

RISK ASSESSMENT AND SUPPLY CHAIN RESILIENCE OF SHIPPING COMPANIES IN RIVERS STATE

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Abstract

The study investigated the correlation between risk assessment and supply chain resilience of shipping companies in Rivers State. Risk assessment was treated unidimensionally, while supply chain resilience was measured with flexibility and cost reduction. The study adopted an explanatory research design with a correlational method of investigation. The study population comprised 84 shipping companies in Rivers State. The researcher used a census method and administered structured questionnaire to operations manager, compliance manager, and information technology coordinator of the shipping companies. Pearson Product Moment Correlation was employed to test the hypotheses relying on Statistical Package for the Social Sciences (SPSS), version 25.0. The study revealed positive and statistically significant correlation risk assessment and measures of supply chain resilience. Thus, the study concluded that risk assessment has positive significant correlation with supply chain resilience of shipping companies in Rivers State, and recommends that shipping companies in Rivers State should institutionalize risk assessment procedures to enhance operational flexibility; and also integrate risk assessment outcomes into cost-control strategies to improve their overall supply chain resilience.

Keywords: Cost reduction, flexibility, supply chain resilience, risk assessment

Introduction

The maritime industry is significant to Nigeria's economic growth and development, as it accounts for a substantial portion of the country's trade, with approximately 80% of shipping business on the West African coast occurring in Nigeria (Adenigbo et al., 2023). Shipping firms are a vital component of the maritime industry. They facilitate intercontinental trade, bulk transport of raw materials, and the import/export of goods, ensure efficient movement of products worldwide and underpin the global economy (Sahdev et al., 2023). Shipping facilitate efficient material transportation and foster investment in port and transport-related infrastructure (Poi & Moko, 2023; Poi & Opara, 2021; Brooks et al., 2014).

Rivers State, with its extensive coastline, ports, and significant oil and gas activities, is an important shipping hub in Nigeria (Nwaogazie & Ikebude, 2023). However, shipping companies in the region are faced with significant risks, including poor infrastructure, cargo theft, natural disasters and geopolitical instability to regulatory changes, and piracy (Eke et al., 2023). Over the years, the need for structured risk management practices has grown, as supply chain disruptions have led to significant financial and reputational losses. Risk assessment has emerged as a crucial risk mitigation practice for analyzing potential threats, ensuring continuity and resilience in shipping operations (Chelak, 2024).

Previous studies provide insights into the role of risk assessment in enhancing supply chain resilience. However, there is scarcity of studies focused on the nexus between risk assessment and supply chain resilience of shipping companies in Rivers State. Thus, this study sought to join the

discourse by examining the correlation between risk assessment and supply chain resilience of shipping companies in Rivers State. It is believed that the outcome of this study will contribute to the development of more resilient maritime supply chains. Thus, ensure business continuity and long-term economic stability in Rivers State and beyond. The conceptual framework of the study is presented in Figure 1 below.

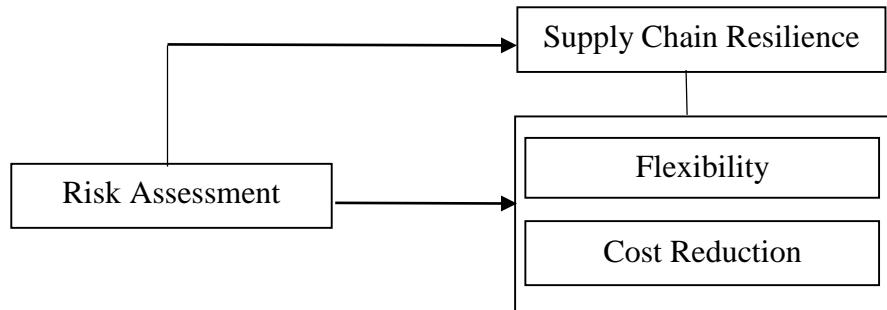


Fig. 1: Conceptual framework of relationship between risk assessment and supply chain resilience of shipping companies in Rivers State.

