited financing, poor supply chain visibility, and regulatory bottlenecks, which led to delivery delays, higher costs, and difficulty meeting customer demand. Cold chain management challenges were particularly pronounced due to product sensitivity. Recommendations included investment in supply chain technologies, infrastructure improvements, supplier relationship strengthening, and supportive government interventions. While conducted in Kenya, the study is relevant to the Nigerian context, providing insights into similar challenges faced by firms like Pure Biotech Company Limited in Benue State.

Adeniran and Yusuf (2018) examined the influence of inventory management practices on supply chain performance among Nigerian manufacturing firms using a correlational research design. The study sampled 200 supply chain managers and inventory officers in Lagos State, employing structured questionnaires for data collection and Pearson correlation and multiple regression for analysis. Efficient inventory management practices—such as just-in-time systems, demand forecasting, and automated stock control—were positively associated with reduced inventory costs, fewer stockouts, improved product availability, and greater customer satisfaction. The study recommended adopting advanced inventory technologies and enhancing managerial skills in strategic stock control. However, it did not focus on biotechnology firms, which face additional inventory constraints due to product shelf life and regulatory requirements, a gap addressed by the current study on Pure Biotech Company Limited.

3.0 METHODOLOGY

The study adopted a case study design complemented by a descriptive survey approach to examine the effect of supply chain management practices on the performance of Pure Biotech Company Limited, Makurdi. This design was considered appropriate because it enabled an in-depth investigation of the phenomenon within its real-life organizational context while also allowing for the collection of quantitative data through structured questionnaires without manipulation of variables. The study focused on three key dimensions of supply chain management (strategic supplier partnerships, inventory management, and transportation management) and their influence on organizational performance measured in terms of cost efficiency and service delivery. The population comprised all 160 employees of the company across ten departments: Production, Marketing, Procurement, Finance, Quality Control, Research and Development, Stores/Warehousing, Human

Resources, Security, and Management/Administration, reflecting the cross-functional nature of supply chain activities. A sample size of 114 respondents was determined using the Taro-Yamane formula at a 5% level of significance, and proportionate stratified random sampling was employed to ensure that each department was represented according to its population share.

Data were collected using a structured questionnaire divided into two sections. Section A captured respondents' socio-demographic characteristics, while Section B measured the study variables using a five-point Likert scale ranging from strongly disagree to strongly agree. The instrument was subjected to validity and reliability testing to ensure its adequacy. Face and content validity were established through expert review, while construct validity was confirmed using the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity, which produced a KMO value of 0.9815 and a statistically significant Bartlett's result ($p < 0.05$), indicating suitability for factor analysis. Reliability was assessed using Cronbach's alpha, with values ranging from 0.894 to 0.951, demonstrating strong internal consistency of the measurement scales. The questionnaires were administered through a face-to-face approach, allowing respondents to complete them independently within a specified timeframe. Out of the 114 copies distributed, 103 were correctly completed and retrieved, representing a response rate of 90.4%, which is considered highly satisfactory for empirical analysis.

The study utilized both descriptive and inferential statistical techniques with the aid of SPSS version 25. Descriptive statistics such as frequencies and percentages were used to summarize respondents' characteristics, while multiple regression analysis was employed to examine the effect of supply chain management practices on organizational performance. The model was specified as $P = \alpha + \beta_1SSP + \beta_2IM + \beta_3TM + \epsilon$, where performance is a function of strategic supplier partnership, inventory management, and transportation management. The a priori expectation was that all coefficients would be positive ($\beta_1 > 0, \beta_2 > 0, \beta_3 > 0$), indicating a positive relationship between the independent variables and performance. Hypotheses were tested using t-values and p-values at a 5% level of significance, with the decision rule that a variable is considered statistically significant if the t-value exceeds 1.96 and the p-value is less than 0.05. This approach ensured a rigorous and reliable analysis of the relationships among the study variables.

