

Supply Chain Flexibility and Responsible Delivery Performance of Bricks Suppliers in South-South Nigeria.

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Abstract

This study critically examined supply chain flexibility and responsible delivery performance of bricks suppliers in South-South Nigeria. The study adopted the correlational research design and the positivist research philosophy. The population of this study consisted of 126 registered bricks companies (suppliers) in South-South Nigeria. A sample size of 30 bricks suppliers was selected from the study population using judgmental sampling technique. The sampling units were made up of managers of the selected bricks suppliers in South-South Nigeria. Data were collected from the respondents using a structured questionnaire. Descriptive statistics were used to analyze the data collected while the formulated hypotheses were tested using the Spearman Rank Order Correlation Coefficient (ρ). The bivariate analysis was carried out using the SPSS software program version 24. The findings revealed that sourcing flexibility has a significant relationship with on-time delivery of bricks suppliers. This study also found a significant relationship between sourcing flexibility and cost-effective delivery of bricks suppliers. The study equally revealed that a significant relationship exists between distribution flexibility and on-time delivery of bricks suppliers. The study also discovered a significant relationship between distribution flexibility and cost-effective delivery of bricks suppliers. Based on these findings, it was concluded that supply chain flexibility is capable of improving the responsible delivery performance of bricks suppliers in South-South Nigeria. Hence, it is recommended that bricks suppliers in Nigeria should integrate high degree of flexibility into their supply chain network as it would improve their delivery in an uncertain environment.

Keywords: *Supply chain flexibility, sourcing flexibility, distribution flexibility, on-time delivery, cost-effective delivery and responsible delivery performance.*

Introduction

In the building and construction industry, the supply of bricks is a crucial activity that affects the success of any building or construction project. As a building material that is used to make walls and floor, bricks have the capability to release and absorb moisture, regulate temperature and humidity inside structures, protect buildings against fire for up to eight hours, resist wear and tear, block unwanted sound, and save up to 50 percent more energy than wood (Adedeji et al, 2022). However, the uninterrupted supply of different sizes of bricks is a sine quo non for achieving project success (Ndububa, 2018). In Nigeria, there are numerous suppliers of bricks - all of which competing for the customer income. Consequently, bricks suppliers need to improve their responsible delivery performance by ensuring a timely and cost-effective delivery of this essential building material to gain customer trust and sustain in the industry.

To achieve an outstanding delivery performance in a dynamic and uncertain environment, brick suppliers must demonstrate a greater flexibility in their supply chain.

Flexibility in supply chain is the capability of an entity to adjust processes, capacities and operations to help overcome the disruptions, mismatches and conflicts among the different parties involved in a supply chain (Lummus et al in Bauer & Gobl, 2017). Supply chain flexibility can take form of sourcing flexibility and distribution flexibility. According to Kumar and Deshmukh (2006), sourcing flexibility is the ability of a firm to have more than one single supplier for the same or similar kind of input or raw material. It occurs when one source of supplier fails to provide the required quantities or if the material supplied does not meet the quality standard of the company, hence the company has to be flexible enough to have substitutes that can deliver the material that will meet its quality standard. Distribution flexibility is the ability to change the mode of transportation as well as the third-party logistics company to ensure that products can be delivered in multiple ways instead of relying on just one mode of transportation or logistics company (Stevenson & Spring, 2007).

Flexibility in supply chain process is crucial to the success of bricks suppliers operating in a dynamic and uncertain environment. Brick suppliers need to respond to the increasing uncertainty in the business environment by adding flexibility into their supply chain operations. Vickery in Sanchez and Perez (2005) stated that flexibility in supply chain represents a potential source to improve the company's efficiency. Morad and Houssam (2019) argued that a firm with a flexible supply chain can embrace change, avoid delay and fine tune delivery to meet specific customer needs. This is made possible when all parties work together to create a fast, reliable and efficient supply chain network (Morad & Houssam, 2019). Macclever et al (2017) opined that flexible supply chain helps a firm to achieve a flexible operation, deliver products in a satisfactory manner and improve its delivery performance. In an uncertain environment, bricks suppliers with highly flexible supply chain can perform better than their competitors with less flexible supply chains. Tipu and Fatanzy et al (2013) stated that companies need to ensure that their supply chain is flexible since flexibility brings about improved delivery performance. It is against this backdrop that this study examines supply chain flexibility and delivery performance of bricks suppliers in South-South Nigeria.

Statement of the Problem

The building and construction industry is one of the most competitive industries in Nigeria and all the key players in the industry are intensifying their efforts to improve their delivery performance. However, achieving an outstanding delivery performance has remained a challenge to bricks suppliers in Nigeria due to the dynamic nature of the business environment. Many bricks contractors/suppliers in Nigeria are finding it difficult to achieve timely and cost-effective delivery due to environmental uncertainties. A good number of bricks suppliers have lost their customers as well as recommendation due to their failure to deliver materials on time in the past. To avoid the reoccurrence of this situation and improve their delivery performance, some brick suppliers have reviewed their operations by integrating some element of flexibility into their supply chain to ensure timely and cost-effective delivery of materials to project sites. However, ever since suppliers integrate flexibility into their supply chain network, it is not yet certain whether such strategic move has improved their delivery performance as empirical studies that examined the relationship between supply chain flexibility and responsible delivery performance of bricks suppliers in Nigeria are lacking. This has created a vacuum in empirical literature which this study intends to fill and contribute to the existing literature.

