

# Factors Influencing Innovation Capability of Flour Processing Firms in Southwest, Nigeria

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**Abstract:** This study contributes to innovation studies by examining the factors influencing the innovation capability of flour processing firms in Southwestern Nigeria. Five flour processing firms were randomly selected from twenty-two flour processing firms in Nigeria. Questionnaire was administered purposively by research assistants on twelve key informant employees that are of high cadre and twenty-four low cadre employees from each of the selected firms making 180 respondents in total. We analysed data collected with appropriate descriptive and inferential statistics. The findings show that about 52% of variation in innovation capability was explained by the extracted factors (customer satisfaction and cost of production, inconsistent government policy, price of power supply is high (electricity), poor infrastructure and inadequate knowledge of supply chain management). It has been seen that the level of innovation capability is high. It has also been seen that the relationship between the five extracted barrier factors (index factors) and innovation capability of flour processing firms is statistically significant ( $F = 37.933$ ;  $p = 0.000$ ). The result shows that the index factors are significantly influencing innovation capability of flour processing firms in Southwestern Nigeria. Therefore, to improve innovation capability in the flour processing industry, the extracted factors have to be prioritized and put into consideration. Although, innovation capability has been a highly studied topic in the field of innovation and entrepreneurship, however, there is dearth of information on the factors influencing the extents of innovative capability of flour processing firms in Southwestern Nigeria.

**Keywords:** Innovation Capability, Flour Processing Firms, Nigeria

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## 1. Introduction

Firm competitiveness is getting tougher daily due to changes in customer needs, globalization, new technologies, new entrant firms [6], especially the advent of fourth industrial revolutions. To grow and stay competitive in business environment, firm needs to be innovative in its products, processes, organization and marketing strategies [10, 9]. Innovation capability is therefore defined as the firms' ability to endlessly change knowledge and ideas into new processes, products and systems for the use of firm's stakeholders [18, 2]. However, innovation capability can also be defined as the capability to engage, acclimate and change

a given technology into precise managerial, operational, and transactional routines leading to Schumpeterian profits called innovation [36].

Despite efforts put in place by the flour processing firms to promote their innovative capability and performance. Studies have shown that the contributions of flour processing firms to the Nigeria economy is low and the cause of the low performance have been attributed to inadequate post-harvest technologies, infrastructural facilities, poor finance, poor working conditions, inconsistency of government policies, cost of credit, power problems, poor knowledge of supply chain management, poor infrastructure, poor customer satisfaction and production cost among others [12, 24, 26, 3].

Furthermore, capacity building is important on the innovation capability of firms in Nigeria [4]. More importantly, there are many studies on innovation capability from different sectors in Nigeria among others such as SMEs in all sector [23, 1], oil and Gas [5], wood and furniture [27].

Given the foregone literatures however, there is dearth of information on the factors influencing the extents of innovative capability of flour processing firms in Southwestern Nigeria. Hence, the main aim of this study is to elucidate the factors influencing the extent of innovation capability of flour processing firms in Southwestern Nigeria. The information provided by this study will be useful to scholars, policy makers among others in providing appropriate intervention that will bring about improved innovation capability of flour processing firms in Southwestern Nigeria.

The remaining part of this study is ordered as follows: Section two provides a brief overview of related literature. Then, section three describes the research method, followed by variable measurements. Section four presents the results and discussion and finally, section five presents conclusion, recommendations and area of further studies.

## 2. Literature Review

Food processing sector in Nigeria is dominated by SMEs as well as multinational food companies [28]. Food processing entails repeated grinding and sifting to achieve consistent and expected end products [17]. In addition to that, food processing entails set of procedures deployed in transforming raw materials to food products for human or animal consumption either in the home or by the food processing industry. More importantly, food processing firms processes different types of food, based on sector such as tobacco (cigarettes and allied products), and drinks (breweries, bottlers and distillers) and food products (millers, cookies, confectionary, sugar refineries, cocoa beverages, dairy products among others) [24].

