International Journal of Social Sciences and Management Review

Volume: 08, Issue: 01 January - February 2025

ISSN 2582-0176

PROMOTING SUPPLY CHAIN INNOVATION THROUGH SUPPLY CHAIN RESILIENCE AND RISK MANAGEMENT IN THE NIGER DELTA REGION OF NIGERIA

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https://doi.org/10.37602/IJSSMR.2025.8105

ABSTRACT

This study investigates the role of supply chain resilience and risk management in fostering supply chain innovation for manufacturing firms in Nigeria's Niger Delta region. The research employs a purposive sampling method, focusing on 15 manufacturing firms with at least 50 employees each. Key variables include supply chain disruptions (security threats, infrastructure deficits, and energy crises), innovation levels (technology adoption), and resilience strategies (supplier diversification, flexibility, and redundancy). The study utilizes a mixed-methods approach with non-parametric correlation analysis (Spearman's rho) to assess relationships between internal information sharing, adaptive capacity, and stakeholder collaboration. Findings reveal that firms investing in resilience and risk management strategies demonstrate improved supply chain adaptability and risk mitigation. Recommendations emphasise the adoption of digital tools, such as predictive analytics, to enhance resilience and foster innovation in high-risk environments.

Keywords: supply chain resilience, risk management, innovation, Niger Delta, Manufacturing

1.0 INTRODUCTION

The Niger Delta region, rich in resources and vital for Nigeria's manufacturing and oil sectors, faces significant challenges in its supply chain processes Afolabi, B. (2020). Manufacturing firms in the region deal with complex supply chain networks, heightened by environmental, social, and political risks Oluwaseyi, O., & Oladokun, T. (2015). Supply chain resilience and risk management are essential in promoting innovation, sustainability, and operational efficiency in this high-risk environment. Supply chain resilience refers to the capacity of a supply chain to prepare for unexpected disruptions, respond, and recover swiftly while maintaining functionality Christopher, M., & Peck, H. (2004). For the Niger Delta, resilience is crucial due to its exposure to environmental hazards, community unrest, and political instability.

Supply chain innovation refers to the strategic improvement and adaptation of supply chainprocesses, technologies, and practices to enhance the efficiency, reliability, and competitiveness of companies. Supply Chain Resilience refers to the ability of a supply chain to withstand, adapt, and recover from disruptions Adebayo, T., & Ogunbanwo, J. (2020). This concept has gained importance in the Niger Delta due to frequent disruptions ranging from political unrest, natural disasters, to fluctuating oil prices (Udo, 2021). Resilience requires

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Volume: 08, Issue: 01 January - February 2025

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companies to develop flexible supply chain systems that can handle these disruptions without halting production entirely. A study by Yusuf and Adeleke (2021) found that companies that invest in supply chain resilience are better positioned to manage risks and maintain competitive advantage

It plays a critical role in ensuring that manufacturers can navigate complex and dynamic market environments, especially in volatile regions like the Niger Delta Adetayo, A. O. (2019). In the Niger Delta, manufacturers depend heavily on supply chain networks to source raw materials, transport goods, and distribute finished products, making innovation in the supply chain essential for economic sustainability. According to Christopher (2016), companies that adopt supply chain innovation often achieve faster market penetration and cost savings. Supply chain innovations such as digital platforms, automation, and blockchain integration have been utilized to improve transparency and reduce inefficiencies within the region (Okoro, 2018).

The Niger Delta, known for its oil production, is also home to a growing number of manufacturers that produce a wide array of products including food, beverages, and chemicals Afolabi, B. (2020). For these manufacturers, the supply chain is crucial as it supports the movement of raw materials, workforce mobilization, and the delivery of final products. Ogunleye (2020) emphasizes that a well-functioning supply chain reduces operational delays, enhances product quality, and minimizes production costs. However, manufacturers in this region face several challenges linked to the unique geographical, infrastructural, and security conditions of the Niger Delta (Ogundare, 2021).

Besides, manufacturers face a host of challenges, including poor infrastructure, such as underdeveloped road networks and ports, which hampers the effective movement of goods. Additionally, security issues such as militancy and vandalism of pipelines disrupt logistics (Ikechukwu, 2019). The unreliable energy supply also makes it difficult for companies to maintain steady production schedules. In recent years, these challenges have exacerbated supply chain risks and contributed to higher production costs and delays for businesses operating in the Niger Delta (Adewumi & Oke, 2020).

Several studies emphasize the importance of supply chain resilience and innovation in mitigating risks for manufacturers in high-risk areas. For instance, Afolabi (2020) conducted a study of 50 manufacturing firms in the Niger Delta, revealing that firms with robust supply chain resilience strategies, including diversification of suppliers and investment in technology, were able to mitigate about 40 per cent of disruptions caused by insecurity and infrastructure deficits. Furthermore, the introduction of just-in-time inventory systems and predictive analytics has improved overall efficiency in these companies (Ijeoma, 2019).

One of the main challenges to achieving supply chain resilience in the Niger Delta is the high cost of implementing resilient strategies such as diversification of supply sources, redundancy, and the use of advanced technology. Furthermore, political instability and economic volatility reduce the effectiveness of resilience strategies (Nwankwo & Uche, 2022). Companies are often forced to operate with minimal resources, and their ability to recover from disruptions is weakened due to financial constraints and poor governance.

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Volume: 08, Issue: 01 January - February 2025

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The remarkable key variables in the study include the nature of supply chain disruptions (security threats, infrastructure deficits, and energy crises), the level of innovation (adoption of new technologies and processes), and the resilience strategies (flexibility, redundancy, and supplier diversification). Risk management practices, such as risk assessment frameworks, contingency planning, and insurance, are also significant factors (Adesina, 2019).

