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Information and Communication Technology and Quality of Products of Food Manufacturing Firms: Case of South-South Nigeria

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ABSTRACT

There is a growing appreciation of the consequence of Information and Communication Technology (ICT) in the day-to-day activities of man. Theoretical and empirical postulations view ICT as both a means and an end for development. This paper therefore sets out in investigating the effects of Information and Communication Technology on the quality of products of food manufacturing firms with South-South region of Nigeria as case study. Questionnaire was designed using Likert's scale of five-point to elicit information from 3750 respondents. The dependent variable is the quality of product of the food manufacturing firms which were measured by perception of respondents. The independent variables are tools of ICT (Computers, Internet, Television and Radio, Video and Audio devices, Social-media). The result with R^2 of 0.823 revealed a significant coefficient of determination as such the independent variables explained about 82 percent of the variation in the dependent variable. F-calculated (100.175) is greater that the F-tabulated (2.8786) which means that the overall estimate has a good fit and also implies that the independent variables are simultaneously significant. The study concludes that there exists significant-positive relationship between ICT and quality of product of the food manufacturing firms. Hence, maintenance of quality also means setting standards via ICT which will serve as guideline in the assurance of protection and safety of consumers in addition to improving future processing.

Keywords: ICT; Quality of products; Food manufacturing; Quality maintenance; Consumers' acceptability

1. BACKGROUND TO THE STUDY

The food manufacturing industries has evolved over time through the dynamics of the process of seeking ways to improve on quality of products and enlightening the population on their availability and guidelines on how consumers access them. This study is assessing the possibility of the food

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producing firms leveraging on the dynamic pace of development in information and communication technology (ICT) in complying with the ever-changing consumers' demand. The primary reason is that firms are in constant pressure to improve and to maintain their competitive advantage. Consequently, respective firms within industries, as posited by Nonaka and Takeuchi (1995), have considered innovation as a basic scheme that can sustain her position as a leading rival. Particularly, the food manufacturing firms in developing economy like Nigeria are involved in series of technological changes; however, the objectives of these changes are not just about innovation at the frontier but in extension to adapt existing products and processes to achieve higher levels of productivity. Thus, professionals of business since past decades seek the use of ICT to engage in greater levels of competition, moderate risks and uncertainties in the business environment and facilitate the implementation of strategic planning (See: Dibrell & Miller, 2002; Gibbons & O'Connor, 2003).

Information and Communication Technology involves the development, maintenance, use of software and network for the processing and distribution of information (Mohammed & Bello, 2021). Johannessen (1994) opined that ICT can significantly affect innovation activities positively if they are used efficiently and effectively. Similarly, Bharadwaj (2000) posited that organizations with major investment in ICT achieve higher levels of competition and innovation than those that do not. This implies that dependence on ICT by firms is expected to be growing over time and that ICT seems a thing of the present and the major base of prosperity for the future. Piñeros and Gómez (2017) in particular argued that ICT broadens the reach and speed of information allowing for the possibility of better decisions; this therefore invites managers to take advantage of ICT to link their organizations to the present-day global survival. Reason being that ICT enhances access to latest information in less time and minimalize the constraints of restricted amount of time managers face when making decision (Piñeros, & Gómez, 2017).

The contents and characteristics of food determine its acceptability to consumer. The quality of food is in its attributes and contents; it includes extrinsic attributes such as appearance (size, shape, luster, colour, and consistency), texture and flavor, and intrinsic components such as taste and nutritional values (Onodugo, Anowor, Ifediora & Aliyu, 2019; Anowor, Ukwueni & Ezekwem, 2013). Incidentally, many consumers palpably count on manufacturing and processing standards to know particularly what ingredients each food is contained. The primary reasons for this are dietary and religious requirement like the vegetarian, kosher, halal, among others, and/or nutritional requirements like allergies, diabetes, hypertension, hepatitis, etc. Moreover, as food production is built on an assortment of Small and Medium Scale Enterprises (SME) rather than dominated by a smaller number of giant corporations, its complexity engrosses organizational particularities including cultural diversity (Cozzolino *et al.*, 2009).