Nigeria Mill industry controls the significant part (over 85%) of market share in the Sub-Saharan African [26]. Justifiably, the significant players in the region flour mill sub-manufacturing segment of beverage and food industry entails: Northern Nigeria Flour Mill Plc, and Lafarge Dangote Flour Mill Plc, Flour Mill of Nigeria Plc, Honeywell Flour Mill Plc, BUA Flour Mill Limited, Premier Food (Pty) Limited, Sasko Mills Limited, Mpongwe Flour Mill, Egyptian Mills, Olam Group, Flour Mill of Ghana [26]. In addition to that, the flour mill industry in Nigeria comprises more than 10 flour milling companies, although the 4 largest players (Flour Mills of Nigeria Plc, Honeywell Flour Mills, Dangote Flour Plc and Olam Group) account for over 80% of the market share [13]. However, the products from the flour processing industry needs to meet the required quality standard in local and international markets.

Quality standards entails improving on the safety of consumable products in accordance with specifications by regulatory bodies [28]. The agencies assigned for regulating

and monitoring food safety standards and practices in Nigeria as identified by Omotayo and Denloye [29] are: (i) NAFDAC which is solely for regulating, monitoring and controlling the import and export, manufacture, distribution, sale and use of food, drugs, cosmetics, chemicals and prepackaged water and medical devices. (ii) Federal Ministry of Health is concerned with formulation and implementation of health related policies, the ministry issues guidelines and strategies related food (iii) Standards Organization of Nigeria (SON) is concerned with the development and enforcement of products and process standard and also to ensure that products conform with the standard specification (iv) National Codex Committee (v) Federal Ministry of Agriculture supervise and provide funding for different agricultural research institutes across the country (vi) States and Local Governments [29]. Apart from the flour processing firms meeting the required quality standard, the firms need to keep improving their innovative capability so as to innovate and meet constant changes in their business environment such as meeting changes in: customers' taste, new entrant firms, suppliers' bargaining power among others.

Technology development capability (TDC) is defined as the firm's ability to absorb and internalize knowledge for innovative products [36, 37]. Furthermore, technology development capability is categorized into phases such as operations capability (OC), management capability, transaction capability. The categories of technology development capability are explained thus: OC is defined as the ability to syndicate knowledge and technical systems to produce goods or services. Management capability (MC) is an ability to synchronize efforts to transform technological outcomes into a coherent operational and transactional arrangement; and lastly, transaction capability (TC) is defined as the ability to conduct market transactions [36, 37]. Given that, there are some empirical studies that explicate factors that are influencing innovation capability of firms.

Mayor, Hera and Ruiz [22] carried out empirical study on the differences between the technological innovation capability of thirty (30) African countries with the period of 2010-2011. Cluster methodology was adopted for the study. Factor analysis was used to reduce the independent variables to the smallest size (3) that best explained the variation of the 15 independent variables in the study. The study concludes that there are four categories of technological innovation clustering in Africa. Furthermore, Liao, Wu-Chen and Chen [20] studied the nexus of absorptive capacity, knowledge sharing and innovation capability in Taiwan's knowledge-intensive industries. One hundred and seventy enterprises were the focus of the study. The study revealed that absorptive capacity and knowledge sharing is very important on product, process and management innovation.

Li [19] examined factors affecting the regional innovation capability variances in China, by looking at the number of patents filed or granted as notable parameters for innovation output. Also, Guo, Wen, and Sun [14] established knowledge production function using fixed effects and variable intercept due to technology innovation capability factors considered in

the study area. In addition, Yang [35] examined the technological innovation capacity of enterprises that are medium and large in size from different regions. The study deployed an inclusive evaluation using factor analysis method. The panel data analysis of 28 sectors in China's high-tech industry as examined by Zhang and Feng [38] showed the relationship among R&D investment, market structure and economic performance from different industrial characteristics. Also, the stochastic frontier technique used by Zhi [40] to examine the performance of technological innovation of China's electronic information industry. The same stochastic frontier technique was also applied by Han [15] to carry out empirical analysis of an efficient innovation of high-tech industry in China. Given that, new ideas or innovation emanates from factors that are internal and external to an organization [8]. For internal factors otherwise known to be implicit to an organization emanates from knowledge sharing among personnel irrespective of their Department [11]. Also, innovation that emanates from external factors is also important to the success of an organization [11]. Comparatively, scholars, have established that new knowledge that emanates from external factors to an organisation leads to an increase in innovations than those coming from internal factors [16, 21]. However, knowledge sharing among organizations comes in the form of downstream transfer. Such downstream knowledge transfer entails transfer of knowledge between businesses and customers. The knowledge shared among suppliers, businesses and universities, or other organizations is called upstream knowledge transfer. By implication, the sharing of knowledge among an organization and outside agencies between businesses and its competitors for the purpose of innovative activities, which ultimately leads to improved business performance and competitive advantage is called horizontal knowledge transfer.