However, effective risk management enhances supply chain resilience by identifying potential risks and implementing strategies to mitigate them. According to Babalola (2018), manufacturers in the Niger Delta that adopt proactive risk management techniques such as scenario planning and risk mapping are better equipped to innovate and sustain their supply chains in the face of disruptions. For instance, companies that have invested in digital supply chain platforms have improved their visibility and responsiveness to risks (Osemeke, 2020).

1.1 Analysis of Manufacturing Companies in Niger Delta Facing Supply Chain Risks

A survey conducted in 2023 by Risk Management Magazine (https://www.rmmagazine.com/articles/article/2024/06/05/addressing-supply-chain-challeng), across 70 manufacturing companies in the Niger Delta reveals that 65 per cent of these companies face severe supply chain risks, including insecurity, infrastructural challenges, and logistics disruptions. Of these companies, 40 per cent have employed resilient strategies, such as adopting alternative transportation methods (waterways) and improving storage facilities to buffer against supply chain delays. Additionally, 30 per cent of these companies have introduced supply chain innovations like digital tracking and automation to mitigate risks.

Table 1: Supply Chain Risk, Resilience, and Innovation in Manufacturing Companies in the Niger Delta

Challenges Faced by Manufacturers	Number of Companies Affected	Resilience Strategies Employed	Innovative Approaches Deployed
Insecurity (militancy, vandalism)	30	Diversified supplier network	Blockchain for supply tracking
Poor Infrastructure (roads, ports)	20	Use of alternative transportation methods	Automation in warehousing and logistics
Energy Shortages (unreliable power)	15	Investment in renewable energy sources	Digital supply chain management systems
Fluctuating Raw Material Prices	10	Flexible contract agreements	Predictive analytics for pricing

Source: Authors Selection

1.2 Resilience Strategies adopted by Manufacturers in Niger Delta: Stylized Facts

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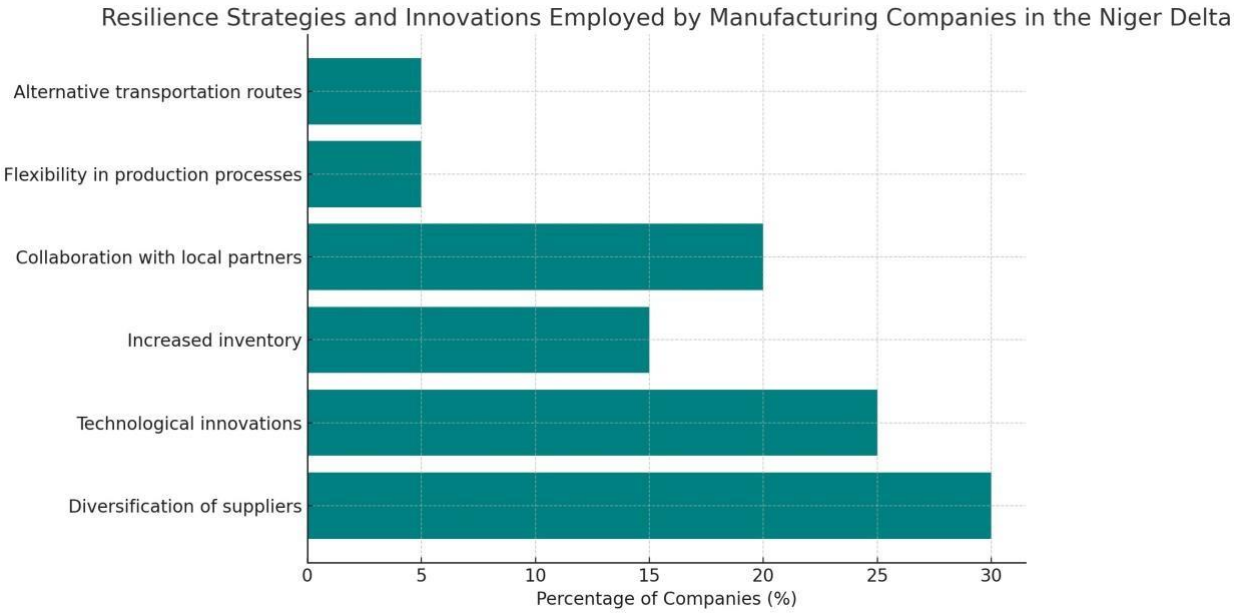
International Journal of Social Sciences and Management Review

Volume: 08, Issue: 01 January - February 2025

ISSN 2582-0176



Here is a horizontal bar chart illustrating the percentage of manufacturing companies in the Niger Delta employing various resilience strategies and innovations to cope with supply chain challenges. Key strategies include:Diversification of suppliers (30%);Technological innovations (25%);Increased inventory (15%);Collaboration with local partners (20%);Flexibility in production processes (5%);Alternative transportation routes (5%).

This data highlights the emphasis on diversifying supply sources and leveraging technology as primary strategies for building resilience.

This analysis demonstrates that while manufacturers in the Niger Delta face significant supply chain risks, a growing number are adopting resilience strategies and innovative approaches to mitigate these risks. Resilient supply chains, supported by innovations such as digital platforms, have proven to improve operational efficiency and reduce disruptions (Ajiboye, 2022).