Conceptual Framework

The conceptual framework of supply chain flexibility and responsible delivery performance of bricks suppliers is shown in figure 1 below:

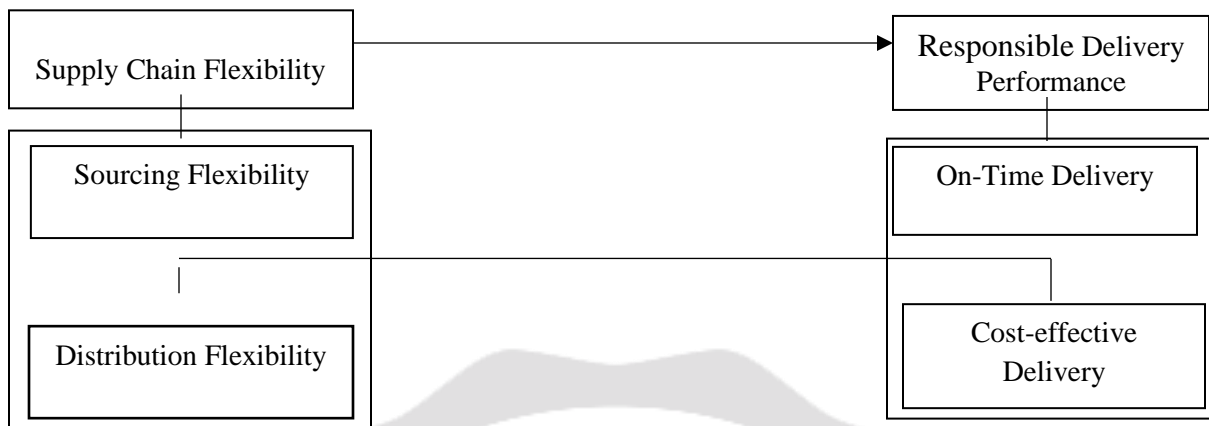


Fig 1: Conceptual framework of supply chain flexibility and responsible delivery performance of bricks suppliers

Aim and Objectives of the Study

The aim of this study is to examine the relationship between supply chain flexibility and responsible delivery performance of bricks suppliers in South-South Nigeria. In order to achieve this broad aim, the study intends to:

1. determine the relationship between sourcing flexibility and on-time delivery of bricks suppliers in South-South Nigeria;
2. find out the relationship between sourcing flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria;
3. ascertain the relationship between distribution flexibility and on-time delivery of bricks suppliers in South-South Nigeria;
4. explore the relationship between distribution flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria;

Research Questions

The following research questions are raised in this study:

1. What is the relationship between sourcing flexibility and on-time delivery of bricks suppliers in South-South Nigeria?
2. How does sourcing flexibility relate to cost-effective delivery of bricks suppliers in South-South Nigeria?
3. What is the relationship between distribution flexibility and on-time delivery of bricks suppliers in South-South Nigeria?
4. To what extent does distribution flexibility relate to cost-effective delivery of bricks suppliers in South-South Nigeria?

Research Hypotheses

The following hypotheses were postulated in this study:

- Ho₁: There is no significant relationship between sourcing flexibility and on-time delivery of bricks suppliers in South-South Nigeria.
- Ho₂: There is no significant relationship between sourcing flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria.
- Ho₃: There is no significant relationship between distribution flexibility and on-time delivery of bricks suppliers in South-South Nigeria.

Ho₄: There is no significant relationship between distribution flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria.

Review of Related Literature

Concept of Supply Chain Flexibility

Supply chain flexibility is the ability of a firm to respond quickly and efficiently to changing customer needs in inbound and outbound delivery, support, and services (Davis in Dhiab et al, 2012). It includes a number of activities such as the organization of inbound and outbound shipments, providing manufacturing support, and supplying information to ensure smooth of these activities (Dhiab et al, 2012). Lummus et al in Bauer and Gobl (2017) defined supply chain flexibility as the capability of an entity to adjust processes, capacities and operations to help overcome the mismatches and conflicts among the different parties involved in a supply chain. However, improving flexibility in just one single area in the supply chain is insufficient to achieve efficiency; hence it is necessary to improve flexibility along all the entire elements in the supply chain to achieve remarkable performance (Manders et al, 2017). Ustundag and Ungan (2020) opined that flexibility can also improve the competitiveness of suppliers in terms of delivering goods on-time than their competitors. Merschmann and Thonemann (2011) argued that flexibility enables a firm to respond quickly to customers' changing orders and delivery date, thereby coping with the uncertainties in the business environment. Therefore, flexibility needs to be taken seriously by suppliers if they want to implement their supply chain initiatives and meet customers' demand.