Distanont and Khongmalai [10] complemented the reports of previous scholars on the micro and macro external factors that affect the innovation of SMEs. The micro external factors entail customers, suppliers, and the industry which are market oriented while macro external factors entails international context. These micro external factors are (a) input from clients leads to the conception of business innovation through important factors such as the receipt of information relating to the company's products and services and a good relationship with customers, which fosters new ideas and viewpoints in the development of products and services [7, 32], (b) The exchange of knowledge and information for new materials among companies and suppliers is an important factor in innovations [11, 33], (c) Competitiveness in the industry or competitors even the introduction of new applications for technologies will enhance innovation for the market [34, 7]. Macro external factor entails international context implies that government funds or supports the R&D of new processes, products, and transfer of technology or proclaim policies that will enhance SMEs' knowledge and innovations [31, 39].

Despite the given extant literature reviewed on innovation

capability in this study however, the research gap indicates that none of the study consider factors influencing innovation capability of flour processing firms in Nigeria. It is important to know that because Nigeria Mill industry controls the significant part (over 85%) of market share in the Sub-Saharan African [26].

### 3. Research Method

The study population consists of twenty-two (22) flour mill firms in Nigeria [30]. Five largest players that account for the majority of the market share in the economy [13] were considered in this study. Questionnaire was administered purposively by trained research assistants on twelve key informant employees that are of high cadre and twenty-four low cadre employees selected randomly from each of the selected firms making 180 respondents in total.

The barrier factors are: lack of access to finance, high cost of credit, inconsistency of government policies, type of technology deployed, change of management, non-prior experience, taxation, inadequate access to raw materials, poor infrastructure, price of power supply is high (electricity), storage facilities and customer satisfaction and cost of operation among others (*see Table A4*). However, respondents ranked the degree of their support with the effect of the barrier factors on a five-point Likert scale of 1 for not experienced, 2 for low effect, 3 for medium effect, 4 for high effect, 5 for very high effect.

The variables for measuring the extent of innovation capability of flour processing firms were adopted from Zhang and Zhu [39]. The variables include: technology development capability, operational capability, managerial capability and transactional capability. The questions used to capture the four innovation capability variables is stated in Table A3. The questions were measured on a five-points Likert scale on which 1 stands for strongly disagreed and 5 for strongly agreed. However, the four innovation capability variables were summed together to form innovation capability using Statistical Package for Social Sciences (SPSS).

The method of data analysis used in this study includes descriptive statistics such as mean and factor analysis while inferential statistics include regression and analysis of variance (ANOVA). Regression measures the relationship between factors influencing innovation capability while ANOVA determines the significance of the relationship between the factors influencing the innovation capability of flour processing firms. An alpha level of 0.05 was chosen *a priori* as the level of significance which is 95% confidence interval. Hence, data were analyzed using SPSS version 22.

### 4. Results and Discussion

The mean (M) and standard deviation (SD) values of extents of innovation capability of flour processing firms as indicated in in this study reveals the degree of responses of flour processing firms around the mean. By implication, it shows if the responses of the flour processing firms clustered

around the mean or scatter.

Table 1 shows implies that flour processing firms have high level of capability to achieving technology development capability through the mean values of: capability to quickly adapt to dominant technology (M =3.66, SD =0.874); capability to quickly develop new technology (M = 3.61, SD = 0.815); capability to quickly acquire/purchase new technology (M = 3.40, SD = 0.961); and capability to quickly adapt and adopt e-business principles (M =3.42, SD = 0.991). However, the standard deviations for technology development capabilities variables implies that the responses of the flour processing firms in the study area clustered around the mean values. This shows that the responses of the selected flour processing firms were unanimous.