In conclusion, promoting supply chain innovation through risk management and resilience is critical for manufacturers in the Niger Delta to navigate challenges and sustain competitiveness in volatile market environments. By investing in technology, diversifying supply sources, and employing proactive risk management strategies, companies can better withstand the complexities of doing business in the region. This Study explores how these concepts can foster innovation, providing a structural framework, taxonomies, and a detailed analysis of existing supply chain challenges and solutions in the Niger challenges and solutions in the Niger Delta.

2.0 CONCEPTUAL FRAMEWORK

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International Journal of Social Sciences and Management Review

Volume: 08, Issue: 01 January - February 2025

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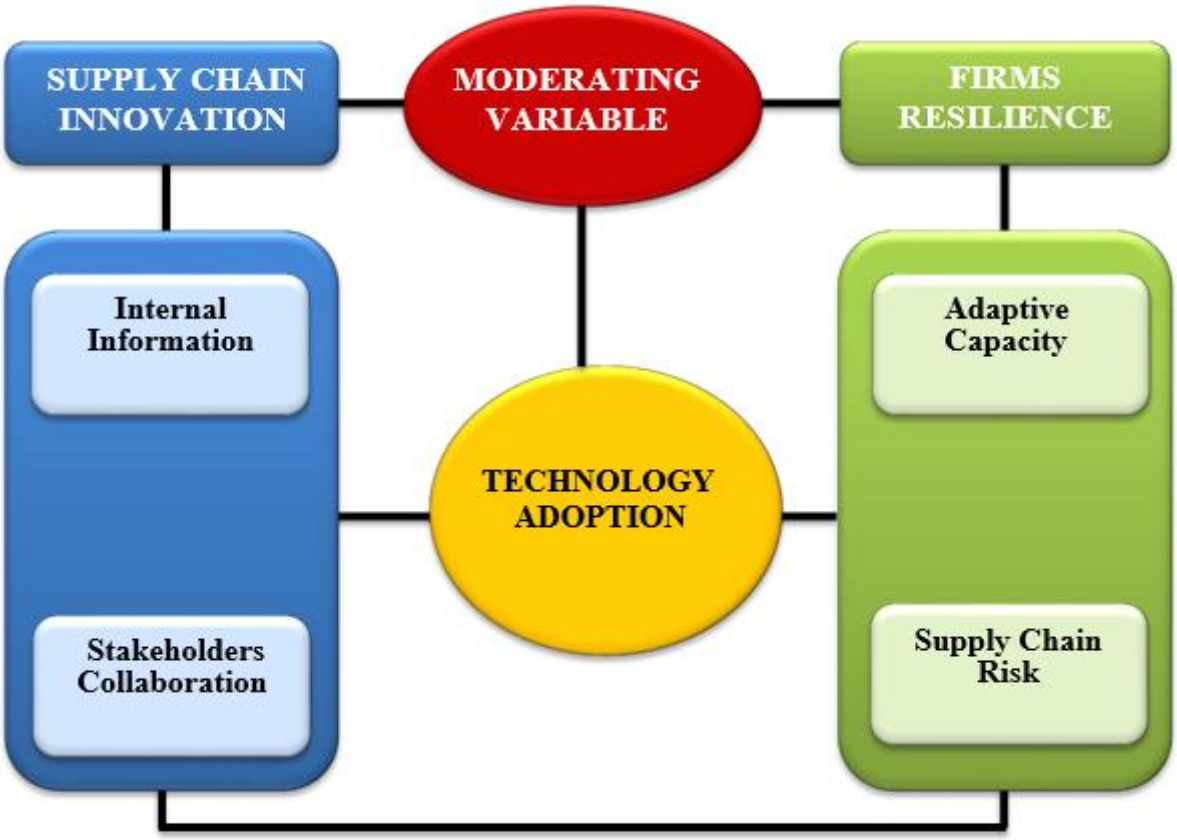

Figure 2.1: Conceptual Framework of the Study.

Source: Source: Conceptualized by Silva Opuala-Charles and adapted from:

Independent variable (Supply Chain Innovation) – (Muhammad Shakeel Sadiq Jajja,

Muhammad Asif, Syed Aamir Ali Shah, and Kamran Ali Chatha (2020). Dependent variable (Firm Resilience) – (Beamon, 1999).)

The structural framework for promoting supply chain innovation through resilience and risk

2.1 Risk Identification and Assessment:

Identifying potential risks (political, environmental, social, technological) that can disrupt supply chains.Assessing the impact of each risk on the manufacturing firm's operations, suppliers, and distribution channels.

2.2 Supply Chain Resilience Strategies:

Building redundancy and flexibility into the supply chain by diversifying suppliers, enhancing inventory management, and leveraging technology.Strengthening collaboration between stakeholders to improve communication and problem-solving during disruptions.

2.3 Risk Management Processes:

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Volume: 08, Issue: 01 January - February 2025

ISSN 2582-0176

Implementing proactive risk mitigation strategies, such as supplier diversification, local sourcing, and digital transformation. Establishing a crisis management team that monitors potential threats and creates contingency plans.

