



FRUGAL INNOVATION STRATEGIES AND SUPPLY CHAIN PERFORMANCE OF FOOD AND BEVERAGE FIRMS IN SOUTH-SOUTH NIGERIA

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ABSTRACT: *This study explored frugal innovation strategies and supply chain performance of food and beverage firms in South-South Nigeria. It critically analyzed the dimensions of frugal innovation strategies (value innovation, cost cutting advancement and technological innovation) and relate them to supply chain performance measures (product availability, on-time delivery and supply chain flexibility) of food and beverage firms. The study applied the positivist research philosophy and correlational research design. The population of this study comprised 82 registered food and beverage firms in South-South Nigeria. The sample size consisted of 68 food and beverage firms in South-South Nigeria. The Taro Yamene's formula was used to determine the sample size for the study. The sampling unit consisted of managers of the selected food and beverage firms in South-South Nigeria. A structured questionnaire was used for data collection in this study. The data collected were analyzed statistically while the Pearson Product Moment Correlation Coefficient (PPMCC) was used to test the formulated hypotheses. The SPSS software program version 24 was used to correlate the data collected on the study variables. The findings revealed that value innovation has a significant relationship with product availability, on-time delivery and supply chain flexibility of food and beverage firms. This study also revealed that cost cutting advancement has significant relationship with product availability, on-time delivery and supply chain flexibility of food and beverage firms. The study equally revealed that technological innovation has a significant relationship with product availability, on-time delivery and supply chain flexibility of food and beverage firms. Based on these findings, it was concluded that frugal innovation strategies such as value innovation, cost cutting advancement and technological innovation are significant predictors of supply chain performance of food and beverage firms in South-South Nigeria. Based on the findings and conclusion, it was recommended that food and beverage firms in South-South Nigeria should adopt frugal innovation strategies as it would improve their supply chain performance.*

KEYWORDS: Frugal innovation, value innovation, cutting edge advancement, technological innovation, supply chain performance, product availability, on-time delivery and supply chain flexibility.



INTRODUCTION

In the food and beverage industry, there is always a strong desire among the competing firms to improve their supply chain performance. Hausman (2014) described supply chain performance as the extended supply chain's activities in meeting end-customer requirements, including product availability and on-time delivery. It connotes the ability of a supply chain to meet customer needs by ensuring product is available at the right time, right place, right price and right quantity. Food and beverage firms operate in a dynamic environment and as such they need to continuously improve their supply chain performance. Continuously improving supply chain performance can give a company the needed stability and competitive edge over its rivals (Linda & Mwaura, 2020). Food and beverage firms want to improve their supply chain performance because it gives better chance of achieving business success. To improve their supply chain performance, food and beverage firms need to focus their innovation effort on the resource constrained market segment and redesign their products to make them more available, accessible and affordable by the resource constrained customers. This can be done by implementing frugal innovation strategies.

Frugal innovation is a resource-scare solution that is designed and implemented in a resource constrained environment where the final solution is less expensive but still good enough to meet the needs of consumers (Hossain et al, 2016). Agarwal et al (2017) defined frugal innovation as a good enough quality products that are designed to meet the needs of resource-constrained customers. This type of innovation is characterized by redesigning systems or products to make them more accessible and affordable. Affordability, high performance and long-term viability are the main characteristics of frugal innovation. Frugal innovation differs from conventional innovation in the sense that it is driven by what people really need as opposed to the conventional innovation that is driven by what people would want to have. This type of innovation tends to address the needs of the weak in a society by offering products and services that create high value at a low cost (Pisoni et al, 2018). Frugal innovation utilizes certain context-sensitive techniques by understanding the demand of the impoverished consumers and focusing on the most important components of the products to serve low-income consumers. The most important aspect of frugal thinking is a firm's ability to solve problems without being restricted by finance, labour, quality materials and other resources (Dima et al, 2022).

Frugal innovation are better suited for emerging markets with high population of middle and low income earners as it addresses the needs of the weak and low-income consumers. Pisoni et al (2018) observed that emerging markets with large number of low-income earners demand for frugal products. Even though frugal products are sold at a lower price compared to the mature market offerings, the affordability factor of these products tend to sustain customer trust in the ability of the product to deliver the expected performance (Radjou, 2020). However, implementing frugal innovation strategy requires firms to build up their strategic capabilities throughout their organizations' dimensions (individual, research group, management team, departments or units, technology) in order to institutionalize frugal innovation logic within the mission of the organization (Benneworth & Cunha, 2015). To successful implement frugal innovation, firms must adopt a management system and establish an organizational culture that promote frugal business model (Leih & Recce, 2016). Firms must also develop capabilities to reduce costs and establish links that promote the diffusion of frugal technologies to target the low income segment of the market (Rao, 2019). In addition, firms must revisit their drawing



board by developing innovative products that are good enough, customized to suit local consumer needs in terms of lower costs, portability, fewer features and ease to use, maintain and deliver across the fragmented markets.

