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Adoption of Frugal Innovation Practices and Business Survival in Food and Beverage Smes in Nigeria

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Abstract

SMEs are central to the economy of Nigeria as they contribute a significant portion of employment and GDP but experience high mortality rates because of the lack of resources, untrustworthy infrastructure, unstable economic environments, and stiff competition. Such problems are especially acute in the industry of food and beverages. Frugal innovation (FI) offers an appealing survival resource to resource-constrained firms by creating low cost, simplified solutions that offer essential functionality with constraints. This paper looks at how adoption of frugal innovation practices is related to business survival of SMEs in the food and beverage industry in Rivers State, Nigeria. The survey design used was cross-sectional where structured questionnaires were distributed among 312 owners and managers who were sampled using stratified random sampling of an estimated population of registered SMEs in the sector. Descriptive statistics and multiple linear regression were both used to analyse data in SPSS. Findings indicated moderate or high use of FI practices, and process frugality (operational simplification and local substitution) exhibited the most positive effect on the survival indicators (0.412, p = 0.001), then product frugality (0.358, p = 0.001), and business model frugality (0.296, p = 0.001). Taken together, these dimensions accounted 42.8 percent of perceived business survival. The results confirm that frugal innovation is a strategic tool of critical utility when it comes to improving resilience, profitability, and longevity of the challenging business environment in Nigeria. Policymakers should support FI through targeted training and infrastructure interventions, and SME managers should prioritise process and product frugality.

Keywords: frugal innovation, business survival, resource constraints, process frugality, product frugality

Introduction

The concept of frugal innovation, known as the development of low-cost and resource-efficient products and services that incur necessary functionality but not the unwarranted complexities, has become a popular strategic requirement of small and medium-sized enterprises (SMEs) in the resource-restrictive emerging economies (Radjou et al., 2012; Zeschky et al., 2014). The food and beverage industry in Nigeria, where the SMEs constitute the majority of the economic activity, is one of the areas where frugal innovation can be used to its advantage by meeting the needs of the price-sensitive customers of the sector and dealing with the operational limitations. The industry, which includes such sub-industries as baking, non-alcoholic beverages, and food processing, is an important source of employment and a major contributor to manufacturing production (Akpan et al., 2016). In this regard, frugal innovation entails the re-arranging

of products, processes, and business models to make them affordable, simple, and sustainable, to further enhance competitiveness in the unstable markets (Rossetto et al., 2023). According to the recent empirical data conducted on Nigeria, frugal strategies such as value innovation, cost-cutting advancements, and technological adaptations have a positive impact on the supply chain performance and business success in food and beverage companies (Eze et al., 2024; Okeke and Eze, 2024). With the increasing economic pressure, the study of the practices is vital in the provision of critical information on how SME can be made resilient and sustainable in Africa.

The Nigerian SME industry is marked by extremely high failure rates, with experts estimating that more than 80% of the SMEs fail after the fifth year, mostly because of the unfavourable economic factors, the lack of capital access, and the poor management practices (SMEDAN, 2024; Moniepoint, 2024). This is a weakness, especially in the food and beverage sector, where local products compete with imported products and this competitiveness is made difficult by the issue of survival (Akpan et al., 2016). To add to these challenges is the contextual factor such as unstable power load forcing the reliance on costly alternative energy sources, rising input costs due to inflation and currency devaluation, and supply chain problems due to bad infrastructure and logistical inefficiency (Ojadi and Walters, 2017; PwC, 2024). Planning and profitability are further compromised by economic volatility that is characterized by policy inconsistencies and variable prices of commodities. Furthermore, there are the issues of food safety, counterfeits, and compliance with regulations which enhance operational risks, which result in the wastage of products and exclusion of markets in many cases (Orji et al., 2021). Without adaptive strategies including frugal innovation, food and beverage SMEs are left on their knees in Nigeria, a factor that is causing unemployment and hindering food security in Nigeria.