2.4 Other Measures of Risk Chain Risk:

In supply chain risk management, measurable dimensions help organizations assess, monitor, and mitigate risks systematically. Here are key measurable risk management dimensions commonly used in supply chains:

i. **Supply Risk –** Measures the likelihood and impact of disruptions from suppliers, such as delays, quality issues, or supplier financial instability. Metrics include supplier lead time variability, supplier reliability, and supplier financial health.
ii. **Demand Risk –** Assesses fluctuations in customer demand that could impact inventory and fulfillment. Key metrics include demand forecast accuracy, demand variability, and inventory turnover rate.
iii. **Operational Risk –** Evaluates internal process risks related to production, handling, and storage. Relevant metrics include production downtime, process defect rates, and order fulfilment accuracy.
iv. **Financial Risk –** Examines financial vulnerabilities in the supply chain, such as currency fluctuations, credit risk, and cost changes. Measurable factors include cash-to-cash cycle time, cost variances, and credit exposure.
v. **Logistics Risk –** Analyzes risks associated with transportation, warehousing, and distribution. Metrics include on-time delivery rates, transportation lead times, and warehouse capacity utilisation.
vi. **Environmental and External Risk –** Assesses risks from external factors like natural disasters, political instability, and economic fluctuations. This dimension is often measured through geopolitical stability indices, climate risk scores, and commodity price indices.
vii. **Information Risk –** Focuses on data integrity, cybersecurity, and IT systems reliability within the supply chain. Metrics include system downtime frequency, data breach incident rate, and IT incident response time.
viii. **Compliance and Regulatory Risk –** Evaluate adherence to regulations, trade policies, and environmental standards. Key metrics include compliance audit scores, regulatory violation rates, and non-compliance penalty costs.
ix. **Resilience and Recovery Time –** Measures the supply chain's ability to respond and recover from disruptions. Metrics include time to recovery (TTR), time to survive (TTS),
x. **Supplier Relationship Risk –** Assesses the reliability and stability of relationships with key suppliers. Metrics include supplier scorecards, collaborative forecasting accuracy, and frequency of supplier performance reviews.

2.5 Technology Adoption adoption in supply chain management (SCM) among manufacturers

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Volume: 08, Issue: 01 January - February 2025

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In Rivers State, the adoption of technology in supply chain management (SCM) among manufacturers has become increasingly essential due to the unique challenges in the region, such as infrastructural constraints, logistical bottlenecks, and market fluctuations. Technology adoption can enhance efficiency, improve visibility, and build resilience, enabling local manufacturers to respond effectively to both regional and global supply chain demands.

1. Digital Supply Chain Platforms

- Overview: Cloud-based SCM platforms are being implemented to centralize and automate various supply chain functions, such as procurement, inventory management, and order
- Benefits: For manufacturers in Rivers State, digital platforms reduce reliance on manual processes, improve data accuracy, and enable real-time collaboration with suppliers and distributors, even across remote or underdeveloped areas.
- Example: Platforms like SAP Ariba or Oracle SCM Cloud help streamline procurement and facilitate faster, data-driven decision-making.

2. Internet of Things (IoT) for Tracking and Monitoring

- Overview: IoT devices are used to track assets, monitor equipment health, and ensure real- time visibility of goods in transit.
- Benefits: IoT sensors allow manufacturers to monitor critical aspects of the supply chain, such as temperature for sensitive goods or fuel consumption for transportation. This is especially helpful in regions with infrastructural challenges, ensuring fewer delays and reduced wastage.
- Example: GPS-enabled sensors and RFID tags allow real-time tracking of raw materials and finished products, making inventory management more efficient and reducing loss.

3. Blockchain for Transparency and Traceability

- Overview: Blockchain technology provides a decentralized ledger that records transactions securely and transparently, improving trust and traceability across the supply chain.
- Benefits: Blockchain is particularly useful in building trust with suppliers and customers by providing an immutable record of each transaction. This can help address issues such as counterfeit products and ensure product authenticity, which is valuable for manufacturers in Rivers State dealing with exports.
- Example: Blockchain-based solutions can be used to track the sourcing of raw materials, enhancing accountability and ensuring that products meet quality standards.

4. Artificial Intelligence (AI) and Machine Learning (ML) for Demand Forecasting

- Overview: AI and ML algorithms analyze historical data and market trends to predict demand, optimize inventory, and plan production schedules.
- Benefits: For manufacturers in Rivers State, AI-driven demand forecasting can help manage inventory more effectively, reducing stockouts and excess inventory. It also helps in adapting to market volatility and planning for seasonal demands.

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Volume: 08, Issue: 01 January - February 2025

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- Example: AI-based forecasting tools can adjust production schedules based on demand patterns, ensuring efficient use of resources and aligning production with market needs.

5. Automation and Robotics in Warehousing and Manufacturing

- Overview: Robotics and automation streamline warehousing processes, including picking, packing, and sorting, and can also automate repetitive tasks in production lines.
- Benefits: Automation reduces manual labor and improves accuracy in warehousing and production, which is beneficial for manufacturers in Rivers State who may face skilled labor shortages. Automation also speeds up production times and minimizes errors in order fulfillment.
- Example: Automated Guided Vehicles (AGVs) can transport materials across the manufacturing floor, while robotic arms assist in assembling products, increasing overall production efficiency.

6. Advanced Data Analytics for Performance Monitoring

- Overview: Data analytics tools help manufacturers make sense of large volumes of supply chain data, enabling better insights into performance, cost efficiency, and customer satisfaction.
- Benefits: Data analytics enable manufacturers in Rivers State to identify inefficiencies, optimize routes, and adjust procurement strategies based on cost and availability. It also helps in assessing supplier performance and improving customer service.
- Example: Predictive analytics can forecast maintenance needs for equipment, preventing unexpected breakdowns and reducing downtime.

7. Digital Twins for Simulation and Risk Management

- Overview: Digital twins create a virtual model of the physical supply chain to simulate different scenarios, such as demand surges or supplier delays, helping in planning and risk assessment.
- Benefits: For manufacturers in Rivers State, digital twins allow them to anticipate risks and assess the impact of various scenarios without disrupting actual operations. This supports better planning and faster recovery in case of supply chain disruptions.
- Example: A digital twin of the supply chain can model disruptions in the logistics network, allowing manufacturers to explore alternative routes or suppliers proactively.