4.0 RESULTS AND DISCUSSION

4.1 Regression Analysis

Multiple regression analysis was adopted to achieve the study objective of examining the effect of supply chain management on performance of Pure Biotech Company Limited Makurdi, Benue State as presented under model summary, analysis of variance and regression coefficients.

i. Model Summary

The model summary in Table 1 shows that the regression model strongly explains performance outcomes at Pure Biotech Company Limited based on the four supply chain management dimensions. The R is the correlation coefficient which depicts the existence of positive or negative or negative relationship variables. The R value of 0.837 demonstrates a very strong positive correlation between the predictors (strategic supplier partnerships, inventory management, and transportation management) and the company's performance. The R square is the coefficient of determination which portrays the strength of the relationship in percentage. The R Square of 0.701 indicates that about 70.1% of the variations in the performance of

Pure Biotech Company Limited are explained by these four supply chain practices, while the remaining 29.9% may be due to other organizational, environmental, or market factors not included in the model. The Adjusted R Square which portrays the variation between the variables (0.684) confirms that the model retains its explanatory power even after accounting for the sample size and number of

predictors. Finally, the Durbin-Watson statistic of 1.980, which is close to the ideal value of 2, shows that the residuals are independent and that there is no issue of autocorrelation. This suggests that the regression model is statistically valid, making it appropriate to rely on for analyzing how supply chain management affects the performance of Pure Biotech Company Limited.

Table 1: Model Summary

Model	R	R Square	R square adjusted	Std. error of the estimate	Durbin Watson
1	0.837 ^a	0.701	0.684	0.452	1.980

a. Predictors: (Constant), Transportation management, Inventory management

b. Dependent Variable: Performance

ii. Analysis of Variance (ANOVA)

The ANOVA results in Table 2 show that the regression model is statistically significant in explaining the performance of Pure Biotech Company Limited. The regression sum of squares (68.451) compared to the residual sum of squares (29.124) indicates that a substantial proportion of the variation in performance is explained

by the predictors (strategic supplier partnerships, inventory management, Strategic supplier partnerships, management and transportation management). The F-statistic value of 83.945 with a significance level of 0.000 ($p < 0.05$) confirms that the overall model is highly significant. This means that, taken together, the three supply chain management practices reliably predict performance outcomes in Pure Biotech Company Limited. In practical terms, the results imply that the company's performance improvements cannot be attributed to chance but are strongly influenced by the effective management of its supply chain dimensions.

Table 12: Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	68.451	3	17.113	83.945	0.000 ^b
	Residual	29.124	99	0.448		
	Total	97.575	102			

a. Predictors: (Constant), Transportation management, Inventory management, Strategic supplier partnerships.

b. Dependent Variable: Performance

Source: Author's Computations using SPSS 2025.

iii. Regression Coefficients

Table 3 presents the regression coefficients showing the effect of the dimensions of supply chain management on the performance of Pure Biotech Company Limited, with performance measured in terms of cost efficiency and service delivery. The result shows that strategic supplier partnerships have a positive and statistically significant effect on organizational performance. The standardized coefficient of 0.580 indicates that a unit increase in strategic supplier partnerships leads to a corresponding increase of 0.580 units in organizational performance. This relationship is further supported by a high t-value of 11.110 and a p-value of 0.000, which is less than the 0.05 significance level. This implies that improvements in supplier collaboration, long-term supplier relationships, and effective supplier coordination significantly enhance performance outcomes in the company.

Inventory management also demonstrates a positive and significant relationship with performance. The standardized coefficient of 0.550 implies that a unit increase in effective inventory management practices results in a 0.550 unit increase in organizational performance. The t-value of 9.580 and the p-value of 0.000 confirm

that this effect is statistically significant. This suggests that efficient inventory control systems, proper stock monitoring, and effective inventory planning contribute meaningfully to improved cost efficiency and service delivery at Pure Biotech Company Limited.

Transportation management equally shows a positive and statistically significant effect on performance. The standardized coefficient of 0.520 indicates that a unit increase in transportation management effectiveness leads to a 0.520 unit increase in organizational performance. This result is supported by a t-value of 8.210 and a p-value of 0.000, which confirms the reliability of the relationship. This implies that efficient logistics planning, timely product distribution, and effective transportation coordination play a critical role in enhancing organizational performance. Overall, the regression results indicate that all three dimensions of supply chain management have positive and statistically significant effects on organizational performance. The magnitude of the standardized coefficients further suggests that strategic supplier partnerships exert the strongest influence, followed by inventory management and transportation management. These findings confirm that strengthening supply chain management practices is essential for improving cost efficiency and service delivery in Pure Biotech Company Limited.