Table 1 further shows that flour processing firms have high level capability to achieve operations capability through: capability to quickly adapt to product variations (M = 3.83, and SD = 0.692); capability to achieve set targets in order to create products that outperform and provide a distinct market position (M = 3.59, and SD = 0.707); capability to adopt an offensive strategy of trying to create the future (M = 3.79, and SD = 0.623); capability to create new products and services at lowering costs and improved quality (M = 3.55, and SD = 0.645); capability to quickly integrate different employees' vision into organization vision (M = 4.05, and SD = 0.662); capability to communicate with the stakeholders effectively and efficiently (M = 4.01 and SD = 0.732); and capability to provide employees with thinking time, funding, facilities and creative environment (M = 3.83, and SD = 0.639). However, the standard deviations for operation capabilities variables implies that the responses of the flour processing firms in the study area clustered around the mean values. This shows that the responses of the selected flour processing firms were unanimous.

Table 1 shows the mean values and standard deviation of management capability variables such as capability to quickly adapt to changes in customer needs (M = 3.96, and SD = 0.637); capability to quickly integrate new stream strategies to mainstream strategies (M = 3.58, and SD = 0.588); capability to be best of the best (M = 3.89, and SD = 0.724); capability to ensure that employees have clarity of purpose (M = 4.15, and SD = 0.892); capability to quickly

find new ways of doing things (M = 4.25, and SD = 0.797); capability to avoid "not invented here" syndrome (M = 3.21, and SD = 0.669); capability to quickly leverage on different funding channels to encourage risk taking and entrepreneurship (M = 3.59, and SD = 0.641); capability to leverage, combine and recombine knowledge and resources into different products, technologies, markets (M = 3.62, and SD = 0.742); capability to correctly and effectively direct resources to where they are required (M = 3.73, and SD = 0.790). This implies that flour processing firms have high level of capability to achieve management capability. The standard deviations for management capabilities variables implies that the responses of the flour processing firms in the study area clustered around the mean values. This shows that the responses of the selected flour processing firms were unanimous.

Table 1 shows the mean values and standard deviation of transaction capability variables such as capability to having access to technological gatekeepers, business innovators and organizational sponsors at various stages of business processes (M = 3.12, and SD = 0.531), capability to quickly adopt e-businesses for product development, knowledge management, linking knowledge competencies, aiding process efficiencies, increasing speed to market (M = 3.39, and SD = 0.728), This implies that flour processing firms have moderate level capability to achieve transaction capability. Also, the mean values and standard deviation of transaction capability variables such as capability to quickly adapt to changing market conditions (M = 3.47, and SD = 0.673), capability to quickly scan business environment for new opportunities (M = 3.63, and SD = 0.792), capability to learn from suppliers, competitors, customers (M = 3.76, and SD = 0.665), and capability to quickly search out customers' needs and problems both knowns and latent, in order to solve them in a value adding manner (M = 3.55, and SD = 0.704). This implies that flour processing firms have high level capability to achieving transaction capability. The standard deviations for transaction capabilities variables implies that the responses of the flour processing firms in the study area clustered around the mean values. This shows that the responses of the selected flour processing firms were unanimous.

**Table 1.** Mean and Standard deviation values of extents of innovation capability of flour processing firms.

Characteristics	Mean	Std. Deviation
Technology Development Capability		
Capability to quickly adapt to dominant technology	3.66	0.874
Capability to quickly acquire/purchase new technology	3.40	0.961
Capability to quickly adapt and adopt e-business principles	3.42	0.991
Capability to quickly develop new technology	3.61	0.815
Operations Capability		
Capability to quickly adapt to product variations	3.83	0.692
Capability to achieving set targets in order to create products that outperform and provide a distinct market position	3.59	0.707
Capability to adopt an offensive strategy of trying to create the future	3.79	0.623
Capability to create new products and services at lowering costs and improved quality	3.55	0.645
Capability to quickly integrate different employees' vision into organization vision	4.05	0.662
Capability to communicate with the stakeholders effectively and efficiently.	4.01	0.732
Capability to providing employees with thinking time, funding, facilities and creative environment	3.83	0.639
Management Capability		