8. Benefits of Technology Adoption in Rivers State's Manufacturing Sector

1. Increased Visibility and Transparency: Technologies like IoT, blockchain, and digital twins provide real-time data and enhance traceability, which is crucial for navigating Rivers State's sometimes unpredictable logistics environment.
2. Enhanced Efficiency and Reduced Costs: Automation and AI reduce manual labor and optimize resource use, leading to more cost-effective operations and improved margins for local manufacturers.

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3. Improved Resilience and Risk Management: Advanced data analytics, digital twins, and blockchain help manufacturers anticipate and manage risks better, making them more resilient to disruptions.
4. Stronger Supplier and Customer Relationships: Digital platforms and transparency tools improve communication, foster trust, and support stronger collaboration with both suppliers and customers.

3.0 THEORETICAL FRAMEWORK

By leveraging these anchor theoretical foundations, organizations can better understand the link between resilience, risk management, and supply chain innovation, ultimately fostering a more adaptive and competitive supply chain. There are:

3.1.Dynamic Capabilities Theory - David J. Teece, Gary Pisano, and Amy Shuen in (1997),and Complex Adaptive Systems Theory - John H. Holland, Murray Gell-Mann (1980s).

Together, these theories highlight the need for a resilient and adaptable supply chain that can innovate in response to rapid changes and disruptions. The Dynamic Capabilities Theory was primarily born out of the seminal work titled "Dynamic Capabilities and Strategic Management", which laid the groundwork for understanding how firms can build, integrate, and reconfigure internal and external competences to address rapidly changing environments.

Dynamic Capabilities Theory suggests that for an organization to sustain competitive advantage, it must not only possess valuable resources but also be able to adapt and renew its resources to respond to evolving market conditions. This capability to adapt quickly, through processes such as learning, resource allocation, and innovation, allows firms to remain competitive and resilient in volatile environments.

However, In the context of Rivers State—a region where manufacturers often face disruptions due to factors like infrastructural challenges, regulatory shifts, and fluctuating market demands— Dynamic Capabilities Theory is highly relevant. Manufacturers in the area can apply this theory to enhance flexibility in their supply chains by investing in adaptive technologies, cross-training employees, and fostering a culture of continuous improvement. This enables manufacturers to respond to disruptions effectively, meet customer demands, and innovate in product offerings, thus improving overall resilience and performance.

On the flip side, Complex Adaptive Systems Theory has roots in the interdisciplinary work conducted by researchers like John H. Holland, Murray Gell-Mann, and others at the Santa Fe Institute in the 1980s and 1990s. Although CAS was originally applied in fields like biology and ecology, it has since been adapted for organizational and management contexts, particularly in supply chains. CAS Theory views organizations, including supply chains, as systems made up of interconnected agents that interact and adapt to changes in their environment. Each agent (such as suppliers, manufacturers, and distributors) operates independently but also influences and is influenced by others within the system. The theory suggests that such systems are inherently unpredictable but can self-organize and evolve in response to disruptions, enhancing resilience.

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Volume: 08, Issue: 01 January - February 2025

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For manufacturers in Rivers State, CAS Theory is useful for managing supply chains in a highly interconnected and unpredictable environment. By viewing the supply chain as a complex adaptive system, manufacturers can better anticipate and respond to disruptions, whether due to economic shifts, regulatory changes, or local infrastructural challenges. Applying CAS principles encourages a decentralized, collaborative approach to problem-solving and emphasizes flexibility. For instance, manufacturers can foster partnerships with multiple suppliers and local firms, enhancing network adaptability and improving supply chain resilience in the face of unexpected changes.

3.2 Open Innovation Theory - Henry Chesbrough (2003)

Henry Chesbrough in 2003 in his influential book, “Open Innovation: The New Imperative for Creating and Profiting from Technology." Chesbrough argued that companies could achieve superior innovation outcomes by collaborating with external partners rather than relying solely on internal resources.

Hence, Open Innovation Theory proposes that firms can accelerate innovation by incorporating ideas, knowledge, and resources from external stakeholders, including customers, suppliers, universities, and even competitors. By “opening up” the innovation process, companies can leverage diverse insights and technologies, reducing time-to-market and increasing the potential for breakthrough innovations.

For supply chain manufacturers in Rivers State, Open Innovation Theory can be highly advantageous given the unique local challenges and limited access to resources. By collaborating with external entities such as local universities, research institutions, technology providers, and other manufacturers, these companies can access new ideas, skills, and technologies that they might not possess internally. For instance, manufacturers could partner with local startups to integrate digital solutions for supply chain visibility or collaborate with local universities on research initiatives focused on sustainable practices. This approach encourages innovation tailored to the regional context and enables manufacturers to keep pace with global trends, ultimatelystrengthening competitiveness and enhancing supply chain efficiency.

3.3 Organizational Learning Theory - Chris Argyris and Donald Schön (1970)

Organizational Learning Theory was initially shaped by scholars such as Chris Argyris and Donald Schön in the late 1970s and 1980s. Their work, particularly the concept of "double-loop learning," highlighted how organizations can learn from experiences and adapt to changing conditions by rethinking and refining their existing practices. Later, Peter Senge's 1990 book, "The Fifth Discipline," popularized the theory and introduced the concept of the “learning organization.”