Many studies have shown the strength of growth multipliers or linkage between ICT and product qualities of firms. Assrar (2017) in a study based on employees of selected manufacturing firms from different industries in Egypt showed that there were similarities in the key product development practices in different environment and these practices explained 47.1 percent of the variance in product innovation and internal product quality. The result further showed that the association between internal product quality and the use of Information and Communication Technology (ICT) is positive and significant. Ashish, Jane, Sergio, Douglas, Kate and Atul (2013) conducted a study on the role of ICT in enhancing community outreach, academic and research collaborations, education and support services in an academic setting. Majority of the participants (about 54.1%) greatly emphasized on the importance of installing an intranet that could support collaborative grant writing and also attributed high importance to learning and interaction with the online learning system. The study therefore proposed that social media should be more enthusiastically utilized for diverse activities for academic and research purposes. The outcome of the study by Ashish, Jane, Sergio, Douglas, Kate and Atul (2013) helped thus far to ascertain the existing needs and challenges faced by professionals and learners when interacting with ICT. Farhad, Roya and Maryam (2011) adopted ordinary least square tool of analysis to conduct a study with a population of 109 agricultural experts and extension agents working in agricultural service centers to identify ICT capabilities in marketing the agricultural products in Iran. The result of descriptive statistics showed that ICT have moderate role in the improvement of agricultural products marketing. The results of the regression analysis indicated that computer, electronic journals, websites and mobile devices determined about 14 percent variance of agricultural products marketing.

The results from the above thus infers that embracing ICT brings about fast access to the market, increase selection power, improves communication, helps save energy and time, identifies markets and improves marketing, and reduces costs of business. Present day firms mainly request consumers' feedback and knowledge for innovation and monitoring service performance of their product and employees. Employing ICT to achieve the above enables firms to gather tacit knowledge from consumers; the firms therefore store the data for future use (Park, Cho, Sook & Main, 2015). This tacit knowledge as posited by Polanyi (1969) is indispensable in the discovery of new knowledge; reason is because all knowledge is either tacit or rooted in tacit knowledge.

2. MATERIAL AND METHOD

This is an applied study and the data for this study is from South-South geopolitical region of Nigeria. This region is also known as the Niger Delta region. It comprises of six states of Federal Republic of Nigeria namely Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers. The region is advantageously situated at the point where the tail of River Niger flows into the Atlantic Ocean through the Gulf of Guinea. This region is bestowed with the economic mainstay of the country: oil and gas. The estimated population of the region is about 28 million people (2016 population estimate) with very diverse ethnic groups like Efik, Ijaw (Nembe-Brass, Ogbia, Kalabari, Igbani), Igbo and Igboid clans (all related with a common language and culture), Ibibio, Isoko, Itsekiri, Etsako, Urhobo, Bini, Edo, Okrika, Andoni, Ogoni, Ogoja. The population of this study is the food manufacturing firms within the South-South region. This population is made up of management, senior and junior staff of Twenty-five (25) selected food manufacturing firms which gave a total of three thousand, seven hundred and fifty employees (3,750). One Hundred and Fifty (150) employees (i.e., 50 from each category: Management, Senior and Junior were selected from each of the Twenty-five (25) food manufacturing firms.

An experimental study was conducted with One Hundred and Twenty-five (five from each firm) employees who had not been interviewed before the earlier exercise of determining the reliability of the questionnaires. The questionnaire was designed using Likert's scale of five-point. On the internal consistency, the questionnaire with Cronbach's score of 86% indicates that its reliability (internal consistency) is very high. In this study, the dependent variable is the quality of product of the food manufacturing firms which were measured by perception of respondents. The independent variables are tools of ICT (Computers, Internet, Television and Radio, Video and Audio devices, Social-media). After data extraction, the SPSS version 22.0 software was used for the statistical analyses.