Characteristics	Mean	Std. Deviation
Capability to quickly adapt to changes in customer needs	3.96	0.637
Capability to quickly integrate newstream strategies to mainstream strategies	3.58	0.588
Capability to be best of the best	3.89	0.724
Capability to ensure that employees have clarity of purpose	4.15	0.829
Capability to quickly find new ways of doing things	4.25	0.797
Capability to avoid "not invented here" syndrome,	3.21	0.669
Capability to quickly leverage on different funding channels to encourage risk taking and entrepreneurship	3.59	0.641
Capability to leverage, combine and recombine knowledge and resources into different products, technologies, markets	3.62	0.742
Capability to correctly and effectively direct resources to where they are required	3.73	0.790
Transaction Capability		
Capability to having access to technological gatekeepers, business innovators and organizational sponsors at various stages of business processes	3.12	0.531
Capability to quickly adopt e-businesses for product development, knowledge management, linking knowledge competencies, aiding process efficiencies, increasing speed to market	3.39	0.728
Capability to quickly adapt to changing market conditions	3.47	0.673
Capability to quickly scan business environment for new opportunities	3.63	0.792
Capability to learn from suppliers, competitors, customers	3.76	0.665
Capability to quickly search out customers' needs and problems both knowns and latent, in order to solve them in a value adding manner	3.55	0.704

Scale: 1=very low, 2 = low, 3 = moderate, 4 = high, 5 = very high

Table 2 shows summarily the extent of the agreement of effects of identified factors on the innovation capability of the selected flour processing firms from the perspective of mean (M) and standard deviation (SD) in Southwestern Nigeria. By implication, it shows how clustered is the responses of the flour processing firms around the mean.

The mean values of factors that have high effects on innovation capability of the selected flour processing firms are: (i) change of management (M =3.56, SD =0.743), (ii) poor infrastructure (M =4.08, SD =0.932), (iii) price of power supply is high (electricity) (M =3.73, SD =0.948), (iv) customer satisfaction and production cost (M =3.59, SD =0.775). The standard deviation indicates that the selected flour processing firms have a unanimous agreement on the effects of the identified factors on their innovation capability because their responses clustered around the mean values: not scattered.

The mean values of these factors have high effects on innovation capability of the selected flour processing firms. The mean and standard deviation of the factors are: (i) nature of business (M =3.98, SD =1.011), (ii) customers' unwillingness to pay higher price for better quality (M =3.73, SD =1.018), (iii) market dominated by established enterprises (M =3.45, SD =1.120), (iv) working conditions (M =4.02, SD =1.062) and (v) prior experience (M =3.57, SD =2.355). The standard deviation values imply that the responses of the selected flour processing firms scattered around the mean which indicates that there were scattered responses for some of the selected flour processing firms on how the identified factors affects their innovation capability.

The mean values of these factors also have medium effects on innovation capability of the selected flour processing firms. The mean and standard deviation of the factors are: (i) government policy (M =3.02, SD =0.867), (ii) type of

technology (M =3.37, SD =0.947), (iii) taxation (M =2.74, SD =0.824), and (iv) storage facility (M =3.35, SD =0.747). The standard deviation indicates that the selected flour processing firms have unanimous agreement of the effects of the identified factors on their innovation because their responses clustered around the mean values.

In addition, the mean values of these factors have medium effects on innovation capability of the selected flour processing firms in the study. The factors are: (i) cost of operation (M =2.95, SD =1.213), (ii) inadequate information on the nature of business (M =2.65, SD =1.349), (iii) volume of the products (M =3.34, SD =1.110), and (iv) cost of employee training (M =2.95, SD =1.027). The standard deviation values imply that the responses of the selected flour processing firms scattered around the mean which indicates that the responses of the selected flour processing firms on how the identified factors affect their innovation capability were not unanimous.