A capability of a firm to implement frugal innovation strategies in emerging markets is crucial to improve its supply chain performance. When a firm implements frugal innovation, it would be able to reduce its costs and sell its products at an affordable prices which would increase customer satisfaction and improve its overall supply chain performance (Basu et al, 2013). Radjou (2020) argued that frugal innovation strategy is capable of improving supply chain flexibility and performance of firms on the short-run. It enables a firms to deliver products at a reduced cost and increase customer satisfaction level. Dima et al (2022) noted that firms with frugal innovation orientation have a better performance than their counterparts without frugal innovation initiatives. It is against this backdrop that this study examines the relationship between frugal innovation strategies and supply chain performance of food and beverage firms in South-South Nigeria.

Statement of the Problem

Given the dynamic nature of the environment and the intense competition in the food and beverage industry, it becomes imperative for food and beverage firms to improve their supply chain performance. Some food and beverage firms in Nigeria are struggling to improve their supply chain performance. These firms are faced with the problem of high costs, delay in delivering products to customers and a rigid supply chain structure, thereby resulting in poor supply chain performance. To address these challenges and improve their supply chain performance, some food and beverage firms have been compelled to implement frugal innovation strategies. However, ever since these firms adopt frugal innovation strategies, it is still not clear whether it has improved their supply chain performance as empirical studies that examined the relationship between frugal innovation strategies and supply chain performance of food and beverage firms in Nigeria are remarkably absent or scanty. This has created a vacuum in literature which this study intends to fill and contribute to the existing literature on the subject matter.



CONCEPTUAL FRAMEWORK

The conceptual framework of frugal innovation strategies and supply chain performance of food and beverage firms is presented in figure 1 below:

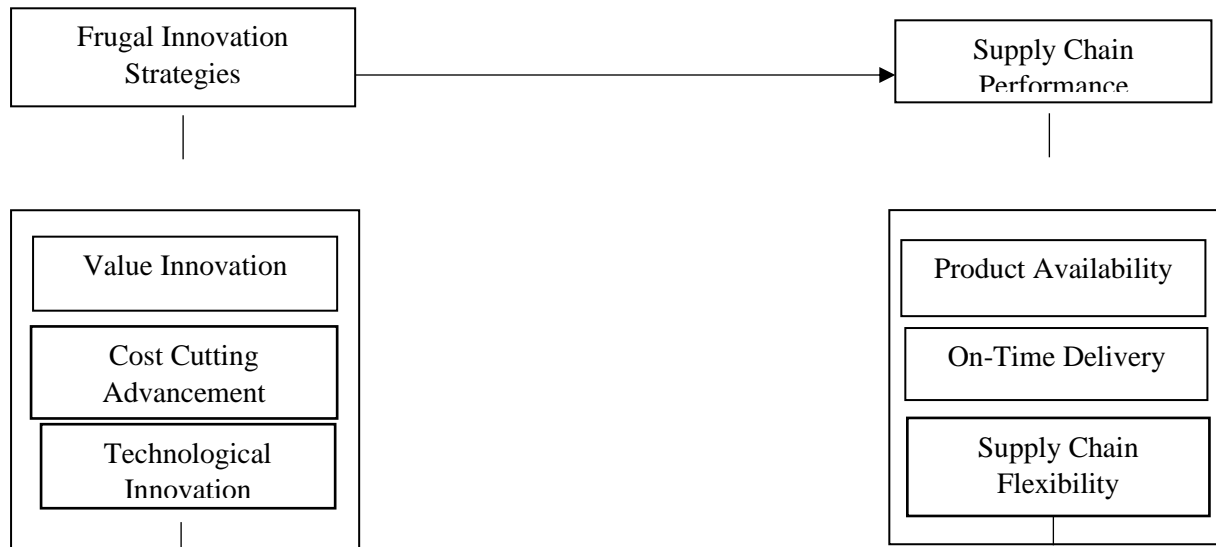


Fig 1: Conceptual framework of frugal innovation strategies and supply chain performance of food and beverage firms

Aim and Objectives of the Study

The aim of this study is to examine the relationship between frugal innovation strategies and supply chain performance of food and beverage firms in South-South Nigeria. The specific objectives of the study are to:

1. ascertain the relationship between value innovation and supply chain performance of food and beverage firms in South-South Nigeria;
2. determine the relationship between cost cutting advancement and supply chain performance of food and beverage firms in South-South Nigeria;
3. explore the relationship between technological innovation and supply chain performance of food and beverage firms in South-South Nigeria.

Research Questions

The following research questions were developed in this study:

1. What is the relationship between value innovation and supply chain performance of food and beverage firms in South-South Nigeria?
2. How does cost cutting advancement relate to supply chain performance of food and beverage firms in South-South Nigeria?
3. To what extent does technological innovation relate to supply chain performance of food and beverage firms in South-South Nigeria?