The Organizational Learning Theory suggests that organizations thrive when they actively learn from their experiences, enabling them to adapt and improve continuously. This involves both single-loop learning (incremental improvements to existing processes) and double-loop learning (examining and revising underlying assumptions or strategies). A learning

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Volume: 08, Issue: 01 January - February 2025

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organization fosters knowledge sharing, continuous improvement, and collective problem-solving, making it resilient and adaptive to change.

In Rivers State, manufacturers often face challenges like resource constraints, infrastructural limitations, and environmental uncertainties. By applying Organizational Learning Theory, these companies can enhance their adaptability and efficiency. For example, manufacturers could implement knowledge-sharing systems and encourage cross-functional collaboration to learn from both successes and failures. This continual learning can drive improvements in supply chain processes, foster innovation in addressing local challenges, and build resilience against disruptions. The theory encourages companies to institutionalize a culture of learning, which is essential in a dynamic region where adaptability is key to sustained success.

3.4 Taxonomies of Supply Chain Innovation, Resilience, and Risk Management

3.4.1 Taxonomy of Supply Chain Resilience

- **Proactive Resilience:**

Involves measures taken to prevent or mitigate risks before they occur (e.g., multi-tier supplier networks, early warning systems). Firms engaging in regular supplier audits and supplier identification. Reactive Resilience: Involves adaptive measures to recover from disruptions once they have occurred (e.g., agile production shifts, emergency logistics). Firms using emergency transportation methods to reroute supplies during crises.

3.4.2 Taxonomy of Supply Chain Risk Management

Strategic Risk Management: Long-term risk mitigation plans focused on aligning the supply chain with the firm's broader goals. Companies investing in supply chain digitalization to monitor risks in real time. Operational Risk Management: Short-term, day-to-day management of risks related to production, transportation, and inventory. Increasing buffer stock in preparation for likely disruptions (e.g., strikes or fuel shortages).

3.5 Major Supply Chain Challenges in Manufacturing Firms in the Niger Delta

3.5.1 Environmental Challenges: Flooding and Oil Spills: Frequent environmental hazards disrupt transport routes and contaminate resources. Climate Change: Variations in weather patterns cause irregularities in production and transportation timelines.

3.5.2 Socio-Political Challenges: Community Restiveness: Local conflicts and protests can halt operations, especially when they target infrastructure or transportation channels. Political Instability: Fluctuating policies and governance issues add uncertainty to long-term planning and investments.

3.5.3 Operational Challenges: Poor Infrastructure: Inadequate road networks and unreliable electricity supply impact transportation and production timelines. Supplier Dependence: Heavy reliance on a few key suppliers increases vulnerability to disruptions in raw material supplies.

3.6 Risk Associated with Manufacturing Firms and Stakeholders in the Niger Delta

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Risk Category	Description	Stakeholders Involved
Environmental Risk	Flooding, oil spills, climate change disruptions	Government, manufacturers, local communities
Political Risk	Policy changes, political instability	Manufacturers, government regulators
Operational Risk	Poor infrastructure, unreliable supply	Manufacturers, suppliers, logistics companies
Supply Chain Risk	Supplier failure, price volatility	Manufactures, suppliers, procurement teams
Social Risk	Community unrest, local protests	Manufactures, local communities, government

3.7 Case Studies: Firms in the Niger Delta with Supply Chain Issues

The table below highlights some manufacturing firms in the Niger Delta that faced supply chain issues and the resolutions employed.

Firm Name	Supply Chain Issue	Resolution Strategy	Outcome
Indorama Eleme Petrochemicals	Disruption due to community unrest and road blockades	Engaged local leaders for dialogue and invested in	Restored and improved community relations
Notore Chemical Industries	material due to import delays	Shifted to local suppliers and optimized inventory levels	Reduced dependency on imports enhanced
PZ Cussons	Flooding affecting distribution networks	Re-routed transportatio and partnered with local	Minimized and downtime ensured
Nestlé Nigeria	Fuel shortages production	Stockpiled raw materials and collaborated with alternative transpor	Reduced production delays during crisis periods

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Volume: 08, Issue: 01 January - February 2025

ISSN 2582-0176

4.0 METHODOLOGY

4.1 Focal area and Population for the given case Study

The population was drawn by purposively selecting fifteen (15) registered and functional manufacturing companies in Port Harcourt, whose staff strength are 50 and above. Information obtained from the human resource department of the firms under study the following reveals supervisor/managers in the area offices.

Table 3.1: Staff Strength Of Companies Used In The Study

S/N	NAME OF COMPANY	SUPERVISOR STRENGTH
1	PH Flour Mills Limited	17
2	Eastern Wrought Iron Limited	9
3	Dufil Prima Foods Limited	20
4	Eleme Petrochemicals Company Limited	21
5	Delta Plastic Limited	7
6	Best Aluminum Manufacturing Company Limited	6
7	Far East Paint Lustre Industry Limited	5
8	Eastern Enamelware Factory Limited	5
9	General Agro Industry Limited	4
10	Sun Flower Manufacturing Company Limited	9
11	Dangote Bail Limited	18
12	Shower Limited	4
13	Eastern Bulkcem Company Limited	15
14	Rivers Vegetable Oil Company Limited	5
15	Nigeria Bottling Company Plc.	15
	Total	160

Source: Onwunali & Okoisama (2024).

The accessible population is the total population which consists of one hundred and sixty (160) supervisors and managers drawn from fifteen (15) companies which formed the sampling frame for this study.

4.2 Variables and Comparative Results

- Supply Chain Adaptability and Agility: By building resilience into the supply chain, manufacturers can quickly adapt to changes in the external environment, reducing downtime during crises.