A lot of available literature on innovation focuses on the institutional paradigms of formal research and development (R&D) that dominate resource-rich developed economies, whereby an organized process and significant investments facilitate technological innovation (Tiwari et al., 2017). This emphasis is insufficient to cover frugal innovation in resource-restricted, informal or semi-formal settings that are common in sub-Saharan Africa (Knorringa et al., 2016). Although studies have explored frugal practices in Asian emerging markets and select African sectors, there remains a paucity of context-specific research on Nigeria's food and beverage SMEs, despite emerging evidence of frugal strategies enhancing supply chain and business outcomes in this domain (Eze et al., 2024; Okeke & Eze, 2024). Furthermore, the multidimensionality of frugal innovation, which encompasses simplification of product, process optimisation, and the re-configuration of a business model, has not been properly investigated within the informal African economies with the issues brought by regulatory and infrastructure constraints (Rossetto et al., 2023; Leliveld and Knorringa, 2018). This theoretical gap constrains the theoretical progress and empirical advice, and it demands the application of empirical studies to change the frugal innovation models to fit the socio-economic context of Nigeria.

Research Questions/Objectives

The following research questions and their corresponding objectives guide the study.

1. How far food and beverage SMEs in Nigeria practise frugal innovation? This objective will be utilized in measuring the extent, the nature, and barriers to frugal innovation adoption.
2. How is the adoption of frugal innovation practice related to perceived business survival in such SMEs? This aims at exploring links to survival measures, including prolonged profitability and market existence.

3. What aspects of frugal innovation (e.g. frugal product innovation, process innovation, or business model innovation) are the most important to increase resilience? This objective prioritises key facets that contribute to SME endurance in resource-constrained settings.

Theoretically, this research extends frugal innovation theory by contextualising it within Africa's resource-limited environments, challenging dominant Western models and enriching understandings of innovation in informal sectors (Knorringa et al., 2016; Leliveld & Knorringa, 2018). In practice, it provides the owners of SMEs with a solid framework on how to apply frugal practices, and positions them with mechanisms to cut down on expenses and enhance flexibility in the face of economic turbulence (Eze et al., 2024). The findings can be used by policymakers to implement interventions, including specific training or incentives to encourage employment, innovations, and adherence to sustainable development objectives in the food and beverage sector.

The study has a narrower geographical coverage to Nigeria and among the urban centres such as Lagos, Abuja, Port Harcourt and other South-South/South-East regions where the SMEs of the food and beverage sectors are highly concentrated. The operationalisation of SMEs is based on the guidelines of the Republic of Nigeria: an organisation with less than 250 employees and yearly turnover up to ₦500 million. Given sub-sectors include baking (bread and confectionery), beverages (non-alcoholic drinks and bottled water), and food processing (packaged snacks and staples), the research is limited only to these sub-sectors. Large corporations, primary agriculture, and hospitality services (e.g., restaurants) are excluded. Data collection emphasises perspectives from SME owners and managers via mixed methods, without incorporating consumer viewpoints or cross-national comparisons, thus constraining broader generalisability.

Literature Review and Hypotheses Development

Concept of Business Survival

Business survival serves as the dependent variable in this study and is conceptualised as a multidimensional construct that transcends mere organisational existence to incorporate resilience to external disruptions, sustained profitability, and indicators of growth such as market expansion and operational scalability (Boso et al., 2017; Kowo et al., 2024). The survival in the context of SMEs is an indicator of the ability of the firm to remain viable in the long term due to resource shortages, competition, and macroeconomic uncertainty (Etim, 2022; Onuoha & Uzo, 2024). This construct is particularly relevant to the case of Nigerian food and beverage SMEs in relation to high attrition rates in the sector, with such environmental factors as economic instability and infrastructural shortage posing a major threat to their existence (SMEDAN, 2024). Objective and subjective indicators usually work together with business survival being measured. Objective metrics encompass longitudinal survival rates (e.g., firm longevity beyond 5 or 10 years), financial performance ratios such as return on assets and liquidity, and growth trajectories including revenue increases and employee expansion (Amankwah-Amoah et al., 2021). Such dimensions of resilience as adaptability to crises, customer retention and perceived operational stability, which are commonly measured by perceptual survey of owners or managers, come into play in informal scenarios where formal documentation is in low gear (Cowling et al., 2018; Okeke and Eze, 2024). This mixed approach will ensure that there is a systematic examination because it considers the interplay between the strategic resources of the internal environment and the external environmental factors on the survival of the SMEs in the resource constrained markets.