Research Hypotheses

The following hypotheses were postulated in this study:

HO₁: There is no significant relationship between value innovation and supply chain performance of food and beverage firms in South-South Nigeria.

HO₂: There is no significant relationship between cost cutting advancement and supply chain performance of food and beverage firms in South-South Nigeria.

HO₃: There is no significant relationship between technological innovation and supply chain performance of food and beverage firms in South-South Nigeria.

REVIEW OF RELATED LITERATURE

Concept of Frugal Innovation

Frugal innovation is the process of responding to severe resource constraints with products having extreme cost advantages compared to existing solutions (Zeschky et al, 2011). Dima et al (2022) described frugal innovation as a process that is characterized by efficiency, redesigning systems or products to become a more affordable and accessible. Firms in emerging markets are well known for their capability to develop frugal innovations that offer low costs and superior customer value (Sharmelly & Ray, 2019). Tiwari and Herstatt (2012) noted that most firms operating in emerging markets adopt frugal innovation in order to address the challenges of a volatile environment by fulfilling the needs of the middle and lower class market segments. These innovative products are “good enough,” and customized to suit the needs of local consumers in terms of portability, fewer features, lower costs, affordable prices and easier to use, maintain and deliver to fragmented markets (Wooldridge, 2010). Governments in emerging markets are calling on small entrepreneurs and large firms to develop frugal products such as low-cost ventilators, vaccines and PPE (personal protection equipment) that will benefit the low-income consumers and the society as a whole (Harris et al, 2020).

A good number of firms in emerging markets have developed series of frugal products to meet the needs of the resource constrained customers. For instance, Godrey & Boyce Limited, an Indian based firm, developed ChotuKool, an affordable refrigerator that works with intermittent power supply (Kuo, 2017). Also, Mahindra & Mahindra Enterprise Limited developed the Yuvraj mini tractor, a frugal product that is affordable and good enough to meet the needs of the lower income customers in India (Shivdas et al, 2021). Another firm, Galanz Enterprise Limited, an India based firm, developed an affordable energy-efficient microwaves; Haier Enterprise Limited developed a small-scale and water saving machine while Tata Chemicals Limited, produced a low-cost, portable and easy-to-use water purifiers. The affordability factor of these products makes low-income consumers in India develop trust in the quality of the product.



Low income consumers in developing countries are price sensitivity yet they demand for high quality products and services. Singh and Chaudhuri (2009) observed that most consumers in emerging markets demand for high-end technology products but their financial capability to pay for these products is low due to their low income status. Hence, firms in emerging market must strike a balance between demand conditions and price sensitivity of emerging market by deploying frugal innovation strategy (Kumar & Puranam, 2012). To deploy frugal innovation strategy, firms in emerging markets must develop the capabilities to implement this frugal business model. By capabilities, it mean that firms must have the capacities to lower their manufacturing costs by using low-cost alternative materials and low-cost of labour (Simula et al, 2015). The capabilities of firms to redesign their products using limited resource is key to ensure frugality in product development. In addition to using minimal amount of raw materials, economizing resources through waste reduction and recycling and minimizing needless costs can help firms to successfully implement frugal innovation concept (Sehgal et al, 2010).

Dimensions of Frugal Innovation Strategies

Frugal innovation is a multi-dimensional concept which cuts across three major areas namely; value innovation, cost cutting advancement and technological innovation.

Value Innovation

Value innovation is a strategy where a company launches a new product or service into the market which the industry has never seen before (Carter & Diro, 2008). Value innovation embarked upon by a company to shape the condition of its industry. Here, competition is not the benchmark rather the company pursues a quantum leap in value to dominate the market. Kim and Mauborgne (2004) stated that a value innovator targets the mass of buyers and willingly lets some existing customers go. It focuses on the key commonalities in what customers' value. A company that implements value innovation should not be constrained by what it already has rather it must ask what it would do first assuming it was starting a new business. Kim and Mauborgne (2004) noted that a value innovator thinks in terms of the total solution customers seek, even if that takes the company beyond its industry's traditional offerings. A company needs to carefully analyze and continuously improve its design activities in order to develop product and service that generate new value for customers. It also need to know those competitive factors which key players in the industry have taken for granted, and identifies those factors that should be reduced below the industry's standard; those that should be raised above the industry's standard; and those factors that should be created which the industry has never seen before. Most of the successful companies in the developed countries used value innovation strategies in all their innovation platforms such as product, service and delivery.

