

Factors Affecting the Adoption of Ict on Project Planning in the Nigerian Food and Beverage Industry

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Abstract

This study identified the nature of Information and Communication Technology (ICT) adopted on project planning activities and examined the factors affecting the adoption of these ICT on project planning in the Food and Beverage Industry in Nigeria. The study was carried out through the use of questionnaire and interview schedule to a total of forty five (45) respondents across ICT, Production and Project departments of food and beverage firms in southwestern Nigeria. This was used to elicit information on the factors affecting the adoption of ICT in the industry. Data collected were analysed using both descriptive and inferential statistics. The study revealed that the major ICT adopted by food and beverage firms in Nigeria were Enterprise resource planning (4.48), Product lifecycle management (4.29), Customer Relationship Management (4.19), Supply Chain Management (4.34), Management Information Systems (4.38), Portable Data Collection Hand Held (4.65), Virtual Private Networks (4.53), Internet and e-mail (4.77). All of these ICTs had a mean rank of 4.00 and above on a 5 point-likert scales. Three factors were identified to influence ICT adoption. These include Human Resource capacity (52.8%), level of ICT investment (47.2%) and ICT competency (69.4%). Furthermore, regression analysis showed that level of ICT on Investment ($r = -.425^{**}$; $p < 0.05$) and Employee Competency ($r = -.634^{**}$; $p < 0.05$) are factors which had significant influence on ICT adoption in the project planning activities of the firms. In conclusion, the study revealed that Level of ICT investment and employee ICT competency are factors that significantly influence the adoption of ICT in the selected firms. These factors were found to be critical hindrances to ICT adoption in Nigerian food and beverage industry.

Keywords: ICT, project planning, food and beverage industry

1. Introduction

Information and communication technology (ICT) is one of the main drivers of change, posing new strategic challenges (Somuyiwa & Oyesiku, 2010). The manufacturing environments in the present day have been undergoing unprecedented changes and many companies are seeking new ways to stand out from the competition sustaining their competitive advantage. Similarly, planning in a project management context is the process involved in establishing courses of action within the prevailing environment to accomplish predetermined objectives (Badiru, 1991). A successful project is one that delivers expected results. Effective project definition and initiation play an important role in controlling project processes (Lewis, 1995) and maximizes the chance of developing the customer's product as requested, on time, and within budget (Burke, 1993). The pressure on organizations to find new ways of creating and delivering value to customers is growing stronger and ICT is widely applied in many organizations for different operations such as: Quality control, Production, Operation and Management. It has provided new ways to store, process, distribute and exchange information both within companies, customers and suppliers in the supply chain (Somuyiwa & Oyesiku, 2010).

The use of ICT in the food and beverage industry supports and promotes the exchange of information between the different parts of the industry. This promotes efficiency by reducing administrative workloads and also serves as an important tool for monitoring the production and manufacturing process, thus improving quality management and ensuring compliance with environmental standards (Danish Ministry of Science, Technology and Innovation, 2005).

Consistently, project management software with the help of ICT has made the project planning activities simpler in the recent time PMBOK (2013). Program Evaluation Review Techniques (PERT) is a technique that provides definite estimates of how long it will take to complete tasks or task. Companies in the industries face challenges that make it difficult for them to rise above competition and Government agencies continue to impose complex regulations on the industry. Retailer and food operators are demanding improved product, low price, and healthy products (Oracle Corporation, 2008). The effective use of ICTs by enterprises constitutes a crucial factor of success both for the innovation and for the competitiveness and the development of SMEs (Miles, 2004; European Commission's e-Business Report 2008). Hence, this study intends to provide information in this regard and investigate the factors that hindered adoption of ICT in the industry.

1.1 Literature Review

Information and Communication Technology (ICT) is technology that supports activities involving the creation, storage, manipulation and communication of information, together with the related methods, management and application. In other words, Information Technology enables the easy way to record, store, process, retrieve, and transmit information (Robert & Gavin, 2010). It encompasses modern technologies such as computers, telecommunications, facsimile and microelectronics. Older technologies such as document filling systems, mechanical accounting machines, printing and cave drawings are also included in the term Information Technology.

Information and Communication Technology in today's world refers to those technologies that determine the efficiency and effectiveness of communication and the devices that enable the flow of information. The value of ICT has been measured in many ways such as financial performance measures, economic performance measures and other measures like customer satisfaction. Due to the significance of ICT in the firm's production process, some studies (Brynjolfsson et al., 2000; Gilchrist et al., 2001; Oliner, S. D. & Sichel, D. E., 2000; Jorgenson, D. W. & Stiroh, K. J., 2000; Ahmad Jafari Samimi & Mahshad Arab, 2011; Egwali Annie O. & Osasere R. O., 2012) have dealt with ICT as a production factor. However, not many studies have considered economic performance measure on technical efficiency of the production process (Shao & Lin, 2001).