Frugal Innovation (FI)

Frugal innovation (FI) is defined as the development and deployment of affordable, simplified solutions that deliver core functionalities with optimised performance, achieved through substantial cost reductions without sacrificing essential quality (Zeschky et al., 2014; Radjou et al., 2012). This paradigm is grounded in several core theories: resource-constraint theory, which argues that scarcity drives ingenuity by forcing efficient resource utilisation (Gibbert et al., 2007); bricolage, involving the creative recombination of available resources to address challenges (Baker & Nelson, 2005); and Jugaad, an indigenous Indian concept emphasising flexible, improvised innovation in adverse conditions, often extended to similar contexts in emerging economies (Prabhu, 2017; Tiwari et al., 2017). These theoretical foundations make FI an initiative in response to the limitations, making them a competitive advantage source. The major tenets of FI are high reduction of cost by simplifying designs and sourcing locally, obsessive emphasis on core functionality to ensure underserved consumers only need good-enough, and optimised performance that provides both ease and affordability (Weyrauch and Herstatt, 2017; Rossetto et al., 2023). In contrast to conventional innovation, which is resource-intensive and formal, including R&D, FI adopts bottom-up and iterative strategies and emphasises accessibility, inclusivity and environmental efficiency, which will be especially applicable to SMEs in developing markets with ongoing resource crises.

Frugal Innovation in Emerging Economies/SMEs

Frugal innovation in emerging economies has been experimentally associated with high SME competitiveness and resistance, allowing firms to deal with institutional vacuity, vulnerability in the supply chain, and market uncertainty with cost-driven adaptations (Knorringa et al., 2016; Leliveld and Knorringa, 2018). Research has suggested that FI enhances SMEs performance that support products and procedure affordability, and consequently, enhance market share and sustainability in operations by the low-income segment (Hossain, 2021; Albert, 2019). In African contexts, including Nigeria, FI practices such as local material substitution and simplified production have been associated with superior supply chain performance and overall business success in the food and beverage sector, where firms contend with high input costs and infrastructural challenges (Eze et al., 2024; Okeke & Eze, 2024; Ukpong & Akpan, 2024). Additional evidence from wider emerging markets underscores FI's function in cultivating absorptive capacity and bricolage, enabling SMEs to assimilate external knowledge and dynamically reconfigure resources, thereby bolstering resilience to economic shocks (Silva et al., 2022; Pansera, 2018). Together this literature highlights the importance of FI as a critical driver of SME longevity, both economic viability and sustainable development through tackling affordability barriers and reducing environmental impact in resource-limited environments.

Hypothesis Development

The study has a hypothesis of directional predictive relationships on dimensions of frugal innovation and business survival based on the theoretical framework of resource-constraint theory, bricolage, and jugaad, and empirical evidence regarding emerging economy SMEs. Operational simplification and local substitutions, known as process frugality, allow relying on an unstable importation and enhancing the increase of costs, which enables the continuation of operations and resliency in constrained settings (Baker & Nelson, 2005; Weyrauch & Herstatt, 2017; Ukpong & Akpan, 2024). Accordingly, H1: Process frugality (bounding operations, local alternative) is positively related to the continuity of SMEs operations. Frugality as a product focused on building affordable, good-enough products focus core functionality

principles to focus on price-sensitive markets and improve customer loyalty and market positioning in the face of stiff competition (Zeschky et al., 2014; Eze et al., 2024). Therefore, H2: Product frugality (creating decent-enough, affordable products) has a positive effect on market share and customer retention. Frugality The business model is based on the use of community networks and flexible pricing mechanisms, which allows the value of financial adaptability and revenue stability through social capital formation and responsiveness value creation (Knorringa et al., 2016; Okeke & Eze, 2024). Hence, H3: Business model frugality (community network, flexibility in pricing) has a positive impact on the financial sustainability.