Cost Cutting Advancement

Cost cutting advancement is the deliberate measure taken by a company to reduce its cost of innovation without compromising on quality (Figar & Ivanovic, 2015). Wing (2000) defined cost cutting advancement as a deliberate effort made by a firm to minimize its innovation costs with a view of making its products and services more accessible and affordable by consumers. Cost cutting is a basic element of frugal innovation (Matei & Savulescu (2009). There are several ways in which a company can reduce its innovation costs. For instance, removing



additional features from the products and focusing on its core functions can help firms to reduce innovation costs and address customers' needs in a functional, simpler and user-friendly way (Palma et al, 2016). Innovation cost can also be reduced by using locally available materials, reusing old materials, removing unnecessary product features, and minimizing maintenance costs (Oyerogba et al, 2014). The use of materials from local suppliers helps firms to reduce their production and innovation costs (Oyerogba et al, 2014). A typical example of company that uses local materials to reduce their production and innovation costs is Indian Conglomerate Tata. In 2009, this company introduced the Tata Swach, a water purifier, which is made using local materials such as locally abundant risk ash (van Beers et al, 2012). Similarly, refrigerator MittiCool which was made using local clay and rice husk was launched into the Indian market (Hossain, 2017). All these efforts associated with the use of local materials in the production and innovation process is targeted at reducing costs (Hossain, 2017).

Technological Innovation

Technological innovation is the process of developing new technology or improving on existing technology to produce a much better and superior performance. It involves recognizing new technological possibilities, organizing the human and financial resources needed to transform them into useful products and processes and sustaining the requisite activities (Li & Zhang, 2007). Tushman and Anderson (1990) described technological innovation as the process of creative destruction which support the idea that technologies evolve over time through cycles of long periods of incremental change that enhance and institutionalize the existing technology, punctuated by technological discontinuities in which new, radically superior technologies displace old and inferior ones, thereby making possible for more improvement in organizational performance. Adepoju et al in Fayomi et al (2019) stated that technological innovation does not only comprise of only new technology but also includes improved ones which resulted from callow-tech sector that might have economic and social effects. The capability to implement technological innovation within the organization is an essential quality of a frugal company (Shivdas et al, 2021). Creating a new technology involves modification of its physical attributes (Goi, 2017). Here, the old technology is modified and improved in terms of outlook, speed, durability, reliability, style and design. Even though the physical outlook of the technology did not change, the minor changes and modification done to it can attract more buyers. When a company changes its technology being its production technology or packaging technology, it tends to send a message to its customers that its new method of production or packaging will give them satisfaction (Goi, 2017). Li and Zhang (2007) stated that technological innovation creates market opportunities for companies and gain a competitive edge over their rivals. Fayomi et al (2019) posited that new technology can enhance the competence of firms, improve their existing technical know-how and reinforce their incumbents' positions and making them to be technologically superior to their competitors.



Concept of Supply Chain Performance

Supply chain performance refers to how well the supply chain system of a firm is functioning (Kurien & Qureshi, 2011). Hausman (2014) defined supply chain performance as the extended supply chain's activities in meeting end-customer requirements, including product or service availability and on-time delivery. It measures the ability of a supply chain to meet customer needs by ensuring product or service availability at the right time, right place, right price and right quantity. Business firms operate in a dynamic environment and as such they need to continuously improve their supply chain performance. They need to assess their supply chain performance and become more purposeful about improving it. Assessing supply chain performance can be critical since each firm has a different list of criteria and priorities to weigh. Generally, supply chain performance is measured based on quality, time, cost and flexibility (Hausman, 2014; Somuyiwa et al, 2015; Linda & Mwaura, 2020). Ascertaining and understanding the level of supply chain performance is important because it serves as a check to see how well the company is meeting their supply chain goals (Hausman, 2014). Continuously improving supply chain performance can give a company the needed stability and competitive edge over its rivals (Linda & Mwaura, 2020).

Measures of Supply Chain Performance

Measuring the supply chain performance of a firm will give management team a greater understanding of how their company is doing in meeting its supply chain goals. There are several performance metrics that can be used to measure the supply chain performance of a firm. In this study, supply chain performance is measured using product availability, on-time delivery and supply chain flexibility.

Product Availability

Product availability refers to the physical presence of products at the right place, right time, right quantity and at the right price (Linda & Mwaura, 2020). The Committee on World Food Security (CFS) (2011) defines product availability as the physical existence of products. On national level, product availability is a combination of domestic production, commercial product imports and exports, product aid and domestic product stocks (CFS, 2011). On household level, product could be from own production or bought from the local markets (Linda & Mwaura, 2020). Product availability is a necessary condition for industrialization and consumption (Hausman, 2014). Providing product to each and every person is the most important issue for the government (Somuyiwa et al, 2015). There has been a growing demand for food and beverage products in Nigeria. Despite the growing demand for these products, the products are not available in sufficient quantity to meet the growing market demand. The CFS (2011) confirmed this statement when the committee stated that food and beverage products are unlimited in supply because the demand for these products is growing in a geometric progression while the supply of the products is moving at an arithmetic progression. At the local level, the supply of food and beverage products to Nigerians is very low and this has resulted in the hike in the prices of the available products in the market.