Dimensions of Supply Chain Flexibility

There are various dimensions of supply chain flexibility. However, the most common forms of supply chain flexibility include sourcing flexibility, manufacturing flexibility, distribution flexibility, product flexibility, volume flexibility, routing flexibility, delivery flexibility, trans-shipment flexibility, postponement flexibility, sourcing flexibility, market flexibility, distribution flexibility and logistics flexibility as their dimensions of supply chain flexibility (Sanchez & Perez, 2005; Kumar & Deshmukh, 2006; Stevenson & Spring, 2007; Bauer & Gobl, 2017). In this study, the focus is on sourcing flexibility and distribution flexibility.

Sourcing Flexibility

Sourcing flexibility is the ability of a company to find another supplier for each specific component or raw material (Sanchez & Perez, 2005). More and Subash (2009) defined sourcing flexibility as the capability of a firm to discover alternate sources for the purchasing of raw materials and other inputs to ensure a smooth and undisrupted supply of materials. Kumar and Deshmukh (2006) described sourcing flexibility as the ability of a firm to have more than one single supplier for the same or similar kind of input or raw material. Companies need to have more than one supplier for the same material so that if one source of supplier fails to deliver the required quantities or does not meet the quality standard of the company, the company can easily switch to other suppliers (substitutes) that can deliver the required material that will meet its quality standard. Narasimhan and Das (2000) stated that a company will become more efficient along its supply chain if it is flexible in sourcing for raw materials. Zhang et al (2005) noted that flexible suppliers respond quickly to sudden emergencies and customers' changing demands.

Distribution Flexibility

Distribution flexibility is defined as the ability of a firm to change its mode of transportation and third-party logistics service provider in order to deliver products in multiple ways instead of relying on just one mode of transportation or logistics service provider (Stevenson & Spring, 2007). Macclever et al (2017) defined distribution flexibility as a firm's capability to have more than one distribution channel and adjust its distribution system quickly to ensure that products are distributed in a timely and cost-effective manner. Zhang et al (2005) described distribution flexibility as the ability of a firm to quickly and effectively adjust the inventory, packaging, warehousing and transportation of physical products to meet customer needs. Distribution flexibility is crucial in supply chain flexibility because it requires firms to cope with demand uncertainty and volatility. It also allows companies to respond quickly to changes in customers' demand and market conditions (Eyers et al, 2018). Abdelilah et al (2018) stated that distribution flexibility enables companies to manage uncertainties and sudden emergencies to increase customer satisfaction and supply chain efficiency. Sanchez and Perez (2005) stated that distribution flexibility is facilitated by the close coordination of downstream activities in the supply chain whether performed internally or externally to the firm.

Concept of Delivery Performance

Delivery performance is the measure of how a supplier meets its delivery commitments and condition (Dalin-Kaptzan, 2022). It indicates how well a supplier can deliver goods within the stipulated deadlines using planned resources and minimizing costs (Warchol, 2022). Lemmen (2017) defined delivery performance as the fulfillment of a customer's order in accordance to the delivery terms and conditions. Cybit (2007) described delivery performance as the capability of a firm to fulfill order placed by customer at an agreed date. Morgan et al (2004) opined that delivery performance shows the number of orders that are delivered on-time and the number of orders that are delivered late. Suppliers need to track and monitor their delivery performance in order to know where there is problem in their delivery processes and make improvement. Yang (2016) stated that suppliers can monitor their delivery performance by identifying the number of deliveries, on-time delivery rate, out-of-route miles, average time per delivery, average cost per delivery, vehicle utilization rate, and customer satisfaction score. Green et al (2012) posited that a good delivery performance will lead to customer satisfaction and retention while a poor delivery performance will bring about customer dissatisfaction and defection. However, the ability of a firm to achieve a good delivery performance will depend on its team's capability to complete their tasks according to the delivery terms (Cirtita & Glaser-Segura, 2012).

Measures of Responsible Delivery Performance

Responsible Delivery performance of suppliers can be measured using on-time delivery and cost-effective delivery. These two measures of responsible delivery performance are discussed below:

On-Time Delivery

On-time delivery occurs when a company delivers a specific product to customer on or before the scheduled date as stipulated in the contractual agreement (Shepard & Gunter, 2016). To calculate on-time delivery rate, supplier need to know the total number of deliveries made in a month as well as the number of late deliveries and then divide these numbers. For instance, if a supplier had 500 deliveries this month and 40 of these deliveries were late, then the supplier on-time delivery rate is 80% while late deliveries are 20%. On-time delivery is very important to customers who placed an order. Muiruri and Iravo (2015) opined that suppliers need to deliver products at the promised delivered date to keep customers happy. Shahzadi et al (2013) posited that on-time delivery helps companies to increase their customer retention rate and keep their customers satisfied. Shepard and Gunter (2016) observed that most companies struggle to meet delivery date due to travel distance, poor planning and selection of delivery route. Customers who experienced three late deliveries are likely to express their dissatisfaction on digital platforms such as social media and other websites which would give the company a bad reputation and consequently lose large number of clients. Even a single failed delivery attempt can have a detrimental effect and cause a delay in lead times for the remaining orders delivered on the driver's run (Krushinsky et al, 2022).