The ICT sector is vital for growth because its associated production mechanisms have been characterized by rapid technological progress, solid and strong demand volumes (Oshikoya & Hussain, 2007). The sector can make significant contributions to economic development, employment and exports. According to Laudon and Laudon, 2006; and Papastathopoulos et al. (2009) ICT were categorized into five major groups. These include:

- Enterprise Systems

Enterprise Systems covers Enterprise Resource Planning (ERP I& ERP II or XRP), Customer Relationship Management (CRM), and Supply Chain Management (SCM). The application of these systems involve automation of activities with an integrated software application by facilitating information flow between all business functions inside the organization, and manages connections to outside stakeholders (Bidgoli, 2004). Enterprise system software is a multi-billion dollar industry that produces components that support a variety of business functions. These are complex software packages that offer the potential of integrating data and processes across functions in an enterprise Shaul & Tauber (2012). Enterprise system can run on a variety of computer hardware and network configurations, typically employing a data base as a repository for information (Khosrow Puor, 2006).

- Information Systems

Information system (IS) is the study of complementary networks of hardware and software. People and organizations collect, filter, process, create, and distribute data with this process. The following are categories of Information Systems: Transaction Processing Systems (TPS), Management Information Systems (MIS), Decision-Support Systems (DSS), and Executive Support Systems (ESS). In a broad sense, Information system is used to refer not only to the ICT that an organization uses, but also to the way in which people interact with this technology in support of business processes.

- Digital Technologies

Digital technologies enable easy way to create, produce, distribute, and market business or product to a society. Bradley, (2002) refers Digital technologies as digital enablement of transactions and processes within a firm. Examples of these technologies are Electronic commerce (e-commerce) and Electronic business (e-business). These are type of industry where buying and selling of product or service is conducted over electronic systems such as the Internet and other computer networks. These are drawn on technologies such as mobile commerce, electronic funds transfer, Internet marketing, online transaction processing, electronic data interchange (EDI),

consisting of the exchange of data to facilitate the financing and payment aspects of business transactions. These are effective and efficient way of communicating within an organization and one of the most effective and useful ways of conducting business.

Electronic commerce is generally considered to be the sales aspect of e-business. Examples of these are; Business-to-business(B2B), Business to Consumer (B2C), Business to Business to Consumer (B2B2C), Consumer to Consumer (C2C), Customer to Business to Consumer (C2B2C), Auction Model, Portal Model.

- Telecommunication Systems

These include Internet, e-mail, Local Area Networks, Wide Area Networks, Virtual Private Networks among others. This form of Telecommunication involves communication at a distance by technological means, particularly through electrical signals or electromagnetic waves. Early telecommunication technologies include visual signals such as beacons, smoke signals, semaphore telegraphs, signal flags, and optical heliographs. Other examples of pre-modern telecommunications include audio messages such as coded drumbeats, lung-blown horns, and loud whistles. Electrical and electromagnetic telecommunication technologies include telegraph, telephone and printer, networks, radio, microwave transmission, fiber optics, communications satellites and the Internet.

- Identification and Data Capture Technologies & Telematics Technologies

Identification and data capturing is a method of automatically identifying objects, collecting data about them and entering data directly into the computer system. All these process is done automatically without any human involvement. The categories of these are; Portable Data Collection, Hand Held, Readers, Magnetic & Smart Card Readers, RFID and so forth.

1.2 Factors Affecting Adoption of ICT in European Countries

Capital is crucial to the development and expansion of robust Information and Communication Technologies. Because developing countries often lack the capital as well as the technology and managerial know-how needed to adopt modern technologies, governments can create competitive markets that grow faster, lower costs, facilitate innovation, and respond better to user needs (Guislain et al., 2006)

Liberalization and competition and the resulting increase in private investment have driven the development of ICT in general (Guislain et al., 2006). The regulatory improvements needed to achieve that goal often include opening markets to new entrants (including small domestic entrepreneurs), rebalancing retail tariffs, establishing an effective cost based interconnection regime, securing reasonable access to existing infrastructure, and transparent processes for legal, regulatory, and administrative procedures and institutions are the main requirements. Some traditional regulatory provisions may stand in the way of new technologies, decentralized supply, and other innovations. In addition, high taxation can discourage the investment by the industry; and as government taxes and duties on their import, sale, and use remain a binding constraint on extending information and communication services to poor people.