On-Time Delivery

On-time delivery refers to the ability of a firm to deliver the specific product or service at the stipulated time (McLennan, 2011). When a firm delivers the goods or services to customers on time, such firm can be said to have a good delivery performance. According to Jacobs and Zulu (2012), delivery performance is the measurement of performance right from supplier end to the customer end. It is a standard criterion in supply chains which is used to measure the fulfilment of a customer's demand to the wish date. A firm is expected to deliver product/service in accordance to specification and also at the right time. Customers usually value on time delivery as a symbol of efficient organization. If a firm is able to deliver product according to customer due date, the customer will consider the firm to be reliable and will wish to continuing doing business with the firm. This will bring about customer loyalty which will lead to better sales performance for the firm (Bearmon & Balcik, 2019).

Supply Chain Flexibility

Supply chain flexibility is one of the major indices used to measure the supply chain performance. According to Li (2014), supply chain flexibility is a way of responding to the rising uncertainty and competition in the market. Supply chain flexibility can give a company a competitive advantage over its rivals in the same industry. However, flexibility in supply chain is costly and a blend between flexibility and environmental uncertainty will be a vital option for achieving business success (Somuyiwa et al, 2015). Companies are operating a dynamic and challenging business environment with high level of uncertainty. Hence, companies strive to foresee the market swings and react swiftly with minimal cost adjustment and effective response strategies (Somuyiwa et al, 2015). However, developing flexibility in adapting to changes in the marketplace becomes necessary for business firms. Linda and Mwaura (2020) stated that supply chain flexibility is critical to business success.

Theoretical Review

This study applied the resource based view (RBV) theory which was by Penrose in 1959 and expanded by Barney in 1986 and 1991. The theory considers firms as a bundle of heterogeneous resources, capabilities and attributes, and that a firm's competitive advantage comes from its ability to exploit its existing resources (Barney, 1991). The RBV theory argues that firms in the same industry perform differently because they have different kind of resources and capabilities (Barney, 1986). The theory explains that a firm's resources are strategic, unique, rare and imitable and that they create a competitive advantage for the firm (Barney, 1986). The resources of a firm are the inputs (physical, human, material, technological and financial resources) which the firm use to perform its activities in order to create a competitive advantage in the market (Martin-de-Castro, et al in King & Grace, 2008). Capabilities on the other hand, refer to the skills, knowledge, expertise and competence of management to use these resources to create or sustain competitive advantage (McIvor, 2009). Barney (2001) stated that resources and capabilities lead to competitive advantage if they are valuable, rare, difficult to imitate and non-substitutable.

The resource-based view is very relevant in explaining the relationship between frugal innovation strategies and supply chain performance of firms. The theory explains that a firm can improve its supply chain performance and gain a competitive advantage over its rivals in a



resource constrained market if it possessed the needed resources and capabilities to implement frugal innovation strategies. This theory explains how a firm can leverage on its resources and capabilities to create affordable products to the low income market segment in emerging market. The theory believes that when a firm assembles the right resources and develop capabilities to implement frugal innovation in emerging market like Nigeria, its supply chain performance will improve.

Empirical Review

A good number of studies have been conducted on frugal innovation strategies of firms. For instance, Mvulirwenande and Wehn (2019) critically analysed the frugal innovation incubation programmes in water sector. The researchers developed a conceptual framework for analyzing interventions that facilitates frugal innovation through incubation. Their study adopted the case study research approach where their proposed framework was applied to the case of VIA Water Agenda, which happens to be a Dutch programme to facilitate water innovation in three (3) African countries such as Rwanda, Ghana and Ethiopia. After analyzing and relating the framework to the VIA Water case, the study reported that the innovation capabilities of frugal innovators in developing countries are weaker than those in developed countries. The framework and case study showed the complexity of a frugal innovation incubation process and this calls for the need to take a holistic approach when designing and analyzing related interventions. The study however concluded that frugal innovation incubation programmes should take into consideration the innovation capabilities of the innovators when designing and analyzing related interventions.

Sharmelly and Ray (2020) empirically examined the role of frugal innovation and collaborative ecosystems in the automobile industry in India. The researchers employed the case study research approach with a particular focus on Hyundai Motors India Limited. The researchers used a semi-structured and in-depth interviews to elicit data from top level managers and middle level managers of Hyundai Motors regarding the specific approach and strategy used by the company to develop the most affordable Hyundai Eon for India and other emerging markets. The data collected from the interviewees were tape-recorded and transcribed professionally while an open-ended analytic process of interview transcripts, qualitative analysis software (Nvivo) and in-depth coding were used for data analysis. The findings showed that through frugal engineering, bricolage and modularity, automobile company like Hyundai Motors India Limited is able to create value with less resources and at low costs.