Theoretical Background

Goldratt' (1984) theory of constraints (TOC) is forms the foundation of this study. TOC posits that every complex system, including organizations, has at least one constraint that limits its performance relative to its goal. Identifying and managing this constraint is essential to improving performance (Goldratt, 1984). TOC emphasizes a systematic approach to identifying critical limiting factors (i.e., the constraints) and restructuring organizations around those factors, in order to achieve improvement. This approach involve five steps: identify constraint, exploit constraint, ensure that the constraint's capacity is maximized and not wasted, and subordinate.

In the context of risk assessment and supply chain resilience of shipping firms in Rivers State, TOC offers a framework for identifying and addressing constraints that may hinder the robustness of the supply chain. By focusing on constraints, shipping firms can prioritize risk management efforts on areas that, if improved, would most significantly enhance overall supply chain performance (Bhuiyan et al., 2024). For instance, a common constraint in shipping operations is port congestion, which delay cargo handling and disrupts schedules. Applying TOC, a firm would identify port congestion as a constraint, exploit it by optimizing scheduling to avoid peak times, and subordinate other processes (Sahdev et al., 2023).

Concept of Risk Assessment

Risk assessment is a crucial risk management practice for companies of all sizes (Chelak, 2024) that focuses on identifying and managing internal and environmental risks associated with daily operations (Guterman, 2023). Risk assessment crystalizes as a systematic process used to identify, analyze and evaluate potential risks that could negatively impact a firm, project, or system. It is an essential aspect of risk management that help firms anticipate and mitigate threats before they cause significant disruptions (Crandall, 2020). The process involves assessing the likelihood of an event occurring and determining the potential consequences (Crandall, 2020). This allow firm to develop proactive strategies to minimize negative impacts.

In the opinion of Onuwubuya and Odogwu (2023), risk assessment involves analyzing and evaluating uncertain events that may affect objectives, using both qualitative and quantitative methods. Ebong and Ihunwo (2024) emphasizes that risk assessment is a structured approach used to identify threats, vulnerabilities, and consequences in order to support risk management

decision-making. Galvagni and Clementel (2024) opined that risk assessment involves evaluating potential risks associated with processes and systems in high-hazard environments.

Effective risk assessment helps firms anticipate and mitigate risks; hence, ensure business continuity and resilience (Latif, 2024). It enables better decision-making by providing clear understanding of potential threats and their implications. Additionally, risk assessment improves resource allocation, as organizations focus on mitigating the most significant risks rather than wasting resources on low-impact threats. In shipping firms, risk assessment is crucial for enhancing safety, regulatory compliance and operational efficiency. Narayanan et al, (2024) argued that risk assessment plays a crucial role in supply chain resilience by identifying potential disruptions, enabling proactive strategies, and enhancing decision-making.

Supply Chain Resilience

Resilience can be broadly defined as a system's capacity to adapt, recover, and bounce back from adversity, disruptions, or shocks while maintaining functionality and integrity (Hollnagel et al., 2006). Ateke and Nwulu (2018) described it as a dynamic process that allows creatures subjected to persistent hardship or potentially crippling situations to gradually adapt positively. In other words, it is a system's ability to continue to perform and meet its objectives in the face of challenges (Ateke & Nwulu, 2018). Resilience is an important concept in today's dynamic and competitive business environment characterized by various controllable and uncontrollable uncertainties.

Villar et al. (2024) view supply chain resilience as the capacity of a supply chain to foresee, adjust to, and recover from disturbances while sustaining continuous operations and meeting customer demand. It can also be defined as the capacity of a supply chain to anticipate, absorb, adapt to, and recover from disruptions without compromising operational performance (Ateke & Harcourt, 2018). Villar et al. (2024) opined that supply chain resilience enables firms to adapt to fluctuating demand and resource scarcity, thereby enhancing operational flexibility and efficiency.

Owuso and Ihunwo (2019) states that risk assessment is crucial to improving resilience because it provides essential insights into potential hazards and their implications. The assessment of risk is vital for supply chain resilience, as it involves evaluating potential disruptions such as natural disasters, geopolitical challenges, and supplier issues. By proactively assessing these risks, firms can implement strategies that enhance their supply chain's flexibility and robustness (John et al. 2023). Kern et al. (2012) opined that risk assessment is crucial to supply chain resilience because firms face diverse risks such as supplier, supply market, and external environmental risks. This study adopts the measures of supply chain resilience identified by Leoni et al. (2024) which include flexibility and cost reduction.