Methodology

The research design that will be used in this study will be the quantitative research design which is the cross-sectional survey design to determine the adoption of frugal practices of innovation and its effects on the survival of business in the food and beverage SMEs in Nigeria. The choice of a quantitative design is justified by its ability to facilitate the collection of structured data from a large sample, enabling statistical analysis to identify patterns, relationships, and generalisable insights in resource-constrained contexts (Creswell & Creswell, 2018). Unlike qualitative methods, which emphasise depth and exploratory narratives, a survey-based quantitative approach is particularly suitable for testing hypotheses derived from existing theories, such as resource-constraint theory and bricolage, while quantifying the extent of frugal innovation adoption and its correlation with survival metrics (Okeke & Eze, 2024). This design aligns with prior studies on innovation in Nigerian SMEs, where surveys have effectively captured perceptual data on practices and performance outcomes amid economic volatility (Eze et al., 2024). By focusing on measurable variables through standardised instruments, the methodology ensures objectivity, replicability, and the capacity to handle multivariate relationships, which are essential for addressing the research objectives in a developing economy setting.

The study sample will include all the registered food and beverage SMEs in Rivers State, Nigeria, which is estimated to have 5,009 enterprises judging by national surveys of micro, small, and medium-sized enterprises (SMEDAN, 2024). The selection of rivers state was based on the fact that it possesses dynamic industrial, great concentration of food and beverage operations, and indicative economic concerns in the Nigeria South-South region, including supply chain interference and rivalry (Etim, 2022). To ensure representativeness, a stratified random sampling technique was employed, dividing the population into strata based on sub-sectors (baking, beverages, and food processing) and enterprise size (micro, small, and medium). This method minimises bias by proportionally allocating samples across strata, enhancing the generalisability of findings to the broader SME landscape (Krejcie & Morgan, 1970). The sample was calculated using Krejcie and Morgan formula and gave 357 respondents as the target sample within an accessible population of 1,532 SMEs currently operating in the industry (identified based on local business registries and associations) (Ukpong & Akpan, 2024). This is the sample size that represents the length of a 95% confidence level and a 5% margin of error, and it is adjusted to the possibilities of non-response rates that are typical among the Nigerian SME surveys (Onuoha & Uzo, 2024).

The sampling is done through a structured questionnaire, which was conducted on the SME owners or managers, the questionnaire aimed at obtaining a response to questions about frugal innovation adoption and perceived business survival. The instrument had Likert-type scales (5-point, between 1 = strongly disagree and 5 = strongly agree) to quantify perceptual constructs to enable attenuated quantification of attitudes and practices (Weyrauch & Herstatt, 2017). Frugal innovation (FI) was an independent variable operationalised by multi-dimensional scales based on existing literature, which also have items on process

frugality (e.g., simplifying operations and utilising local substitutes), product frugality (e.g., developing affordable, good-enough products), and business model frugality (e.g., leveraging community networks and flexible pricing) (Rossetto et al., 2023; Hossain, 2021). The scales were contextualised against the Nigerian SMEs by having local examples such as the use of local alternatives instead of imported ones. As a dependent variable, the business survival was measured on a composite index composed of items concerning profitability (e.g. net profit margins), sales growth (e.g. year-over-year increase in revenue), and survival intention (e.g. perceived likelihood of lasting economic shocks), based on validated measures in emerging market research (Etim, 2022; Kowo et al., 2024). Questionnaires were distributed electronically and in person to maximise response rates, with ethical considerations including informed consent and anonymity upheld throughout the process.