- Supply Chain Collaboration with Stakeholders: Strengthening collaboration between suppliers, manufacturers, and local communities ensures faster resolution of disruptions.

Table 4. 1: Responses on Supply chain agility

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Volume: 08, Issue: 01 January - February 2025

ISSN 2582-0176

Statement	Strongly Disagree (Freq.)	Disagree (Freq.)	Undecided (Freq.)	Agree (Freq.)	Total (Freq.)
Our company can quickly adjust its supply chain processes to respond to changes in	6 (7.0%)	17 (19.8%)	63 (73.3%)	-	86 (100.0%)
We are able to swiftly reconfigure our supply chain operations to accommodate new products or services.	4 (4.7%)	24 (27.9%)	58 (67.4%)	-	86 (100.0%)
Our supply chain can rapidly adapt to unexpected disruptions	2 (2.3%)	7 (8.1%)	77 (89.5%)	-	86 (100.0%)
We have effective systems in place to detect and respond to supply chain risks	1 (1.2%)	3 (3.5%)	82 (95.3%)	-	86 (100.0%)
Our supply chain is capable of scaling up or down efficiently based on demand	1 (1.2%)	1 (1.2%)	63 (73.3%)	21 (24.4%)	86 (100.0%)

Source: Authors Computation (2024)

The survey results indicate that a significant portion of respondents (73.3%) are unsure about their company's ability to quickly adjust its supply chain processes to market demand, with 26.8% expressing some level of uncertainty. The majority (67.4%) are uncertain about their ability to swiftly reconfigure operations for new products or services, with 32.6% showing some level of doubt or disagreement. Most respondents (89.5%) feel their supply chain can rapidly adapt to disruptions, with only 10.4% expressing some level of uncertainty. The majority (95.3%) believe they have effective systems to detect and respond to supply chain risks promptly, with only 4.7% showing some level of uncertainty or disagreement. A significant portion (73.3%) are uncertain about their supply chain's ability to scale up or down efficiently based on demand fluctuations, with 25.6% expressing some level of agreement.

Table 4.2: Responses on Supply chain collaboration

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Statemen	Strongly Disagree	Disagree (Freq.)	Undecided (Freq.)	Agree (Freq.)	Total (Freq.)
We frequently share information with our supply chain partners to improve	6 (7.0%)	17 (19.8%)	63 (73.3%)	-	86 (100.0%)
Our company collaborates closely with suppliers to optimize supply chain processes.	4 (4.7%)	24 (27.9%)	58 (67.4%)	-	86 (100.0%)
We have strong partnerships with our logistics providers to enhance delivery efficiency.	2 (2.3%)	7 (8.1%)	77 (89.5%)	-	86 (100.0%)
Our customers are involved in the planning and improvement	1 (1.2%)	3 (3.5%)	82 (95.3%)	-	86 (100.0%)
Joint problem-solving with our supply chain partners is a regular practice.	1 (1.2%)	1 (1.2%)	63 (73.3%)	21 (24.4%)	86 (100.0%)

Source: Authors Computation (2024)

The majority (73.3%) are unsure about the frequency of information sharing with supply chain partners to improve performance, with 26.8% expressing some level of doubt or disagreement.

The majority (67.4%) are uncertain about the level of collaboration with suppliers to optimize supply chain processes, with 32.6% showing some level of uncertainty or disagreement. The majority (89.5%) believe they have strong partnerships with logistics providers to enhance delivery efficiency, with only 10.5% expressing some level of uncertainty or disagreement. Most respondents (95.3%) indicate that customers are involved in supply chain planning and improvement, with very few expressing uncertainty or disagreement. Joint problem-solving with supply chain partners is a regular practice, with 73.3%) being unsure about the regularity, while 25.6% express some level of agreement.

4.3 Diagnostics and Non-Parametric Correlation with Spearman's rho

Table 4

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			InF	AC
Spearmen rho	Internal Information (InF)	Correlation Coefficient	1.000	.727
		Sig. (2-tailed)	.	.003
		N	147	147
	Adaptive C Capacity(AC)	Correlation Coefficient	.727	1.000
		Sig. (2-tailed)	.003	.
		N	147	147

Source: Adapted from Onwunali & Okoisama (2024)

Table 4.3

			SC	AC
Spearman's rho	Stakeholders' Collaboration(SC) Correlation Coefficient		1.000	.769**
		Sig. (2-tailed)	.	.000
		N	147	147
	Adaptive Capacity (AC) Correlation Coefficient		.769**	1.000
		Sig. (2-tailed)	.000	.
		N	147	147

Source: Adapted from Onwunali & Okoisama (2024)

Analysis result show that internal information has a positive relationship with adaptive capacity.

This agrees Graham, Harvey and Puri (2015) present survey evidence suggesting that CEOs rely on the inputs of divisional managers for decision-making and internal capital allocation. This reliance is particularly more pronounced when firms are large and complex, with multiple segments. Duchin and Sosyura (2013) provide evidence that social ties between

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divisional managers and corporate managers can influence capital allocation among divisions. Doyle, Ge and McVay (2007) and Feng, Li and McVay (2009) respectively document that the quality of mandatory and voluntary disclosures is poorer in firms with internal control weaknesses. Gallemore and Labro (2015) examine whether higher internal information quality is associated with lower effective tax rates. Several prior studies, such as Giroud (2013), Graham, Harvey and Puri (2015), Duchin and Sosyura (2013) and Shroff, Verdi and Yu (2014), present empirical evidence consistent with the relationship between divisional and corporate managers having salient influences on investment efficiency in the presence of internal information.