Cost-effective Delivery

Cost-effective delivery is an important metric for measuring responsible delivery performance of suppliers. According to Shou et al (2017), cost-effective delivery revolves around strategic resources optimization, integration of cutting-edge technologies and application of sustainable business model. Lemmen (2017) defined cost-effective delivery as the ability of a supplier or firm to manage its delivery process in such a way to reduce delivery costs without compromising on efficiency and performance. It means producing a good and acceptable delivery results at a reduced cost. To achieve cost-effective delivery, suppliers need to ascertain their average delivery costs and take steps to reduce it (Aranda, 2003). Flynn et al (2016) stated that average delivery cost can be calculated using specific parameters such as distance, product type and vehicle. To calculate average delivery cost based on distance, the cost of fuel, wages of driver, vehicle maintenance and other distance related costs are sum up and the total cost is divided by the total distance travelled. On the other hand, if the total cost is divided by the number of deliveries, it will produce the average delivery cost based on product type. By calculating the average delivery cost, suppliers can make operational changes that will reduce average delivery cost without compromising on speed and efficiency (Skipworth et al, 2015).

Theoretical Review

The dynamic capability theory was utilized in this study. The theory was proposed by Teece and Pisano in 1994. Dynamic capability theory argues that firms must build, develop, integrate and reconfigure their internal and external resources and competence to adapt to the dynamic nature of the environment (Teece et al, 1997). The theory requires that firms to create a position for themselves in the market by demonstrating capabilities to perform better in a dynamic and uncertain environment. The dynamic capability theory is very useful in explaining supply chain flexibility and its

relationship with delivery performance of brick suppliers. The theory explains that flexibility can help brick suppliers to solve their delivery problem and improve their delivery performance in a dynamic and uncertain environment. The theory requires brick suppliers to be flexible along their supply chain so that they can respond quickly to the changes, disruptions and uncertainties in the business environment. The theory believes that brick suppliers need to adapt to change in the business environment while at the same time maintaining their capability to sustain minimum standards. The theory emphasized that lack of dynamic capabilities will hinder a brick supplier from maintaining her position and competitive advantage in a fast changing environment.

Empirical Review

A number of studies have been conducted on supply chain flexibility and performance of firms. For instance, Tipu and Fantazy (2014) empirically examined supply chain strategy, flexibility and performance. Their study adopted the quantitative research approach and survey research design where a structured questionnaire was used to collect data from 170 owners of manufacturing SMEs in Canada and Pakistan. The data collected from the respondents were analyzed using Path Analysis Model. The findings revealed that manufacturing SMEs in Pakistan adopt followers' strategy to improve their financial and non-financial performance; while manufacturing SMEs in Canada adopt innovative strategy and customer-oriented strategy to improve their financial and non-financial performance. The study also revealed that supply chain flexibility significantly relate to the performance of manufacturing SMEs in Canada and Pakistan.

Sanchez and Perez (2005) carried out a study to determine the relationship between supply chain flexibility and firm performance in the automotive industry. Their study adopted the survey research design and the quantitative research approach where data were collected from 126 automotive suppliers in Spain. The researchers used a structured questionnaire to collect data from purchasing managers of the automotive companies. The data collected were analyzed statistically using frequency count and percentage tables while the hypotheses were tested using Spearman Rank Order Correlation Coefficient. The findings revealed that superior performance in flexibility capabilities have a positive relationship with firm performance. The study also revealed that aggregate flexibility capabilities are more positively related to firm performance than basic flexibility capabilities. The study equally revealed that flexibility capabilities are increased in the supply chain with higher environmental uncertainty, technological complexity, and mutual understanding but with lower interdependence among agents involved in the supply chain.

Muntaka et al (2017) explored the impact of supply chain integration and flexibility on business performance. The study employed the cross-sectional survey research design where a structured questionnaire was used to collect data from 255 employees of registered companies in the Kumasi metropolis. The data collected were analyzed statistically using percentage and frequency tables, mean and standard deviation while the hypotheses were tested using the Structural Equation Modeling and Pearson correlation. The findings revealed that supply chain integration (company integration with suppliers, company integration with customers and cross-functional integration within a company) have significant relationship with firm performance. The study also revealed that supply chain flexibility (adaptability, alignment and agility) have a significant relationship with firm performance (financial performance, operational performance and logistics performance).

Dhiaf et al (2012) examined supply chain flexibility and balanced scorecard. Their study adopted the survey research design where data were collected from 105 managers of manufacturing firms in Tunisia that are active in the international market. The researchers used a structured questionnaire to obtain data from the respondents. The data collected from the respondents were analyzed using exploratory factor analysis, confirmatory factor analysis and structural equation modeling. The findings showed that supply chain flexibility such as human resource flexibility, logistics flexibility and information technology flexibility have a positive relationship with global performance; while product flexibility and process flexibility have no positive relationship with global performance of manufacturing firms in Tunisia.

Macclever et al (2017) explored supply chain flexibility, agility and firm performance. Their study employed the survey research design and the quantitative research approach where a structured questionnaire to collect data from 77 medium-size manufacturing and service firms in Kumasi, Ashanti Region of Ghana. The data collected were analyzed using Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), Structural Equation Modeling (SEM) and SPSS version 21.0. The findings revealed that supply chain flexibility and supply chain agility

are positively correlated to firm performance. The study also revealed that supply chain agility do not significantly moderate the relationship between supply chain flexibility and firm performance.