To facilitate the validity and reliability of the instrument, the pilot test was carried out on a sample of 30 SMEs in a similar yet non-overlapping sample in neighbouring states, which made possible the initial refinements (Taber, 2018). Construct validity was evaluated using exploratory factor analysis (EFA), which ensured the overall structure of FI dimensions and survival indicators with factors loading values of more than 0.6 and better than 60% variance (Hair et al., 2019). The content validity was determined through expert reviews of academics and industry professionals with knowledge about the Nigerian SMEs. To test reliability; Cronbachs alpha was used where the process frugality, product frugality, business model frugality and the general business survival scale obtained scores of 0.82, 0.79, 0.85, and 0.87 respectively, above the acceptable level of 0.70 which is the acceptable level of internal consistency (Nunnally and Bernstein,1994). These findings confirm the instrument strength in gauging latent constructs in innovation research, and overcoming the usual problems such as bias in responding to self-reports.

The analysis of the data was performed with the help of SPSS version 25 and the multi-stage analysis was applied in order to respond to the research questions and hypotheses. The demographics, adoption levels, and survival perceptions were summarised using descriptive statistics such as means, standard deviations, frequency, and percentages, and provided an overview of the central tendencies and dispersion (Field, 2018). The inferential methods included Regression models that are used to determine the predictive ability of practices of FI on survival, after abiding by confounding factors like firm age and size. This analytical framework aligns with the previous quantitative research on frugal innovation in SMEs, which guarantees rigorous hypothesis test and practical implications (Okeke and Eze, 2024; Eze et al., 2024).

Results

The researchers obtained the response rate of 87.4 where 312 questionnaires that were useful were collected out of the total samples of 357 food and beverage SMEs in Rivers State, Nigeria. This is a strong response rate that contributes to the reliability and validity of the further analyses.

Demographic Profile

The demographic factors of the respondents and the firms give the necessary background to the interpretation of frugal innovation practice adoption. The most important demographic information is presented in Table 1.

Table 1: Demographic Profile of Respondents and Firms (N = 312)

Variable	Category	Frequency	Percentage (%)
Gender	Male	213	68.3
	Female	99	31.7
Firm Size	Micro (1–9 employees)	133	42.6
	Small (10–49 employees)	121	38.8
	Medium (50–249 employees)	58	18.6
Firm Age	Less than 5 years	89	28.5
	5–10 years	141	45.2
	More than 10 years	82	26.3
Location	Port Harcourt/Urban	226	72.4
	Semi-urban/Rural	86	27.6
Sub-sector	Baking	112	35.9
	Beverages	100	32.1
	Food Processing	100	32.0

The percentage of male respondents was the highest (68.3) and 31.7 percent of the respondents were women, which is typical of SME ownership in Nigeria. The largest proportion of 42.6 is composed of micro enterprises (1-9 employees), small enterprises (10-49 employees), and medium enterprises (50-249 employees). It comes in line with the tendencies of the country, where micro and small businesses are dominant in the food and beverage sector. The age of the firm was combined with 28.5% age of the firm less than 5 years, 45.2 years between 5-10 years, and 26.3 years age above 10 years, therefore a combination of both nascent and established firms, suffering due to the economic climate. Regarding the geographical situation, the majority of them (72.4) were located in Port Harcourt and its surroundings, and the others lived in semi-urban regions in Rivers State, which is appropriate due to the similarity of food processing and beverage activities industrial zones (Ukpong and Akpan, 2024). Sub-sector representation was as follows; baking (35.9%), beverages (32.1%), and food processing (32.0%), which provide the same viewpoints in the desired areas.

Descriptive Statistics

Descriptive statistics reveal the extent of frugal innovation adoption and perceptions of business survival. Table 2 summarises the means and standard deviations for the key constructs and their dimensions, measured on a 5-point Likert scale (1=strongly disagree to 5= strongly agree).