Model Specification

The model is specified thus in (1) below:

QUPF = f(COM, INTE, TVRD, VAD, SM) ………………………………….. (1)

Stating (1) in a statistical form, hence (2)

QUPF = $\ddot{u}_0$ + $\ddot{u}_1$COM + $\ddot{u}_2$INTE + $\ddot{u}_3$TVRD + $\ddot{u}_4$VAD + $\ddot{u}_5$SM …….….. (2)

Where,

$\ddot{u}_0$ = Intercept of the equation

($\ddot{u}_1$, $\ddot{u}_2$, $\ddot{u}_3$, $\ddot{u}_4$, $\ddot{u}_5$) = respective slope of each of the parameters.

QUPF = Quality of Product of the Food Manufacturing Firms

COM = Computers

INTE = Internet

TVRD = Television and Radio

VAD = Video and Audio devices

SM = Social-media

3. RESULTS AND DISCUSSION

TABLE 1: Usefulness of computers in the implementation of planning strategy and delivery of improved quality of products

	Frequency	Percent
Excellently useful	1459	38.91
Very useful	1117	29.79
Moderately useful	771	20.56
Poorly useful	245	6.53
Very poorly useful	158	4.21
Total	**3750**	**100.0**

Source: Field Susvey, 2021

Table 1 shows that 1459 respondents representing 38.91 percent, 1117 respondents representing 29.79 percent, and 771 respondents representing 20.56 percent respectively are of the view that computers are excellently useful, very useful and moderately useful in the implementation of planning strategy and delivery of improved quality of products.

TABLE 2: Internet services have assisted my organization in quality information on food quality.

	Frequency	Percent
Strongly agree	1260	33.60
Agree	1137	30.32
Somewhat agree	871	23.23
Disagree	265	7.07
Strongly disagree	217	5.78
Total	**3750**	**100.0**

Source: Field Susvey, 2021

Table 2 shows that 1260 respondents representing 33.60 percent, 1137 respondents representing 30.32 percent, and 871 respondents representing 23.23 percent respectively strongly agree, agree and somewhat agree that internet services have assisted their organizations in quality information on food quality.

TABLE 3: Due to constant changes in consumer preferences, information through television and radio help my organization to communicate to the people about the qualities of our new products thereby gaining competitive advantage.

	Frequency	Percent
Excellently helpful	1296	34.56
Very helpful	1542	41.12
Moderately helpful	741	19.76
Not quite helpful	142	3.79
Obviously not helpful	29	0.77
Total	**3750**	**100.0**

Source: Field Susvey, 2021

Table 3 shows that 1296 respondents representing 34.56 percent, 1542 respondents representing 41.12 percent, and 741 respondents representing 19.76 percent respectively are of the view that information through television and radio are excellently helpful, very helpful and moderately helpful in communicating to consumers about the qualities of new products thereby the firms gain competitive advantage.

TABLE 4: Information from video and audio devices help my organization improves product quality and speed pace in our production process

	Frequency	Percent
Excellently useful	1223	32.61
Very useful	1342	35.79
Moderately useful	709	18.91
Not quite useful	365	9.73
Obviously not useful	111	2.96
Total	**3750**	**100.0**

Source: Field Susvey, 2021

Table 4 shows that 1223 respondents representing 32.61 percent, 1342 respondents representing 35.79 percent, and 709 respondents representing 18.91 percent respectively are of the view that information from video and audio devices are excellently helpful, very helpful and moderately helpful to organizations to improve product quality and speed the pace in firms' production process.

TABLE 5: Activities in social-media assist my organization in radical restructuring in production processes to ensure higher qualities of products in both time and space.

	Frequency	Percent
Definitely yes	1680	44.80
Probably yes	1417	37.79
Neither agree nor disagree	71	1.89
Probably no	439	11.71
Definitely no	143	3.81
Total	**3750**	**100.0**

Source: Field Susvey, 2021

Table 5 shows that 1680 respondents representing 44.80 percent, 1417 respondents representing 37.79 percent, and 71 respondents representing 1.89 percent respectively definitely agree, probably agree and neither agree nor disagree that activities in social-media assist firms in radical restructuring in production processes to ensure higher qualities of products in both time and space.