Merschmann and Thonemann (2011) carried out a study to determine the relationship among supply chain flexibility, uncertainty and firm performance in the German manufacturing industry. The study employed the mixed-mode survey research design and quantitative research approach. The researchers used a structured questionnaire and face-to-face interview to collect data from executives and top managers in 34 German manufacturing companies. The data collected from the respondents were analyzed using Structural Equation Modeling (SEM), Partial Least Square (PLS) and Factor Analysis. The findings showed that supply chain flexibility significantly lead to competitive advantage. The study also confirmed that in uncertain environments companies with highly flexible supply chain perform better than companies with less flexible supply chains but in certain environments the opposite holds.

Morad and Houssam (2019) explored the relationship between supply chain flexibility and financial performance of industrial companies in Morocco. Their study adopted the survey research design where a structured questionnaire was used to elicit data from 150 staff comprising directors, supervisors and team leaders of the industrial companies in Morocco. The data collected were analyzed using descriptive statistics while the multiple regression analysis was used to test their hypotheses. The findings showed that supply chain flexibility contributes significantly to revenue growth of a company. The study also revealed that supply chain flexibility need to be align with the company's strategy so that its financial impact can be felt.

Gap in Literature

From the literature reviewed, it was observed that a good number of empirical studies have been conducted on supply chain flexibility and performance of firms but none of these studies relate supply chain flexibility to responsible delivery performance (on-time delivery and cost-effective delivery) of firms. It was also observed that most of the studies conducted on supply chain flexibility are carried out in the manufacturing industry, automobile sector and SMEs while studies that examined supply chain flexibility and responsible delivery performance of firms in the building and construction industry in Nigeria are lacking. This has created a gap in literature which this study attempts to bridge and contribute to the existing literature on the subject matter.

Methodology

This study is a correlational research that employs the positivist research philosophy. The study population was made up of 126 brick companies (suppliers) that are duly registered with the Corporate Affairs Commission (CAC) in South-South Nigeria. The bricks companies are spread across the six states in the South-South Zone of Nigeria namely; Akwa Ibom State, Cross River State, Delta State, Edo State, Bayelsa State and Rivers State. A sample size of 30 brick companies was selected from the study population judgmental sampling technique. The sampling units were made up of managers of the selected bricks companies in South-South Nigeria. The managers include strategic managers, operational managers, distribution managers and logistics managers. A sample of 120 managers was drawn from the 30 selected companies on the ratio of 4 managers per company. A structured questionnaire was used to elicit data from the respondents. The questionnaire was structured on a 4 point rating scale such as Strongly Agree, Agree, Disagree and Strongly Disagree. The questionnaire was validated and its reliability was determined using Cronbach Alpha method. A total of one hundred and twenty (120) copies of the questionnaire were administered to the respondents (managers) of the selected brick companies and 106 copies were collected. The data collected were analyzed statistically while the hypotheses were tested using Spearman Rank Order Correlation Coefficient (ρ). The SPSS 24.0 version was used to perform bivariate analysis.

Results and Discussion

The data collected on supply chain flexibility (sourcing flexibility and distribution flexibility) were correlated with those obtained on responsible delivery performance (on-time delivery and cost-effective delivery) using SPSS software program version 24. The results of the bivariate analysis are presented in the tables below:

Table 1: Result of bivariate analysis between sourcing flexibility and on-time delivery of bricks suppliers

			Sourcing Flexibility	On-Time Delivery
Spearman Rank (rho)	Supply Chain Flexibility	Correlation Coefficient	1.000	.792**
		Sig. (2 tailed)	.	.001
		N	106	106
	On-Time Delivery	Correlation Coefficient	.792**	1.000
		Sig. (2 tailed)	.001	.
		N	106	106

**Correlation is significant at 0.01 levels (2 tailed)

*Correlation is significant at 0.05 levels (2 tailed)

Source: SPSS-Generated Output

Table 1 contains the result of the bivariate analysis carried out between sourcing flexibility and on-time delivery of bricks suppliers in South-South Nigeria. The result indicates that sourcing flexibility has a strong and positive correlation with on-time delivery of bricks suppliers ($\rho = .792^{**}$) and the symbol ** signifies that this correlation is significant at 0.01 level. Therefore, the null hypothesis (H_{01}) is rejected and the alternate hypothesis is accepted. This means that we then accept that there is significant relationship between sourcing flexibility and on-time delivery of bricks suppliers in South-South Nigeria.

Table 2: Result of bivariate analysis between sourcing flexibility and cost-effective delivery of bricks suppliers

			Sourcing Flexibility	Cost-Effective Delivery
Spearman Rank (rho)	Sourcing Flexibility	Correlation Coefficient	1.000	.695**
		Sig. (2 tailed)	.	.001
		N	106	106
	Cost-Effective Delivery	Correlation Coefficient	.695**	1.000
		Sig. (2 tailed)	.001	.
		N	106	106

**Correlation is significant at 0.01 levels (2 tailed)

*Correlation is significant at 0.05 levels (2 tailed)

Source: SPSS-Generated Output

Table 2 presents the result of the bivariate analysis carried out between sourcing flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria. The result shows a strong and positive correlation between sourcing flexibility and cost-effective delivery of bricks suppliers ($\rho = .695^{**}$) and this correlation is significant at 0.01 level as indicated by the symbol ** . Based on this result, we then reject the null hypothesis (H_{02}) and accept the alternate hypothesis which states that there is significant relationship between sourcing flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria.