Table 2: Descriptive Statistics for Frugal Innovation Adoption and Business Survival (N = 312)

Construct/Dimension	Mean	Standard Deviation	Interpretation
Frugal Innovation (Overall)	3.82	0.76	Moderate to High Adoption
Process Frugality	4.01	0.68	High Adoption
Product Frugality	3.78	0.82	Moderate to High Adoption

Construct/Dimension	Mean	Standard Deviation	Interpretation
Business Model Frugality	3.67	0.79	Moderate Adoption
Business Survival (Overall)	3.65	0.84	Moderately Positive Perception
Operational Continuity	3.89	0.77	Positive Perception
Financial Sustainability	3.72	0.81	Moderately Positive
Market Share & Customer Retention	3.34	0.92	Moderate Perception

The descriptive statistics will provide the general outline of the frugal innovation (FI) adoption levels and perceptions regarding business survival among the respondents. The total means of the Likert scale (1 = strongly disagree to 5 = strongly agree) is 3.82 (SD = 0.76), which indicates moderate to high involvement frugal practices. In particular, the highest mean was process frugality (e.g., simplifying operations and local substitutes), then product frugality (M = 3.78, SD = 0.82) and business model frugality (M = 3.67, SD = 0.79). These figures indicate that Nigerian food and beverage SMEs prioritise operational efficiencies and local sourcing to mitigate high input costs and supply disruptions, consistent with patterns observed in resource-constrained emerging economies (Okeke & Eze, 2024; Hossain, 2021). Business survival perceptions measured through composite index of profitability, sales growth and survival intention produce a mean of 3.65 (SD = 0.84), which is a moderately optimistic perception of business survival under contextual pressure. Operational continuity (M = 3.89) and financial sustainability (M = 3.72) were the strongest perceived by the respondents, and lower scores were recorded in market share retention (M = 3.34), highlighting the vulnerabilities to competition and economic volatility (Kowo et al., 2024).

To analyze the hypotheses, the multiple linear regression analysis was carried out, where business survival was dependent variable, and three dimension of the FI was independent variables. It was statistically significant ($F = 48.726$, $p < 0.001$) and it accounted 42.8 percent of the business survival ($R^2 = 0.428$). The regression coefficients are summarised as follows:

Table 3: Multiple Linear Regression for Business Survival and Dimensions of Frugal Innovation

Predictor	β	t	p-value
Process Frugality	0.412	7.892	<0.001
Product Frugality	0.358	6.514	<0.001
Business Model Frugality	0.296	5.213	<0.001

Hypothesis 1, which states that process frugality positively influences operational continuity (a key facet of survival), was supported ($\beta = 0.412$, $p < 0.001$) and shows that simplifications and local substitutions significantly enhance resilience against infrastructural and cost-related disruptions. Hypothesis 2, which posits that frugality of products has a positive impact on the market share and customer retention was also confirmed ($\beta = 0.358$, $p = 0.001$), which reveals the importance of affordable and good-enough products in maintaining the demand among price-sensitive consumers. It was supported ($\beta = 0.296$, $p = 0.001$), but with a smaller coefficient, which indicates that other variables, such as community networks and flexible prices, have a positive effect that can be maximized only with the level of financial sustainability (Hypothesis 3), indicating that business model frugality has a positive impact, although it may need other

factors to be maximized (Eze et al., 2024; Weyrauch and Herstatt, 2017). On the whole, the findings confirm that there are positive relationships between dimensions of the FI and business survival in that sense.

Further comparison investigated group differences in terms of all independent samples t- tests and ANOVA in terms of level of adoption of FI. A significant difference was found between the micro and small/medium enterprises ($t = 3.456$, $p < 0.01$), as a higher adoption mean was found in micro firms ($M = 4.05$) than in small/media ($M = 3.68$), which is probably because of the resource constraints that force them to be more frugal. There were no significant differences between sub-sectors ($F = 1.892$, $p > 0.05$) or firm age groups ($F = 2.104$, $p > 0.05$), which means that FI adoption is widespread regardless of these factors. These additional insights add to the flexibility of frugal approaches in different SMEs in the food and beverage industry of Nigeria (Rossetto et al., 2023).