Flexibility

The Latin words *flexus* (bent, winding) and *flectere* (to bend or bow) are the root of the English term flexibility, which originally described tangible items that could bend without losing their shape or identity (Jackson, 2015). Interest has arisen through the realization that flexibility is a key weapon for achieving competitive advantage, especially in competitive markets and those with the greatest uncertainty. The importance of flexibility stems from the fact that firms do not compete in isolation but within a dynamic environment. This environment is characterized by rapid economic, social, environmental and technological changes that necessitate adaptable organizational structures (Barrales et al., 2022).

According to Nagaraju (2024), flexibility refers to the potential to quickly and efficiently supply individualized and more satisfying services. Alolayyan and Alyahya (2023), posit that

flexibility refers to the ability to adjust quickly with minimal impact on time, cost, effort, or performance as situations change, enhancing performance. It also describes how businesses can adjust capacity in response to shifting demand, improving performance by effectively adjusting to unanticipated events (Barrales et al., 2022). Lee (2022) defines it as the capacity of service providers to modify human functions, service levels, and procedures in response to evolving needs, hence improving organizational capability and service performance.

Cost reduction

Cost reduction is another critical measure of supply chain resilience; and a primary tool of competition in a global economy (Leoni et al., 2024). Cost reduction is a corrective function that includes minimizing expenses to turn a profit. Since no cost is at its optimal level, it begins when cost control concludes (Mandy, 2017). Every corporate sector - manufacturing, packaging, freight, finance and accounting, human resources, legal, marketing - is in search of the best strategy to reduce costs (Gaurav et al. 2013) without compromising quality or customer service (Agburum & Adiele, 2022).

Cost reduction is very crucial because it enable firms achieve and sustain long-term savings (Kohana et al., 2023), and ultimately gain a competitive advantage through efficient resource allocation, enhanced profitability and innovation that leads to improved market positioning and sustainability (Yu et al., 2023). Also, cost reduction is help firms maintain competitiveness, enhance productivity, and ensure long-term sustainability. It allow enterprises eliminate waste, optimize resources, and adapt to market challenges, ultimately leading to increased profitability and resilience (Figar & Ivanović, 2015).

Risk Assessment and Supply Chain Resilience

Considering the importance of risk assessment, various empirical studies have been carried out to provide insight on its relationship with supply chain resilience. Samson et al. (2024) examined effect of risk assessment and management on operational performance of Kenya Revenue Authority. The findings of the study showed that risk assessment and management have a significant relationship with operational performance of Kenya Revenue Authority.

Ebong and Ihunwo (2024) investigated impact of logistics risk assessment on resilience of oil and gas servicing companies in Akwa-Ibom State, focusing on coping with change, adaptability and resilience ethos as proxies of resilience. The study adopted an explanatory research design. Its population comprised 16 oil and gas servicing companies. Results of the analyses showed that logistics risk assessment has positive and significant impacts on coping with change, adaptability and resilience ethos of oil and gas servicing companies in Akwa-Ibom State.

Kashif (2024) analysed supply chain risk management in the pharmaceutical industry and found that effective supply chain risk assessment significantly enhance operational performance. Relatedly, Sangwa and de Dieu (2023) investigated the effect of risk management on project performance and found that risk management positively influence project performance.

The foregoing empirical review showed that risk assessment is instrumental to enhancing supply chain resilience. However, due to our need to conduct statistical analyses and interpretation, we hypothesize as follows:

H₀₁: There is no significant correlation between risk assessment and flexibility of shipping companies in Rivers State.

H₀₂: There is no significant correlation between risk assessment and cost reduction of shipping companies in Rivers State.