Table 3: Result of bivariate analysis between distribution flexibility and on-time delivery of bricks suppliers

			Distribution Flexibility	On-Time Delivery
Spearman Rank (rho)	Distribution Flexibility	Correlation Coefficient	1.000	.723**
		Sig. (2 tailed)	.	.001
		N	106	106
	On-Time Delivery	Correlation Coefficient	.723**	1.000
		Sig. (2 tailed)	.001	.
		N	106	106

**Correlation is significant at 0.01 levels (2 tailed)

*Correlation is significant at 0.05 levels (2 tailed)

Source: SPSS-Generated Output

Table 3 shows the result of the bivariate analysis carried out between distribution flexibility and on-time delivery of bricks suppliers in South-South Nigeria. The result indicates that distribution flexibility is strongly and positively correlated to on-time delivery of bricks suppliers ($\rho = .723^{**}$) and the symbol ** signifies that this correlation is significant at 0.01 level. As a result of this, the null hypothesis (H_{03}) is rejected and the alternate hypothesis is accepted. This means that we then accept that there is significant relationship between distribution flexibility and on-time delivery of bricks suppliers in South-South Nigeria.

Table 4: Result of bivariate analysis between distribution flexibility and cost-effective delivery of bricks suppliers

			Distribution Flexibility	Cost-Effective Delivery
Spearman Rank (rho)	Distribution Flexibility	Correlation Coefficient	1.000	.835**
		Sig. (2 tailed)	.	.001
		N	106	106
	Cost-Effective Delivery	Correlation Coefficient	.835**	1.000
		Sig. (2 tailed)	.001	.
		N	106	106

**Correlation is significant at 0.01 levels (2 tailed)

*Correlation is significant at 0.05 levels (2 tailed)

Source: SPSS-Generated Output

Table 4 contains the result of the bivariate analysis carried out between distribution flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria. The result shows a very strong and positive correlation between distribution flexibility and cost-effective delivery of bricks suppliers ($\rho = .835^{**}$) and this correlation is significant at 0.01 level as indicated by the symbol ** . Consequently, the null hypothesis (H_{04}) is rejected and the alternate hypothesis is accepted. This implies that there is significant relationship between distribution flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria.

Discussion of Findings

This study found a significant relationship between sourcing flexibility and on-time delivery of bricks suppliers in South-South Nigeria. This finding emerged from the result of the bivariate analysis carried out on the two variables. The result revealed that sourcing flexibility has a strong and positive correlation with on-time delivery of bricks suppliers ($\rho = .792^{**}$) and this correlation is significant at 0.01 level. Hence, the null hypothesis (H_{01}) was rejected and the alternate hypothesis was accepted. This means that we then accepted that there is significant relationship between sourcing flexibility and on-time delivery of bricks suppliers in South-South Nigeria. This finding is supported by Manders et al (2017) who revealed that sourcing flexibility has the capability of achieving timely delivery in an uncertain environment. Ustundag and Ungan (2020) also agreed with this finding when they reported that companies that are flexible in sourcing for alternative suppliers are likely to deliver products on or before the scheduled date of delivery.

This study also found a significant relationship between sourcing flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria. This finding emerged from the result of the bivariate analysis carried out on the two variables. The result showed a strong and positive correlation between sourcing flexibility and cost-effective delivery of bricks suppliers ($\rho = .695^{**}$) and this correlation is significant at 0.01 level. Based on this result, we then rejected the null hypothesis (H_{02}) and accepted the alternate hypothesis which states that there is significant relationship between sourcing flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria. This finding is in line with the research conducted by Narasimhan and Das (2000) which revealed that sourcing flexibility enables a firm to deliver products in a cost-effective manner. Merschmann and Thonemann (2011) also supported this finding when they revealed that suppliers that are flexible in sourcing for materials are more likely to achieve a cost-effective delivery than those that are rigid in terms of sourcing materials.

This study equally discovered a significant relationship between distribution flexibility and on-time delivery of bricks suppliers in South-South Nigeria. This finding was deduced from the result of the bivariate analysis carried out on the two variables. The result revealed that distribution flexibility is strongly and positively correlated to on-time delivery of bricks suppliers ($\rho = .723^{**}$) and this correlation is significant at 0.01 level. As a result of this, the null hypothesis (H_{03}) was rejected and the alternate hypothesis was accepted. This means that we then accepted that there is significant

relationship between distribution flexibility and on-time delivery of bricks suppliers in South-South Nigeria. This finding is supported by Sanchez and Perez (2005) which reported that distribution flexibility would ensure timely delivery of goods to their destination. Muntaka, et al (2017) also agreed with this finding when they revealed that companies would deliver goods on-time if they have a flexible distribution system.