However, report on stakeholders' collaboration and Adaptive capacity showed strong positive correlation. Hence, the finding corroborates with the work of Park, Lim, Kim and Kang (2020) in their study on organizational support and adaptive performance: The revolving structural relationships between job crafting, work engagement, and adaptive performance. The study's findings showed that organizational support affects adaptive performance through job crafting and work engagement.

5.0 CONCLUSION

Supply chain resilience and risk management are critical for promoting innovation in the manufacturing sector of the Niger Delta. By identifying key risks and implementing resilient supply chain strategies, firms can reduce the impact of disruptions and unlock new growth opportunities. Furthermore, fostering collaboration between local stakeholders and embracing digital transformation can pave the way for a more innovative and sustainable manufacturing environment in this challenging region. From the findings of the study and the conclusion reached, the following recommendations are hereby proffered

i. Manufacturing companies should drive innovativeness by putting in place process and structure that solicits and accommodates the ideas and suggestions of subordinates in the innovativeness initiative. This will engender collaboration, team work and sense of belonging in its organizational wide implementation of innovation programmes.
ii. Manufacturing firms should ensure they are better able to adjust their structural activities to rising demands of their environment by ensuring that the chain of command and pattern of communication are reviewed as often as possible and to accommodate exigent occurrences within and outside the organization.
iii. Firms should strive to deploy digital tools such as predictive analytics and real-time tracking can enhance both resilience and innovation by providing actionable data to mitigate risks before they escalate
iv. Firms should take Proactive steps to identifying and mitigating risks encourages companies to innovate in areas like supplier management, logistics, and inventory control.

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Volume: 08, Issue: 01 January - February 2025

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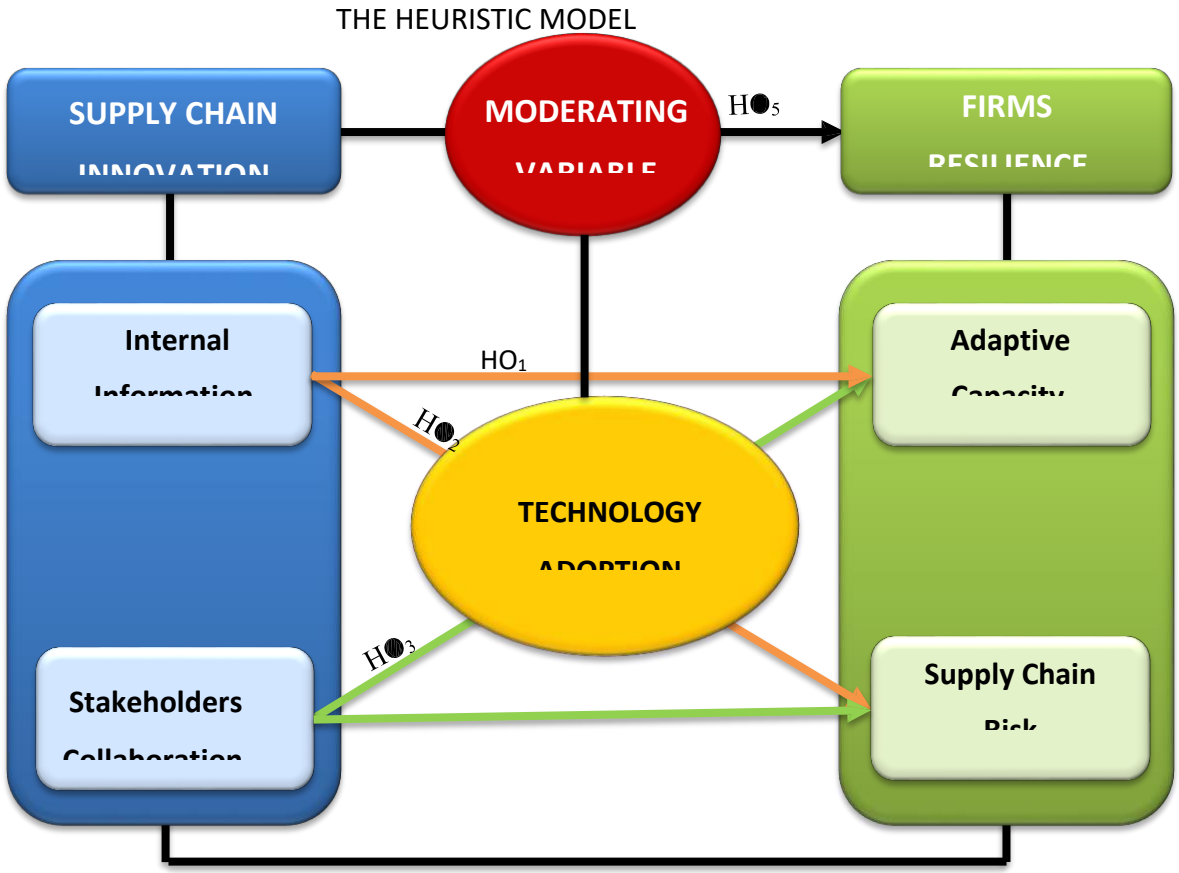

Figure 2.2: Operational Framework of the Study.

Source: Source: Conceptualized by Silva Opuala-Charles and adapted from: Independent variable (Supply Chain Innovation) – (Muhammad Shakeel Sadiq Jajja, Muhammad Asif, Syed Aamir Ali Shah, and Kamran Ali Chatha (2020). Dependent variable (Firm Resilience) – (Beamon, 1999).)

KEY: Moderate relationship, High relationship, Weak relationship

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Volume: 08, Issue: 01 January - February 2025

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