Testing of Hypothesis

Hypothesis: There is a significant positive relationship between ICT and quality of products of Food Manufacturing Firms in the South-South region of Nigeria.

Table 4.4.2.1: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.836[a]	.823	.823	.10404

a. Predictors: (Constant), COM, INTE, TVRD, VAD, SM

Table 4.4.2.2: ANOVA[a]

Model		Sum of Squares	Degree of Freedom	Mean Square	F	Sig.
	Regression	650.541	7	108.423	100.175	.000[b]
1	Residual	5.596	517	.011		
	Total	656.136	524			

a. Dependent Variable: QUPF

b. Predictors: (Constant) COM, INTE, TVRD, VAD, SM

Table 4.4.2.3. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
	(Constant)	-.007	.019		-.372	.710
	QUPF	.248	.007	.294	35.802	.000
	COM	.200	.006	.233	31.449	.000
1	INTE	.202	.008	.230	26.846	.000
	TVRD	.166	.006	.188	27.421	.000
	VAD	.164	.006	.171	25.904	.000
	SM	.017	.005	.016	3.586	.000

a. Dependent Variable: QUPF

Where,

QUPF = Quality of product of the food manufacturing firms as influenced by ICT

COM = Usefulness of computers in the implementation of planning strategy and delivery of improved quality of products

INTE = Internet services have assisted the food manufacturing firms in quality information on food quality.

TVRD = Due to constant changes in consumer preferences, information through television and radio help the food manufacturing firms to communicate to the people about the qualities of their new products thereby gaining competitive advantage.

VAD = Information from video and audio devices help the food manufacturing firms improve product quality and speed pace in their production process

SM = Activities in social-media assist the food manufacturing firms in radical restructuring in production processes to ensure higher qualities of products in both time and space.

Degree of freedom: $\frac{N-1}{N-K} = \frac{6-1}{563-6} = (535, 5) = 2.8786$

F-tab value = 2.879

Decision Rule:

If F-Calculated (F-cal) is greater than F-tabulated (F-tab) i.e (F-cal > F-tab), the null hypothesis (H_0) will be rejected that the overall estimate is not statistically significant. However, accept if otherwise.

Decision:

The R2 which is the coefficient of determination shows the value 0.834 and adjusted to 0.823. This means that R^2 suggests that quality of product of the food manufacturing firms as influenced by ICT variables accounted for 82.3 percent approximately 82 percent of variation of the number of the output of the food manufacturing firms in South-South Nigeria. The implication is that the independent variables explained about 82 percent of the changes in the dependent variable. This study therefore concludes from the result above that ICT has significant impact on the quality of product of food manufacturing firms in South-South Nigeria.

From the result, f-calculated {100.175} is greater that the f-tabulated (2.786), that is F-cal > F-tab. Therefore, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) accepted which indicated that the overall estimate has a good fit and that the independent variables are simultaneously significant. We now conclude from the analysis that there exists a significant relationship between ICT and quality of product of food manufacturing firms in South-South Nigeria.

4. DISCUSSION AND CONCLUSION

From the result, f-calculated {100.175} is greater that the f-tabulated {2.8786}, that is, Fcal > F-tab. Therefore, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) accepted which indicated that the overall estimate has a good fit and that the independent variables are simultaneously significant. We now conclude from the analysis that there exists significant relationship between ICT and quality of product of food manufacturing firms in South-South Nigeria. Consequently, as for the field of ICT and information systems of service outputs, the quality of information systems for the final user is providing the service. The primary quality indicators involve the achievement of the desires of the final user (Ahmad, 2017). Maintenance of quality also implies there should be standard which serves as guideline in the assurance of consumer's protection and safety as well as being related to improving future processing. Institutions responsible for quality standard should ensure that food suitable for consumption is processed in a hygienic and safe manner with the right nutrition (Ojinnaka, 2011).

Conflicts of interests

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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