Fischer et al (2021) explored knowledge transfer for frugal innovation with a particular focus on entrepreneurial universities. The aim of their study was to analyze the strategic knowledge transfer practices of entrepreneurial universities in facilitating frugal innovation in emerging economy. Their study adopted the case study research approach with a particular focus on University of Campinas (Unicamp) in Brazil. The researchers used a semi-structured interview to obtain data from 14 key personnel comprising senior academic staff of the university. The data collected via interviews were analyzed using coding technique. The findings showed that the internal capabilities of university to foster frugal innovations and connect them to markets are peculiar in encouraging frugal innovation practices among firms in Brazil.



Winterhalter et al (2017) carried out a study to determine the business models for frugal innovation in emerging markets. Their study focused on medical device and laboratory equipment industry in India and China with a view to know how firms use value creation and value capturing mechanisms to reach out to new market segments in rural areas with such unprecedented value propositions. The researchers employed the qualitative research approach and the multiple case study research design. Their data were obtained from five (5) firms within the medical and laboratory equipment industry that deploy frugal innovation business model. The data were collected through a semi-structured interview which was conducted among 13 senior managers who are directly involved either at the development, marketing or general management of the frugal innovation process. The interviews conducted were recorded and transcribed in verbatim immediately. The result of the analysis showed that value proposition, value creation and value capturing depend on each other when deploying frugal innovation in a resource constraint environment. The study revealed that the value proposition to the resource constraint customers is an affordable solution that creates high value for them. The study also confirmed that all the business models do not only serve their target customers satisfactorily but also improve the entire healthcare system in resource constraint environments.

European Commission (2015) explored frugal innovation and reengineering of traditional techniques for entrepreneurs and European industry. The Commission focused specifically on technology based frugal innovation and adopted the case study approach to study the mentality of entrepreneurs and European firms towards frugal innovation. Their data were collected from entrepreneurs who deploy frugal innovation in emerging and European countries using personal interview. The data collected were analysed using coding technique. The findings revealed that that entrepreneurs and firms from emerging economies demonstrate unrivalled capacity to reduce cost and capitalize on local knowledge while firms in Europe look for opportunity to leverage on the existing portfolio of technologies in Europe.

Tiwari et al (2017) examined the socio-economic impacts of frugal innovation in Germany. The researchers adopted qualitative research approach where focus group discussion and semi-structured interview were used to gather data from stakeholders such as academicians, researchers, businessmen, policymakers and civil society groups in Germany. The data collected were recorded and analyzed using content analysis. The findings showed that frugal innovation can help German companies to secure long-term competitiveness in emerging markets.

Krohn et al (2020) carried out a study to determine the frugal mind-set of managers in Germany. The researchers employed the survey research design where focus group discussion, structured questionnaire and semi-structured interview were used to collect data from 20 managers from two multinational companies with high-tech innovation in Germany. The data collected were analyzed using the Structural Equation Modeling and Partial Least Squares (PLS-SEM). The findings showed that managers' attitudes, perceived subjective norms and perceived behavioural control over frugal innovation are positively related to the development of intentions to support frugal innovation.



Gap in Literature

From the studies reviewed, it was observed that a good number of studies have been conducted on frugal innovation in both developing and developed countries but none of these studies relate frugal innovation strategies to supply chain performance of food and beverage firms in Nigeria. Even the methods and techniques applied by previous studies are very much insignificant to reckon with. This has created a gap in literature which needs to be filled. This study attempts to fill this gap in literature by exploring the relationship between frugal innovation strategies and supply chain performance of food and beverage firms in South-South Nigeria.

METHODOLOGY

The study applied the positivist research philosophy and correlational research design. The study population comprised 82 food and beverage firms in South-South Nigeria that are registered with the Nigeria Directory (www.directory.org.ng). These food and beverage firms were drawn from the six (6) states in the South-South Zone namely; Akwa Ibom, Bayelsa, Cross River, Delta, Edo and Rivers State. Sixty-eight (68) firms constituted the sample size of the study. The Taro Yamene's formula was used to determine the sample size for the study. The sampling unit constituted managers of the 68 selected food and beverage firms in South-South Nigeria. The managers fall under the categories of marketing managers, Research & Development (R&D) managers, procurement managers, finance managers, and information technology managers. 340 managers were drawn from the 68 selected food and beverage firms on the ratio of 5 managers per firm. A structured questionnaire was used to elicit data from the respondents (managers). The questionnaire was structured on a four (4) rating scale such as Strongly Agree, Agree, Disagree and Strongly Disagree. The instrument was validated through face and content analysis while the Cronbach Alpha method was used to determine its reliability. Three hundred and forty (340) copies of questionnaire was administered to the respondents (managers) and 226 copies were collected. The data collected were analyzed using descriptive statistics while the Pearson Product Moment Correlation Coefficient (PPMCC) was used to test the hypotheses. The correlation analysis was performed with the aid of the SPSS 24.0 version.