Discussion

Interpretation of Findings

The findings indicate that frugal innovation (MI) activities play a major role in business survival of food and beverage SME in Rivers State, Nigeria, and the regression model is capable of explaining 42.8% of perceived survival. The strongest positive effect was found in process frugality ($\beta = 0.412$, $p < 0.001$), meaning that operational simplifications and local material substitutions are essential to resource-constrained environments continuity. This observation is consistent with Eze et al. (2024), who indicated that the use of frugal strategies improved the performance of the supply chains in South-South Nigerian food and beverage companies that minimized the need to depend on imported inputs. Equally, the high importance of the product frugality market share and customer retention ($\beta = 0.358$, $p < 0.001$) supports Hossain (2021), whose survey conducted on the effects of the price-sensitive product groups revealed the relevance of low-cost, simplified products in consumer acquisition. Although business model frugality was positively related to financial sustainability ($\beta = 0.296$, $p = 0.001$), it was not as significant, in line with Ukpong and Akpan (2024), who concluded that network-related changes in SMEs in Nigeria typically need additional institutional backing to have significant impacts. On the whole, moderate high rates of adoption ($M = 3.82$) and positive attitudes to survival ($M = 3.65$) support the previous discussion that FI is one of the adaptive mechanisms to SME survival in unstable conditions (Okeke and Eze, 2024; Rossetto et al., 2023).

Contextual Explanation

The prevalence of process frugality in the Nigerian food and beverage industry is a manifestation of structural complexities, such as unreliable power supply, inflationary pressures on raw material costs, and inefficiency in the logistics that are overly impacting the production processes (SMEDAN, 2024; Kowo et al., 2024). To escape these hurdles, the Rivers State SMEs tend to resort to the local alternatives and the simplified operations in order to proceed with the output in spite of the economic unpredictability. Product frugality's relative prominence over business model innovation can be attributed to the sector's characteristics: perishable goods demand rapid market responsiveness, and low-income consumers prioritise immediate affordability over innovative distribution or pricing models (Eze et al., 2024). Developing "good-enough" products, such as simplified packaged snacks or beverages using indigenous ingredients, directly addresses counterfeit risks and food safety concerns while yielding quicker returns on investment compared to restructuring business models, which may involve complex community

partnerships or digital platforms hindered by limited infrastructure (Ukpong & Akpan, 2024). This sectoral variety of physical process adjustments and product customisation differentiates the informal economy of Nigeria and more formalised emerging markets where business model innovations can frequently be based on highly developed ecosystems (Hossain, 2021).

Theoretical Implications

The results build on the resource-constraint theory by demonstrating how scarcity triggers multidimensional FI, especially process-based practices, to spearhead SME survival in African informal sectors (Baker & Nelson, 2005; Weyrauch and Herstatt, 2017). They confirm bricolage and Jugaad frameworks, showing that recombining local resources fosters resilience beyond mere cost reduction (Prabhu, 2017; Tiwari et al., 2017). The focus on process and product dimensions needed allows the study to refute Western-centric innovation paradigms, which focus on formal R&D, instead confirming FI as a context-specific innovation pathway to low-resource entrepreneurship (Knorringa et al., 2016; Leliveld and Knorringa, 2018). The relatively disadvantaged position of business model frugality implies that institutional voids should be introduced theoretically and reveal how regulatory and infrastructural gaps in Nigeria might limit some facets of FIs (Zeschky et al., 2014). Finally, the findings contribute to the development of FI theory because they highlight how this theory is consistent with sustainable development aims, that foster inclusive growth by making it affordable and resource efficient (Albert, 2019).