Methodology

This study adopted an explanatory research design with a correlational approach to examine the relationships between risk assessment and measures of supply chain resilience in a natural setting. The population of the study comprised 28 shipping companies in Rivers State, as listed in the Fineline.com Nigeria Directory and Search Engine (2024). The study adopted a census approach, which involved studying the entire population. However, 3 respondents from each of these shipping companies provided data for the study. The respondents were operations manager, compliance manager, and information technology coordinators. Primary data was collected through structured self-administered questionnaire. The validity of the questionnaire was confirmed by academic experts in the department of marketing. The Cronbach Alpha test was used to assess the reliability of the instrument, with 0.7 set as the benchmark. Table 1 provide a summary of results of test of reliability. Descriptive statistics were used to analyze the demographic data and response distribution. Inferential statistical tools such as Pearson's Product-Moment Correlation (r) were used to test the formulated hypotheses, with the aid of SPSS version 25.0.

Table 1: Summary of Reliability Test Results

Construct/Scale	Number of Items	Cronbach's Alpha
RA (Risk Assessment)	4	0.890
FL (Flexibility)	4	0.851
CR (Cost Reduction)	4	0.826

Source: SPSS output of data analyses (2025).

Analysis and Results

Table 2: Descriptive Statistics of Risk Assessment

Item	N	Min	Max	Mean	Std. Dev.
Our organization evaluates the likelihood of occurrence of identified risks	77	2	5	3.58	1.080
Our organization assesses the severity of consequences associated with each risk	77	2	5	3.57	0.802
Our company examines its internal vulnerabilities such as infrastructure or safety systems	77	2	5	3.69	1.091
Our company categorizes risks by type (e.g., environmental, operational, regulatory)	77	2	5	3.55	0.882
Valid N (listwise)	77				

Source: SPSS output of data analyses (2025).

Table 2 summarizes the descriptive statistics for risk assessment as practiced by shipping companies in Rivers State. The mean scores for all four items ranged from 3.55 to 3.69, indicating that respondents generally affirmed the presence of structured risk assessment procedures within their organizations. The highest mean (3.69) was recorded for the item on assessing internal vulnerabilities such as infrastructure or safety systems, suggesting a relatively stronger emphasis on internal evaluations. The item on categorizing risks by type recorded the lowest mean (3.55), though still indicating moderate attention to systematic classification of risks. Standard deviations ranged from 0.802 to 1.091, reflecting a modest spread in responses, with the greatest variability found in responses about internal vulnerability assessments.

Table 3: Descriptive Statistics of Flexibility

Item	N	Min	Max	Mean	Std. Dev.
We believe that our company can switch shipping routes in response to disruptions	77	2	5	3.75	1.114
We believe that our company can switch to alternative logistics partners, terminals, or service contractors	77	2	5	3.45	0.804
We believe that our company can reschedule or adjust delivery plans due to unforeseen events	77	2	5	3.52	1.096
We believe that our company can reallocate resources to maintain continuity during disruptions	77	2	5	3.51	0.772
Valid N (listwise)	77				

Source: SPSS output of data analyses (2025).

Table 3 presents the descriptive statistics for flexibility. The mean values range from 3.45 to 3.75, indicating a moderate to high level of perceived flexibility among the sampled shipping companies. The highest-rated item (mean = 3.75) was the ability to switch shipping routes in response to disruptions, reflecting a strong confidence in route adaptability. This was followed by the capacity to reschedule or adjust delivery plans (mean = 3.52) and to reallocate resources during disruptions (mean = 3.51), suggesting operational responsiveness is generally achievable. The lowest mean (3.45) was associated with switching to alternative logistics partners or service providers, indicating some limitations in external collaboration flexibility. Variability in responses was highest for route switching (SD = 1.114), showing divergent levels of capability across firms.

Table 4: Descriptive Statistics of Cost Reduction

Item	N	Min	Max	Mean	Std. Dev.
Our company minimizes cargo damage-related costs through proactive risk management practices	77	2	5	3.60	1.055
Our company reduces container handling and terminal-related costs	77	2	5	3.49	0.754
Our organization implements strategies to optimize fuel consumption and reduce fuel-related costs	77	2	5	3.60	1.103
Our company makes operational decisions that reduce logistics costs without compromising quality	77	2	5	3.40	0.730
Valid N (listwise)	77				

Source: SPSS output of data analyses (2025).