RESULTS AND DISCUSSION

The data collected on frugal innovation strategies (value innovation, cost cutting advancement and technological innovation) were correlated with those obtained on supply chain performance (product availability, on-time delivery and supply chain flexibility) using the SPSS software program version 24. The results are presented in the tables below:

Table 1: Result of correlation analysis between value innovation and supply chain performance of food and beverage firms

			Value Innovation	Supply Chain Performance		
				Product Availability	On-Time Delivery	Supply Chain Flexibility
Pearson (r)	Value Innovation	Correlation Coefficient Sig. (2 tailed) N	1.000 . 226	.551** .001 226	.622** .001 226	.589** .001 226
	Product Availability	Correlation Coefficient Sig. (2 tailed) N	.551** .001 226	1.000 . 226	.614** .001 226	.533** .001 226
	On-Time Delivery	Correlation Coefficient Sig. (2 tailed) N	.622** .001 226	.614** .001 226	1.000 . 226	.521** .001 226
	Supply Chain Flexibility	Correlation Coefficient Sig. (2 tailed) N	.589** .001 226	.533** .001 226	.521** .001 226	1.000 . 226

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

*Correlation is significant at 0.05 levels (2 tailed)

Source: *SPSS-generated Output*

Table 1 shows the result of the correlation analysis between value innovation and supply chain performance (product availability, on-time delivery and supply chain flexibility) of food and beverage firms in South-South Nigeria. The result shows that value innovation is positively correlated to product availability ($r = .551^{**}$); on-time delivery ($r = .622^{**}$); and supply chain flexibility ($r = .589^{**}$), and these correlations are significant at 0.01 level as indicated by the symbol **. As a result of this, we then reject the null hypothesis one (H_{01}) and accept the alternate hypothesis which states that “there is significant relationship between value innovation and supply chain performance of food and beverage firms in South-South Nigeria.”



Table 2: Result of correlation analysis between cost cutting advancement and supply chain performance of food and beverage firms

			Cost Cutting Advancement	Supply Chain Performance		
				Product Availability	On-Time Delivery	Supply Chain Flexibility
Pearson (r)	Cost Cutting Advancement	Correlation Coefficient Sig. (2 tailed) N	1.000 .226	.673** .001 226	.517** .001 226	.623** .001 226
	Product Availability	Correlation Coefficient Sig. (2 tailed) N	.673** .001 226	1.000 .226	.502** .001 226	.591** .001 226
	On-Time Delivery	Correlation Coefficient Sig. (2 tailed) N	.517** .001 226	.502** .001 226	1.000 .226	.563** .001 226
	Supply Chain Flexibility	Correlation Coefficient Sig. (2 tailed) N	.623** .001 226	.591** .001 226	.563** .001 226	1.000 .226

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

*Correlation is significant at 0.05 levels (2 tailed)

Source: SPSS-generated Output

Table 1 presents the result of the correlation analysis between cost cutting advancement and supply chain performance (product availability, on-time delivery and supply chain flexibility) of food and beverage firms in South-South Nigeria. The result shows that cost cutting advancement has a positive correlation with product availability ($r = .673^{**}$); on-time delivery ($r = .517^{**}$); and supply chain flexibility ($r = .623^{**}$), and these correlations are significant at 0.01 level as indicated by the symbol **. Consequently, the null hypothesis two (H_{02}) was rejected and the alternate hypothesis was accepted. This means that “there is significant relationship between cost cutting advancement and supply chain performance of food and beverage firms in South-South Nigeria.”



Table 3: Result of correlation analysis between technological innovation and supply chain performance of food and beverage firms

			Technological Innovation	Supply Chain Performance		
				Product Availability	On-Time Delivery	Supply Chain Flexibility
Pearson (r)	Technological Innovation	Correlation Coefficient Sig. (2 tailed) N	1.000 .226	.628** .001 226	.649** .001 226	.744** .001 226
	Product Availability	Correlation Coefficient Sig. (2 tailed) N	.628** .001 226	1.000 .226	.615** .001 226	.713** .001 226
	On-Time Delivery	Correlation Coefficient Sig. (2 tailed) N	.649** .001 226	.615** .001 226	1.000 .226	.684** .001 226
	Supply Chain Flexibility	Correlation Coefficient Sig. (2 tailed) N	.744** .001 226	.713** .001 226	.684** .001 226	1.000 .226

**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 correlation analysis between technological innovation and supply chain performance (product availability, on-time delivery and supply chain flexibility) of food and beverage firms in South-South Nigeria. The result revealed that technological innovation is positively correlated to product availability ($r = .673^{**}$); on-time delivery ($r = .649^{**}$); and supply chain flexibility ($r = .744^{**}$), and these correlations are significant at 0.01 level as indicated by the symbol **. Based on these results, the null hypothesis three (H_{03}) was rejected and the alternate hypothesis was accepted. This means that we then accept that “there is significant relationship between technological innovation and supply chain performance of food and beverage firms in South-South Nigeria.”