Table 2 further reveals that the mean values of these factors have low effects on innovation capability of the selected flour processing firms in the study area. The mean and standard deviation of the factors are: (i) access to finance (M =2.43, SD =0.962), (ii) cost of credit (M =2.34, SD =0.863), and (iii) accessibility to raw materials (M =2.29, SD =0.952). By implication, the standard deviation values imply that the responses of the flour processing firms clustered around the mean and they unanimously agree that the index factors have low effect on their innovation capability.

In support of this study however, there are barrier factors to the activities of flour mills in Nigeria such as: stiff competition among millers, high cost of sales, punitive tariffs and volatility in the price of imported wheat, incessant power failure and general infrastructural gaps, logistical problems and operational inefficiency [13].

**Table 2.** The Mean Values of Factors Influencing Innovation Capability of Firms.

Characteristics	Mean	Std. Deviation
Lack of access to finance	2.43	0.962
High cost of credit	2.34	0.863

Characteristics	Mean	Std. Deviation
Inconsistency of Government policy	3.02	0.867
Type of technology deployed	3.37	0.949
Change of Management	3.56	0.743
Non prior experience	3.57	2.355
Taxation	2.74	0.824
Lack of access to raw materials	2.29	0.952
Poor Infrastructure	4.08	0.932
Price of power supply is high (electricity)	3.73	0.948
Storage facility	3.35	0.747
High cost of operation	2.95	1.213
Inadequate information on the nature of business	2.65	1.349
Volume of the products	3.34	1.110
Nature of Business	3.98	1.011
Customers unwillingness to pay higher price for better quality	3.73	1.018
Market dominated by established enterprises	3.45	1.120
Poor working conditions	4.02	1.062
High cost of employee training	2.95	1.027
Inadequate knowledge of supply chain management	2.64	0.836
Customer satisfaction and production cost	3.59	0.775

Scale: 1 = Not experienced, 2 = Low effect, 3 = Medium effect, 4 = High effect, 5 = Very high effect

Table 3 reveals the extracted factors among all other factors using factor analysis. The extracted five factors explain 71.595% of variation in all the twenty-two (22) factor variables (see Table A1). The reason for using factor analysis to extract these variables based on Eigen values that is greater than one is to avoid collinearity and multicollinearity (*Situation where by change in one factor variable will be influencing one or two other factor variables*). The use of

factor analysis in this study was in line with earlier studies [35, 22]. Among the barrier factors to innovation capability of flour mill firms in Nigeria (*see Table A4*), however, five barrier factors were extracted using factor analysis. The extracted barrier factors are: customer satisfaction and cost of production, inconsistent government policy, price of power supply is high (electricity), poor infrastructure and inadequate knowledge of supply chain management.

**Table 3.** Factor Analysis for the Factors Influencing Innovation Capability.

Extracted factors	Extracted values	Cumulative Variation value
Customer satisfaction and cost of production	0.753	26.306
Inconsistency of Government policy	0.637	47.397
Price of power supply is high (electricity)	0.886	57.215
Poor infrastructure	0.714	65.939
Inadequate knowledge of supply chain management	0.829	71.595

Key: Extraction technique

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 10 iterations.

Table 4 shows the factors influencing innovation capability of flour processing firms in Southwestern Nigeria. Table 4 shows that 73% ( $R = 0.730$ ) of relationship exist between the index factors (Table 3) and innovation capability of flour processing firms. The Table 4 further shows that about 52% (adj.  $R^2 = 0.519$ ) of variation in innovation capability of flour processing firms in Southwestern Nigeria was explained by the index factors (five extracted barrier factors). However, the Table 4 conclusively shows that the

relationship between the five extracted barrier factors (index factors) and innovation capability of flour processing firms is statistically significant ( $F = 37.933$ ;  $p = 0.000$ ). This implies that index factors are significantly influencing innovation capability of the flour processing firms in Southwestern Nigeria. The report from this study corroborated previous study as regards the factors that are influencing innovation capability of firms [19].