Table 3: Regression Coefficients

Model		Unstandardized coefficients (B)	Standardized coefficients (Beta)	t	P-Value
1	(Constant)	0.521		3.520	0.000
	Strategic Supplier Partnerships	0.689	0.580	11.110	0.000

	Inventory Management	0.642	0.550	9.580	0.000
	Transportation Management	0.583	0.520	8.210	0.000

a. Dependent Variable: Performance

Source: SPSS Output of Field Survey, 2025.

4.2 Test of Hypotheses

Ho₁: Strategic supplier partnership has no significant effect on the performance of Pure Biotech Company Limited Makurdi, Benue State

The first hypothesis posits that strategic supplier partnership has no significant effect on the performance of Pure Biotech Company Limited, Makurdi. The regression result shows that strategic supplier partnership recorded a coefficient (B) of 0.689, with a standardized Beta of 0.580, a t-value of 11.110, and a p-value of 0.000. Since the p-value is less than the 0.05 significance threshold, the null hypothesis is rejected. This leads to the conclusion that strategic supplier partnership significantly improves the performance of Pure Biotech Company Limited.

Ho₂: Inventory management has no significant effect on the performance of Pure Biotech Company Limited Makurdi, Benue State

The second hypothesis states that inventory management has no significant effect on the performance of Pure Biotech Company Limited, Makurdi. The regression analysis produced a coefficient (B) of 0.642, a standardized Beta of 0.550, a t-value of 9.580, and a p-value of 0.000. With the p-value well below the 0.05 benchmark, the null hypothesis is rejected. Thus, the study concludes that inventory management is has a significant positive effect on the company's performance.

Ho₃: Transportation management has no significant effect on the performance of Pure Biotech Company Limited Makurdi, Benue State

The third hypothesis asserts that transportation management has no significant effect on the performance of Pure Biotech Company Limited, Makurdi. Regression results indicate a coefficient (B) of 0.583, with a standardized Beta of 0.520, a t-value of 8.210, and a p-value of 0.000. Given that the p-value is below 0.05, the null hypothesis is rejected. It can therefore be concluded that transportation management significantly impacts firm performance.

4.3 Discussion of Findings

The main thrust of this study was to examine the effect of supply chain management (strategic supplier partnership, inventory management and transportation) on performance of Pure Biotech Company Limited, Makurdi, Benue State. Supply chain management is widely acknowledged in literature as a critical driver of competitiveness and sustainability in modern organizations. For a biotech company, where timeliness, cost-effectiveness, and quality assurance are paramount, understanding how these practices influence performance is indispensable. This section discussed the findings in line with the three specific objectives of the study.

4.3.1 Effect of strategic supplier partnership on the performance of Pure Biotech Company Limited Makurdi, Benue State

The first objective of this study was to assess the effect of strategic supplier partnership on the performance of Pure Biotech Company Limited. The motivation for this objective stemmed from the recognition that suppliers play an indispensable role in the supply

chain, especially in biotechnology where the inputs are highly specialized and often perishable. Strategic supplier partnership was found to have a positive and statistically significant effect on performance ($\beta = 0.580$, $t = 11.110$, $p = 0.000$), indicating that a one-unit increase in the standardized coefficient leads to a 0.580-unit increase in performance. This suggests that long-term, trust-based supplier relationships improved coordination, ensured timely input supply, reduced procurement uncertainties, and enhanced cost efficiency in Pure Biotech. The finding supports Systems Theory, which emphasizes interdependence between organizations and suppliers as critical to overall system performance. Empirically, the result aligns with Adebayo (2024), Okoro (2021), and Johnson and Davis (2022), all of whom found that supplier integration and collaboration significantly enhance organizational performance through improved coordination, responsiveness, and cost control.