DISCUSSION OF FINDINGS

This study discovered a significant relationship between value innovation and supply chain performance of food and beverage firms in South-South Nigeria. This finding was derived from the result of the correlation analysis carried out on the variables in the first hypothesis. The result revealed that value innovation is positively correlated to product availability ($r = .551^{**}$); on-time delivery ($r = .622^{**}$); and supply chain flexibility ($r = .589^{**}$), and these correlations are significant at 0.01 level. As a result of this, we then rejected the null hypothesis one (H_{01}) and accepted the alternate hypothesis which states that “there is significant relationship between value innovation and supply chain performance of food and beverage firms in South-South Nigeria.”. This finding is supported by Dima et al (2022) who revealed that value innovation ensures product availability in the marketplace. Somuyima et al (2015) supported this finding when they revealed that a firm is likely to deliver its products on-time if it implements value innovation strategy. Basu et al (2013) also reported that value innovation gives a firm a greater flexibility in its supply chain operations.

This study also found a significant relationship between cost cutting advancement and supply chain performance of food and beverage firms in South-South Nigeria. This finding emanated from the result of the correlation analysis carried out on the variables in the second hypothesis. The result showed that cost cutting advancement has a positive correlation with product availability ($r = .673^{**}$); on-time delivery ($r = .517^{**}$); and supply chain flexibility ($r = .623^{**}$), and these correlations are significant at 0.01 level. Consequently, the null hypothesis two (H_{02}) was rejected and the alternate hypothesis was accepted. This means that “there is significant relationship between cost cutting advancement and supply chain performance of food and beverage firms in South-South Nigeria.”. This finding is supported by Figar and Ivanovic (2015) and Tiwari and Herstatt (2012) as both studies reported that cost cutting advancement significantly facilitate supply chain flexibility of business firms. Oyerogba et al (2014) also agreed with this finding as they revealed that companies that are able to cut down their costs are likely to distribute their products to the market on-time.

Finally, it was revealed that significant relationship exists between technological innovation and supply chain performance of food and beverage firms in South-South Nigeria. This finding was obtained from the result of the correlation analysis carried out on the variables in the third hypothesis. The result showed that technological innovation is positively correlated to product availability ($r = .673^{**}$); on-time delivery ($r = .649^{**}$); and supply chain flexibility ($r = .744^{**}$), and these correlations are significant at 0.01 level as indicated by the symbol **. Based on these results, the null hypothesis three (H_{03}) was rejected and the alternate hypothesis was accepted. This means that we then accept that “there is significant relationship between technological innovation and supply chain performance of food and beverage firms in South-South Nigeria.” This finding is supported by Adepoju et al (2017) who noted that a company that embrace new technology innovation would make their product available in the market on-time. Fayomi et al (2019) also reported that a firm can become more flexible in executing its supply chain functions if it adopts new technology and digitalize its supply chain operations.



CONCLUSIONS

This study examines frugal innovation strategies and supply chain performance of food and beverage firms in South-South Nigeria. It critically analyzed the dimensions of frugal innovation strategies (value innovation, cost cutting advancement and technological innovation) and relate them to supply chain performance measures (product availability, on-time delivery and supply chain flexibility) of food and beverage firms. The results of this study revealed that value innovation has a significant relationship with product availability, on-time delivery and supply chain flexibility of food and beverage firms. Cost cutting advancement was also found to have a significant relationship with product availability, on-time delivery and supply chain flexibility of food and beverage firms. Technological innovation was equally reported to have a significant relationship with product availability, on-time delivery and supply chain flexibility of food and beverage. Based on these findings, it is concluded that frugal innovation strategies such as value innovation, cost cutting advancement and technological innovation are significant predictors of supply chain performance of food and beverage firms in South-South, Nigeria.

RECOMMENDATIONS

The following recommendations are provide for the study:

1. That, food and beverage firms in South-South Nigeria particularly those that are experiencing poor supply chain performance should adopt frugal innovation strategies as it would improve their supply chain performance.
2. That, food and beverage firms in South-South Nigeria should adopt value innovation and cost cutting advancement as it would not only facilitate product availability but would also ensure on-time delivery of their products.
3. That, food and beverage firms in South-South Nigeria especially those whose technologies are outdated should embrace new technology and digitalized their supply chain operations as it would promote frugal innovation practices but would also improve their supply chain performance in terms of ensuring product availability and on-time delivery.
4. That, food and beverage firms in South-South Nigeria particularly those that have a rigid supply chain system should adopt frugal innovation strategies such as value innovation, cost cutting advancement and technological innovation as it would ensure greater flexibility in their supply chain operations.
5. That, food and beverage firms in South-South Nigeria should reduce their supply chain costs to its barest minimum as it would go a long way in improving their supply chain performance.
6. Finally, it is recommended that food and beverage firms in South-South Nigeria should periodically review their frugal innovation strategies to identify those areas that create room for loopholes and adjust them accordingly as this would help to improve their supply chain performance.



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