Finally, it was revealed that distribution flexibility has a significant relationship with cost-effective delivery of bricks suppliers in South-South Nigeria. This finding was deduced from the result of the bivariate analysis carried out on the two variables. The result showed a very strong and positive correlation between distribution flexibility and cost-effective delivery of bricks suppliers ($\rho = .835^{**}$) and this correlation is significant at 0.01 level. Consequently, the null hypothesis (H_{04}) was rejected and the alternate hypothesis was accepted. This implies that there is significant relationship between distribution flexibility and cost-effective delivery of bricks suppliers in South-South Nigeria. This finding is supported by Tipu & Fantasy (2014) and Dhiaf et al (2012) as both studies revealed that distribution flexibility enables firms to deliver products at a reduced costs.

Conclusions

Given the uncertainties in the business environment and the stiff competition in the building and construction industry, it becomes imperative for bricks suppliers to integrate flexibility into their supply chain network in order to improve their delivery performance. This can be achieved by integrating flexibility into their sourcing and distribution practices. The results of this study have shown that sourcing flexibility and distribution flexibility have a positive and significant relationship with on-time delivery and cost-effective delivery of bricks suppliers in South-South Nigeria. The implication of these findings is that if bricks suppliers become more flexible in the sourcing and distribution practices, it would ensure timely and cost-effective delivery, and hence improve their overall delivery performance in an uncertain environment.

Recommendations

The following recommendations are provided for the study:

1. Bricks suppliers in Nigeria particularly those that are experiencing poor delivery performance should review their supply chain network and make it more flexible as it would improve their delivery performance in terms of achieving timely and cost-effective delivery.
2. Bricks suppliers in Nigeria should integrate some degree of flexibility into their material sourcing process as it would enable them respond quickly to customer needs and improve their delivery performance in an uncertain environment.
3. Bricks suppliers in Nigeria should not rely on a single supplier for their material rather they should have multiple suppliers of the same materials so that if one source of supplier fails to provide the required quantities or meet their quality standard, they can quickly switch to their substitutes that can deliver the material that will meet their standard and save time of searching for new suppliers.
4. Bricks suppliers in Nigeria should make their distribution practices more flexible by making changes in their mode of transportation and third-party logistics company so that they can deliver products in multiple ways instead of relying on just one mode of transportation or logistics company.
5. Finally, it is recommended that bricks suppliers in Nigeria should strengthen their supply chain network by ensuring that all stages of the supply chain are flexible as this would enable them respond quickly to customer changing needs and improve their delivery performance.

REFERENCES

- Abdelilah, B., El Korchi, A. & Balambo, M.A. (2018). Flexibility and agility: Evolution and relationship. *Journal of Manufacturing Technology Management*, 29 (2), 1139-1162.
- Adedeji, I., Deveci, G. & Salman, H. (2022). The incentives of stabilized interlocking clay bricks for providing sustainable affordable housing in Nigeria. *Open Access Library Journal*, 9, 1-11.
- Adobor, H. & McMullen, R.S. (2018). Supply chain resilience: A dynamic and multidimensional approach. *The International Journal of Logistics Management*, 29 (4), 1451-1471.

- Aranda, D.A. (2003). Service operation strategy, flexibility and performance in engineering consulting firms. *International Journal of Operation and Production Management*, 23(11), 1401–1421.
- Bauer, D. & Gobl, M. (2017). Flexibility measurement issues in supply chain management. *Journal of Applied Leadership and Management*, 5, 1-14.
- Brabazon, P.G. & MacCarthy, B. L. (2017). The automotive order-to-delivery process: How should it be configured for different markets? *European Journal of Operational Research*, 263, 142-157.
- Cirtita, H., & Glaser-Segura, D. A. (2012). Measuring downstream supply chain performance. *Journal of Manufacturing Technology Management*, 23(3), 299–314.
- Cybit (2007). Marshalls improves delivery efficiency by over 20 per cent. Retrieved from: www.cybit.co.uk/CaseStudies/Marshalls.aspx
- Dalin-Kaptzan, Z. (2022). On-time delivery: Understanding, calculating and improving your KPI. Retrieved from: <https://www.bringg.com/blog/delivery/on-time-delivery/>
- Dhiaf, M.M., Benabdelhafid, A. & Jaoua, F. (2012). Supply chain flexibility and balanced scorecard: Conceptual model and empirical study in Tunisian companies launched upgrading program. *Polish Journal of Management Studies*, 5, 34-57.
- Eyers, D.R., Porter, A.T., Gosling, J. & Naim, M.M. (2018). The flexibility of industrial additive manufacturing systems. *International Journal of Operations and Production Management*, 38 (12), 2313-2343.
- Eisenhardt, K. M. & Martin, J.A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21 (1), 1105-1121.
- Flynn, B.B., Koufteros, X. & Lu, G. (2016). On theory in supply chain uncertainty and its implications for supply chain integration. *Journal of Supply Chain Management*, 52 (3), 3-27.
- Forsslund, H., Jonsson, P. & Mattsson, S.A. (2021). Supplier flexibility in the order-to-delivery process: A customer perspective. *International Journal of Physical Distribution and Logistics Management*, 51 (1), 4-24.
- Green, K., Whitten, D., & Inman, R. (2012). Aligning marketing strategies throughout the supply chain to enhance performance. *Industrial Marketing Management*, 41(6), 1008- 1018.
- Helfat, C., Finkelstein, S., Mitchell, W., Peteraf, M.A., Singh, H., Teece, D.J. & Winter, S.G. (2007). *Dynamic capabilities: Understanding strategic change in organizations*. Blackwell.
- Kumar, P. & Deshmukh, S.G. (2006). A model for flexible supply chain through flexible manufacturing. *Global Journal of Flexible Systems Management*, 7 (3/4), 17-25.
- Lemmen, B. (2017). Are you focused on damage-free delivery? Retrieved from: <https://packagingeurope.com/are-you-focused-on-damage-free-delivery/3526.article>.
- Liao, Y. (2020). An integrative framework of supply chain flexibility. *International Journal of Productivity and Performance Management*, 69 (6), 1321-1342.
- Macclever, A.B., Annan, J. & Boahen, S. (2017). Supply chain flexibility, agility and firm performance. *European Journal of Logistics, Purchasing and Supply Chain Management*, 5 (3), 13-40.
- Manders, J.H.M., Caniels, M.C.J. & Ghijsen, P.W.T. (2017). Supply chain flexibility: A systematic literature review and identification of directions for future research. *International Journal of Logistics Management*, 28 (4), 964-1026.
- Merschmann, U. & Thonemann, U.W. (2011). Supply chain flexibility, uncertainty and firm performance: An empirical analysis of German manufacturing firms. *International Journal of Production Economics*, 13, 43-53.
- Morad, L., & Houssam, R.M. (2019). Supply chain flexibility and financial performance: Morocco case study. Governance Research and Development Centre, Zegreb.
- More, D. & Subash, B. A. (2009). Supply chain flexibility: A state-of-the-art survey. *International Journal of Services and Operations Management*, 5 (1), 29-65.
- Morgan, N. A., Kaleka, A., & Katsikeas, C. S. (2004). Antecedents of export venture performance: A theoretical model and empirical assessment. *Journal of Marketing*, 68, 90-108.