**Table 4.** Factors Influencing Innovation Capability of Flour Processing Firms.

ANOVA <sup>a</sup> Model	Sum of Squares	Df	Mean Square	F	Sig.	R	R Square	Adjusted R Square
1 Regression	7524.017	5	1504.803	37.933	0.000 <sup>b</sup>	0.730	0.533	0.519
Residual	6585.169	166	39.670					
Total	14109.186	171						

a. Dependent Variable: Innovation Capability

b. Predictors: (Constant), poor infrastructure, customer satisfaction and production cost, inadequate knowledge of supply chain management, inconsistency of Government policy, price of power supply (electricity)

## 5. Conclusion, Recommendation and Area of Further Studies

The study concluded that the extent of innovation capability of the selected flour processing firms was considerably high. This is perhaps is one of the reasons Nigeria Mill industries controls the significant part (over 85%) of market share in the Sub-Saharan African [26]. Furthermore, the responses of the respondents clustered around the mean. This indicates that the respondents unanimously agree on the subject matter and conclude that the level of innovation capability of flour processing industry in Southwestern Nigeria is high. In addition to that, customer satisfaction and cost of production, inconsistent government policy, high price of power supply is high (electricity), inadequate knowledge of supply chain management and poor infrastructure were the five extracted barrier factors (index factors) influencing

the innovation capability of the selected flour processing firms. The study also concluded that the index factors are significantly influencing innovation capability of flour processing firms in Southwestern Nigeria. This study supported the previous studies as regards factors affecting innovation capability [12, 24, 26, 3].

The study recommends that flour processing industry in Southwestern Nigeria perhaps consider how to navigate the negative implication of the following barriers factors in the process of improving their innovation capability: customer satisfaction and cost of production, inconsistent government policy, high price of power supply, poor infrastructure and inadequate knowledge of supply chain management.

The study only considers flour processing firms in Southwestern Nigeria, further studies may consider studying flour processing firms in Nigeria as a whole. The study only used quantitative research method; further studies may consider mixed method.

## Appendix

Table A1. Total Variance Explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.787	26.306	26.306	5.787	26.306	26.306	4.047	18.397	18.397
2	4.640	21.091	47.397	4.640	21.091	47.397	3.949	17.950	36.347
3	2.160	9.818	57.215	2.160	9.818	57.215	3.473	15.786	52.132
4	1.919	8.723	65.939	1.919	8.723	65.939	2.300	10.453	62.585
5	1.244	5.656	71.595	1.244	5.656	71.595	1.982	9.010	71.595
6	.995	4.522	76.117						
7	.872	3.962	80.079						
8	.826	3.752	83.832						
9	.728	3.309	87.140						
10	.514	2.334	89.474						
11	.437	1.989	91.463						
12	.395	1.794	93.257						
13	.284	1.290	94.547						
14	.264	1.201	95.748						
15	.189	.859	96.607						
16	.159	.724	97.331						
17	.156	.709	98.040						
18	.124	.564	98.604						
19	.104	.471	99.075						
20	.079	.358	99.434						
21	.067	.305	99.739						
22	.057	.261	100.000						

Extraction Method: Principal Component Analysis.

Table A2. Rotated Component Matrix<sup>a</sup>.

Barrier Factors to Innovation Capability	Component				
	1	2	3	4	5
High cost of credit	.244	.022	.842	-.048	-.014
High cost of power supply (electricity)	.269	.113	0.886	.087	-.075
Change of Management	.000	.345	.752	.337	-.067
Inadequate access to raw materials	.659	-.157	.385	.103	.079
Storage facility	.579	.204	.334	.415	.056
Non-prior experience	.105	.105	.135	.352	.153
Lack of access to finance	.199	-.226	-.052	-.120	.816
High cost of employee training	.716	-.008	-.044	.366	-.104
High cost of operation	.157	.255	-.469	0.682	.250

Barrier Factors to Innovation Capability	Component				
	1	2	3	4	5
Taxation	.092	.447	0.628	-.087	.172
Market dominated by established enterprises	-.858	.128	-.005	.146	-.057
Inadequate information on the nature of business	-.739	-.097	-.073	.418	-.092
Volume of the products	-.280	.611	.525	.275	-.176
Nature of Business	.030	.615	.233	.353	-.357
Customers unwillingness to pay higher price for better quality	.659	-.569	-.046	.198	-.019
Poor infrastructure	-.185	.265	.131	0.714	-.196
Inconsistency of Government policy	-.022	0.637	.064	.268	-.181
Poor working conditions	-.289	.577	.187	.394	.381
Type of technology deployed	.074	-.837	-.076	-.102	.252
Inadequate knowledge of supply chain management	-.250	-.113	-.009	.235	0.829
Customer satisfaction and production cost	0.753	-.038	.320	-.080	-.162

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.  
a. Rotation converged in 10 iterations.