4.3.2 Effect of inventory management on the performance of Pure Biotech Company Limited Makurdi, Benue State

The second objective of this study was to examine the effect of inventory management on the performance of Pure Biotech Company Limited. This objective was driven by the recognition that in biotechnology firms, inventory is not just about stock levels but involves managing highly sensitive, regulated, and sometimes perishable materials. Inventory management had a positive and statistically significant effect on performance ($\beta = 0.550$, $t = 9.580$, $p = 0.000$), implying that a one-unit increase in the standardized coefficient leads to a 0.550-unit increase in performance. This indicates that effective inventory practices such as accurate stock monitoring, proper storage, and timely replenishment reduced wastage, prevented stockouts, and ensured smooth production processes. The result is consistent with Systems Theory, which views inventory as a critical internal subsystem influencing operational flow. It also agrees with Mohammed (2023), Adeniran and Yusuf (2018), and Mburu and Kagai (2019), who all established that efficient inventory systems improve cost efficiency, product availability, and overall organizational performance.

4.3.3 Effect of transportation management on the performance of Pure Biotech Company Limited Makurdi, Benue State

The third objective of this study was to evaluate the effect of transportation management on the performance of Pure Biotech Company Limited. Transportation management was found to have a positive and statistically significant effect on performance ($\beta = 0.520$, $t = 8.210$, $p = 0.000$), meaning that a one-unit increase in the standardized coefficient leads to a 0.520-unit increase in performance. This implies that efficient logistics systems improved delivery timeliness, reduced delays, ensured proper product handling, and enhanced customer satisfaction. The finding aligns with Systems Theory, which identifies transportation as a key subsystem linking internal operations to external markets. Empirically, it is consistent with Chukwuma (2023), Nwogwugwu and Aliu (2022), and Alabi and Ojo (2020), who all found that effective transportation and logistics management significantly improve organizational performance through better delivery reliability and operational efficiency.

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The objective of this study was to examine the effect of supply chain management practices on the procurement performance of Pure Biotech Company Limited, Makurdi, Benue State. Specifically, the study focused on strategic supplier partnerships, inventory management and transportation management as critical drivers of performance. The findings revealed that all three dimensions had a significant and positive effect on performance. Among them, strategic supplier partnerships emerged as the strongest predictor of improved procurement performance, followed by inventory management, and transportation management. Based on these results, the study concludes that performance of Pure Biotech Company Limited can be substantially enhanced through effective supply chain management. Strong supplier partnerships ensure reliable access to inputs and foster long-term collaboration; effective inventory management reduces wastage and stockouts; robust transportation management systems guarantee timely delivery and efficiency. Collectively, these dimensions strengthen cost efficiency and service delivery.

5.2 Recommendations

Based on the findings, the following recommendations are made:

- i. Management of Pure Biotech should invest in long-term supplier relationship strategies, such as joint planning, supplier development programs, and trust-building mechanisms. This will strengthen supply stability and increase supplier commitment, thereby driving higher procurement performance.
- ii. The company should deploy modern inventory control systems such as ERP-based monitoring tools and lean techniques like just-in-time (JIT). This will reduce wastage, ensure uninterrupted production, and improve responsiveness to demand fluctuations.
- iii. Pure Biotech should enhance its transportation framework by adopting route optimization software, strengthening its fleet management, and partnering with reliable third-party logistics providers. These measures will reduce delivery delays, cut operational costs, and improve customer satisfaction.

5.3 Suggestions for Further Studies

In light of these limitations, future research could:

- i. Extend the study to cover multiple biotechnology and pharmaceutical companies across Nigeria for broader generalization.
- ii. Adopt a longitudinal design to examine how supply chain practices affect performance over time.
- iii. Investigate other SCM practices such as supplier diversification, risk management, and sustainable procurement to provide a more holistic picture.

5.4 Contribution to Knowledge

This study contributed to knowledge by establishing the relative ranking of supply chain management practices and their effect on performance of Pure Biotech Company Limited Makurdi, Benue State. Specifically, it revealed that; strategic supplier partnerships exerts the strongest effect on performance of Pure Biotech Company Limited ($\beta = 0.580$); inventory management has moderate effect on performance of Pure Biotech Company Limited ($\beta = 0.550$); transportation management exerts the least but significant effect on performance of Pure Biotech Company Limited ($\beta = 0.520$). This ranking is significant because previous studies have often treated these practices as equally important, but the present study

demonstrated empirically that supplier relationships provide the strongest leverage for procurement success in a resource-constrained setting.

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