- Muiruri, G. & Iravo, M. (2015). The effects of outsourcing logistics on operational efficiency in manufacturing industry: Case study of De Monet Kenya Ltd. *The Strategic Journal of Business and Change Management*, 2 (16), 291-316.
- Muntaka, A.S., Haruna, A. Mensah, H.K. (2017). Supply chain integration and flexibility and its impact on business performance. *International Journal of Business and Management*, 12 (4), 130-143.
- Narasimhan, R. & Das, A. (2000). An empirical examination of sourcing's role in developing manufacturing flexibilities. *International Journal of Production Research*, 38 (4), 875-893.
- Ndububa, E.E. (2018). Stabilized lateritic bricks as alternative to mud housing in Bauchi, North East Nigeria. *Journal of Mechanical and Civil Engineering*, 14, 67-73.
- Rakesh, P. (2022). 10 ways to prevent shipping damage for delivery drivers. Retrieved from: <https://www.upperinc.com/blog/how-to-prevent-shipping-damage/>
- Sanchez, A.M. & Perez, M.P. (2005). Supply chain flexibility and firm performance: A conceptual model and empirical study in the automotive industry. *International Journal of Operations & Production Management*, 25 (7), 681-700.
- Shahzadi, I., Amin, S. & Chaudhary, K.M. (2013). Drivers of supply chain performance enhancing organizational output: An exploratory study for manufacturing sector. *European Journal of Business and Management*, 5 (14), 53-64.
- Shepard, C. & Gunter, H. (2006). Measuring supply chain performance: Current and future directions. *International Journal of Productivity and Performance Management*, 55 (3/4), 242-258.
- Shou, Y., Shao, J. & Chen, A. (2017). Relational resources and performance of Chinese third-party logistics providers: The mediating role of innovation capability. *International Journal of Physical Distribution and Logistics Management*, 47 (9), 864-883.
- Skipworth, H., Godsell, J., Wong, C.Y., Saghiri, S., & Julien, D. (2015). Supply chain alignment for improved business performance: An empirical study. *International Journal of Supply Chain Management*, 20 (5), 511-533.
- Stevenson, M. & Spring, M. (2007). Flexibility from a supply chain perspective: Definition and review. *International Journal of Operations & Production Management*, 27 (7), 685-713.
- Teece, D.J., Pisano, G. & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18 (7), 509-533.
- Tipu, A. S. A. & Fantasy, K.A. (2014). Supply chain strategy, flexibility and performance. *International Journal of Logistics Management*, 25 (2), 399-416.
- Ustundag, A. & Urgan, M.C. (2020). Supplier flexibility and performance: An empirical research. *Business Process Management Journal*, 26 (7), 1851-1870.
- Warchol, J. (2022). On-time delivery – The story and potential behind the metric. Retrieved from: <https://lingarogroup.com/blog/on-time-delivery-the-full-story-behind-the-metric-and-its-potential>.
- Yang, C.C. (2016). Leveraging logistics learning capability to enable logistics service capabilities and performance for international distribution center operators in Taiwan. *International Journal of Logistics Management*, 27 (2), 284-308.
- Zhang, M.J. (2005). Information systems, strategic flexibility and firm performance: An empirical investigation. *Journal of Engineering and Technology Management*, 22 (3), 163-184.
- Zollo, M. & Winter, S.G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science*, 13, 339-351.