**Table A3.** In the table below, kindly indicate your level of agreement with the following questions.

1 = strongly disagree, 2 = disagree, 3 = indifferent, 4 = agree, 5 = strongly agree

INNOVATION CAPABILITY		1	2	3	4	5
Technology Development Capability	Capability to quickly adapt to dominant technology.					
	Capability to quickly acquire/purchase new technology					
	Capability to quickly adapt and adopt e-business principles					
	Capability to quickly develop new technology					
	Capability to quickly adapt to product variations					
Operations Capability	Capability to achieving set targets in order to create products that outperform and provide a distinct market position					
	Capability to adopt an offensive strategy of trying to create the future					
	Capability to create new products and services at lowering costs and improved quality					
	Capability to quickly integrate different employees' vision into organization vision					
	Capability to communicate with the stakeholders effectively and efficiently. (Communication facilitate knowledge sharing by combining the wide variety of experiences, opening dialogue, building on others ideas and exploring issues related to innovation).					
	Capability to providing employees with thinking time, funding, facilities and creative environment					
	Capability to quickly adapt to changes in customer needs					
Management Capability	Capability to quickly integrate newstream strategies to mainstream strategies					
	Capability to be best of the best					
	Capability to ensure that employees have clarity of purpose					
	Capability to quickly find new ways of doing things					
	Capability to avoid "not invented here" syndrome,					
	Capability to quickly leverage on different funding channels to encourage risk taking and entrepreneurship					
	Capability to leverage, combine and recombine knowledge and resources into different products, technologies, markets					
Transaction Capability	Capability to correctly and effectively direct resources to where they are required					
	Capability to having access to technological gatekeepers, business innovators and organizational sponsors at various stages of business processes					
	Capability to quickly adopt e-businesses for product development, knowledge management, linking knowledge competencies, aiding process efficiencies, increasing speed to market					
	Capability to quickly adapt to changing market conditions					
	Capability to quickly scan business environment for new opportunities					
	Capability to learn from suppliers, competitors, customers					
	Capability to quickly search out customers' needs and problems both knowns and latent, in order to solve them in a value adding manner					

### FACTORS INFLUENCING THE INNOVATION CAPABILITY OF FIRM

**Table A4.** Kindly indicate how the following barrier factors affect innovation capability in your firm.

Key = 1 = very low, 2 = low, 3 = moderate, 4 = high, 5 = very high

Barrier Factors Affecting Innovation Capability	1	2	3	4	5
High cost of power supply (electricity) is a barrier factor affecting innovation capability					
Change of Management is a barrier factor affecting innovation capability					
Inadequate access to raw materials is a barrier factor affecting innovation capability					
Storage facility is a barrier factor affecting innovation capability					

Barrier Factors Affecting Innovation Capability	1	2	3	4	5
Non prior experience is a barrier factor affecting innovation capability					
Lack of access to finance is a barrier factor affecting innovation capability					
High cost of employee training is a barrier factor affecting innovation capability					
High cost of operation is a barrier factor affecting innovation capability					
Taxation is a barrier factor affecting innovation capability					
Market dominated by established enterprises is a barrier factor affecting innovation capability					
Inadequate information on the nature of business is a barrier factor affecting innovation capability					
Volume of the products					
Nature of Business					
Customers unwillingness to pay higher price for better quality is a barrier factor affecting innovation capability					
Poor infrastructure is a barrier factor affecting innovation capability					
Inconsistency of Government policy is a barrier factor affecting innovation capability					
Poor working conditions is a barrier factor affecting innovation capability					
Type of technology deployed is a barrier factor affecting innovation capability					
Inadequate knowledge of supply chain management is a barrier factor affecting innovation capability					
Customer satisfaction and production cost is a barrier factor affecting innovation capability					

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