Practical Implications

For SME Owners and Managers:

1. **Prioritise Process Frugality Immediately:** Carry out a basic inspection of your production line to single out high cost imported goods (e.g., flour, sugar, packaging, etc) and substitute at least 3050 percent with local substitutes within 6 months (e.g. cassava flour in place of wheat in baking or sorghum in place of some drinks, etc.). Get cheap or free backups, such as a manual mixer or a small hybridsolar panel/generator, to minimize downtime when the power goes off, which can save on energy costs of 20-40 percent.
2. **Accelerate Product Frugality Development:** Introduce a minimum viable product loop: get direct customer feedback on existing products of 20-50 regular customers, and trim useless features (e.g. fancy packaging or imported flavours) and make smaller information and cheaper versions with 15-25 per cent different price but the same taste and quality. Experiment in domestic markets within 3 months increase volume sales and retain customers who purchase products with low income.
3. **Strengthen Business Model Frugality Gradually:** Establish informal relationships with 5-10 local retailers or community organizations to sell in bulk on credit or consignment with flexible payment arrangements (e.g. weekly installments) based on the sales. Co-ordinate the ordering and deliveries with the help of free apps such as WhatsApp Business groups that will help to avoid inventory holding expenses and to increase cash flow without official digital platforms.

For Policymakers and Support Institutions (e.g., SMEDAN, BOI, State Ministries of Commerce):

1. **Roll Out Targeted FI Training Programs:** Hold monthly practical seminars in key hubs such as Port Harcourt, on the practical skills such as local ingredient replacement of food processing, low-cost

energy options to the SMEs, and forge agreements with local universities or technical colleges to train at least 500 owners in these areas each year.

2. **Provide Dedicated FI Funding and Incentives:** Establish a low-interest Frugal Innovation Grant program that provides 500,000-2 million seed funds for equipment upgrades (e.g. solar kits, manual processors) or product reformulation trials with simplified application procedures and mentorship.
3. **Facilitate Infrastructure and Networking Hubs:** Develop or enhance SME clusters with common facilities (e.g. good power supply), cold storage, and periodic "FI marketplace" events where owners are shown frugal products and where they can meet the suppliers and have access to extension officers to provide further guidance.

These measures can directly transform the findings of the study to better survival, retention and contribution to the food security in the food and beverage industry of Nigeria.

Limitations and Future Research Directions

The weakness of the study is its cross-sectional nature that provides the association but fails to provide causality or long-term dynamics of the adoption of FIs and their survival (Creswell and Creswell, 2018). Self-reported perceptual information can also result in a common method bias or social desirability bias, especially where only informal industries are considered (Podsakoff et al., 2003). The concentration on Rivers state limits its ability to be generalised to other areas in Nigeria that may have different economic profile. The future research must follow longitudinal designs to analyze causal pathways and effects over time, combine qualitative research methods to inspect the issue of implementation problems in depth, and extend the research to other areas (e.g., manufacturing vs. services) or countries in Africa to balance the circumstances (Hossain, 2021; Leliveld and Knorringa, 2018).

Conclusion

This paper has discussed the problem of high mortality rates of small and medium-sized firms (SMEs) in the competitive food and beverage industry in Nigeria, where members of the industry are fighting against the unstable power supply, rising production costs, supply chain and production, cutthroat competition and economic instability. The main aim was to determine how much such SMEs have adopted frugal innovation (FI) and the connection between perceived business survival and the relative importance of process, product, and business model frugality.

The results demonstrate that the food and beverage SMEs in Rivers State possess moderate to high ratios of FI usages where process frugality is the most frequent and effective dimension, then product frugality followed by business model frugality. All three dimensions have significant positive correlates with business survival, and they have a combined positive correlation that explains a high percentage of the perceived resilience, profitability, and growth intentions.

All in all, the study makes an important point: frugal innovation is not only a cost-saving measure applied when you are desperate, but also an important strategic tool that will turn the scarcity of resources into the source of competitive edge and durability. With such a hard and uncertain business environment that Nigeria presents, it is quite logical that adopting frugal culture allows SMEs to not only survive but also innovate in response, target underserved markets efficiently and play an active role in sustainable economic growth. Through institutionalisation of frugal attitudes and skills, owners, managers, and policymakers can make the SME ecosystem stronger and able to survive the shocks and to prosper in the face of adversity.

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