Table 4 displays the descriptive statistics for cost reduction. The results show mean scores ranging from 3.40 to 3.60, indicating a moderate extent to which respondents agree that their companies actively reduce costs through strategic practices. The highest mean (3.60) was observed for two items: minimizing cargo damage-related costs through proactive risk management and optimizing fuel consumption, reflecting strong emphasis on damage control and energy efficiency. Conversely, the lowest-rated item (mean = 3.40) related to making operational decisions that reduce logistics costs without compromising quality, which may suggest challenges in balancing cost efficiency with service standards. Standard deviations ranged from 0.730 to 1.103, indicating moderate variability in cost reduction practices across firms.

Table 5: Correlation between Assessment and flexibility

		Risk Assessment	Flexibility
Risk Assessment	Pearson Correlation	1	.483**
	Sig. (2-tailed)		.000
	N	77	77
Flexibility	Pearson Correlation	.483**	1
	Sig. (2-tailed)	.000	
	N	77	77

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

Source: SPSS output of data analyses (2025).

As shown in Table 5, the Pearson correlation coefficient yielded a value of $r = 0.483$, indicating a moderate positive correlation between risk assessment practices and flexibility. The relationship was found to be statistically significant at the 0.01 level, with a p-value of 0.000, confirming that the likelihood of this result occurring by chance is less than 1%. The strength and direction of the correlation provide a sound basis for inference. Therefore, the null hypothesis which states that there is no significant correlation between risk assessment and flexibility, is rejected, and the alternate hypothesis that there is a significant correlation between risk assessment and flexibility is accepted.

Table 6: Correlation between Assessment and Cost Reduction

		Risk Assessment	Cost Reduction
Risk Assessment	Pearson Correlation	1	.479**
	Sig. (2-tailed)		.000
	N	77	77
Cost Reduction	Pearson Correlation	.479**	1
	Sig. (2-tailed)	.000	
	N	77	77

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

Source: SPSS output of data analyses (2025).

As shown in Table 6, the result of the correlation analysis reveals a moderate and statistically significant positive relationship between risk assessment and cost reduction of shipping companies in Rivers State. The Pearson correlation coefficient is 0.479, suggesting that firms that engage in systematic risk assessment tend to achieve better cost-saving outcomes. The significance level associated with this correlation is $p = 0.000$, which is below the 0.01 threshold, indicate that the observed relationship is not due to random variation. The strength of the correlation provides robust support for rejecting the null hypothesis (H_04), which posits no significant relationship between the two variables and the acceptance of the alternate hypothesis which posits that there is a significant relationship between the two variables.

Discussion of Findings

The study revealed a moderate positive correlation between risk assessment and flexibility and cost reduction. These findings are in line with the findings of similar studies. Specifically, the findings of this study agree with the findings of Samson et al. (2024) found that risk assessment and management have a significant relationship with operational performance of Kenya Revenue Authority. Ebong and Ihunwo (2024) found that logistics risk assessment has positive

and significant impacts on coping with change, adaptability, and resilience ethos of oil and gas servicing companies in Akwa-Ibom State. Kashif (2024) revealed that effective supply chain risk assessment in the pharmaceutical industry can significantly enhance operational performance by addressing supply-related, production-related, and demand-related risks, ultimately improving resilience and efficiency in supply chain management.

Conclusion and Recommendations

From the analysis of the data obtained, this study arrived at a number of findings. Based on these findings and their consistency with the results of several previous studies, this study concludes that there is a significant relationship between risk assessment and supply chain resilience of shipping companies in Rivers State. Risk assessment is a strategic approach, as it is very important because it enhances flexibility and enables cost reduction within the supply chain. Therefore, shipping companies need to comprehensively assess risk to enable them to strengthen supply chain resilience and promote more efficient operations. Inferring from the detailed results, findings, and conclusions from this study. Consequently, we recommend that:

1. Shipping companies in Rivers State should institutionalize regular and systematic risk assessment procedures to enhance operational flexibility.
2. Shipping companies in Rivers State should integrate risk assessment outcomes into cost-control strategies to enhance their overall supply chain resilience.

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