Large organizations have enough resources to adopt ICT while on the other hand SMEs have limited financial and human resources to adopt ICT. Duan et al. (2002) identified lack of ICT skills and knowledge in SMEs as one of the major challenges faced by all European countries, particularly in the UK, Poland and Portugal, in their study. Houghton & Winklhofer (2004) have reported a slow response of SMEs relating to adoption of ICT. Shiels et al. (2003) found that characteristics of the firm and industry sector are contributory factors to the adoption and exploitation of ICTs by SMEs. Kapurubandara & Lawson (2006) have categorized internal and external barriers that impede adoption of ICT by SMEs in a developing country. These include owner manager characteristics, firm characteristics, cost and return on investment, infrastructure, social, cultural, political, Age, Gender, legal and regulatory.

2. Method

The study covered three states in Southwest Nigeria namely Lagos, Ogun and Oyo states. These states were chosen because they are states where we have the largest concentration of food and beverage firms among the manufacturing industries in Nigeria (MAN, 2008; Nigerian Stock Exchange, 2007). Adopting Manufacturer Association of Nigeria (MAN) official classification of the manufacturing industry, five sub-sectors of food and beverage firms were purposively selected, which serve as bases from which sample were drawn. These comprise biscuits and bakery products, confectioneries, dairy products, processed food products, and tea, coffee, and other beverages.

A set of structured questionnaire was designed and administered randomly by hand on 45 heads of departments

across the ICT, project, and production departments in five of each of the selected sub-sectors. This was with a view to elicit information on the intensity of the effect of these factors on the ICT adoption by the firms. The three departments play a key role in the use of ICT to run project activities towards producing final products. These factors include: HR Capacity, level of Investment, Government policy, Social, Economic, Employee competency on the usage of ICT and Choice of Technology. The questionnaire specifically addressed issues regarding production and operation process of the food and beverage industry. The data collected by hand was treated and subjected to analysis using descriptive and appropriate inferential statistics. Inferential statistics such as correlation and regression were used to examine the factors affecting the adoption of ICT by the firms.

3. Result

ICT adoption on project planning activities by the Nigerian food and beverage industry

Table 1 presents the detailed analysis both in percentage distribution and mean rank of the ICT adopted on project planning activities among the selected food and beverage firms. The result of the analysis revealed that the major ICT adopted by the firms were Enterprise resource planning (4.48), Product lifecycle management (4.29), Customer Relationship Management (4.19), Supply Chain Management (4.34), Management Information Systems (4.38), Portable Data Collection Hand Held (4.65), Virtual Private Networks (4.53), Internet, e-mail and voice over IP (4.77). All of these ICTs had the mean rank of 4.00 and above. Of the fifteen ICTs identified, only Primavera with mean of (1.88) was ranked to be very low in used.

Table 1. ICT Adopted on Project Planning Activities by the Nigerian F&B Industry

Parameters	5 F(%)	4 F(%)	3 F(%)	2 F(%)	1 F(%)	Mean rank
ERP	71(54.6)	51(39.2)	7(5.4)	1(0.8)	-	4.48
PLM	29(38.7)	41(54.7)	3(4.0)	2(2.7)	-	4.29
Merlin Software	4(28.6)	5(35.7)	4(28.6)	-	1(7.1)	3.79
PERT AND CPM	-	5(71.4)	2(28.6)	-	-	3.71
CRM	15(57.7)	6(23.1)	1(3.8)	3(11.5)	1(3.8)	4.19
SCM	12(41.4)	15(51.7)	2(6.9)	-	-	4.34
TPS	3(16.7)	12(66.7)	2(11.1)	1(5.6)	-	3.94
MIS	20(44.4)	22(48.9)	3(6.7)	-	-	4.38
DSS)	1(14.3)	2(28.6)	4(57.1)	-	-	3.57
ESS	1(12.5)	7(87.5)	-	-	-	4.13
PDC, Hand Held	28(70.0)	10(25.0)	2(5.0)	-	-	4.65
VPN	68(56.7)	48(40.0)	3(25)	1(08)	-	4.53
Omni plan	3(50.0)	-	1(16.7)	2(33.3)	-	3.67
Primavera	1(0.6)	1(0.6)	1(0.6)	1(0.6)	5(62.5)	1.88
Internet, e-mail, voice over IP	120(77.4)	34(21.9)	1(0.6)	-	-	4.77

Note. 1 = very low, 2 = low, 3 = moderate, 4 = high, 5 = very high. ERP = Enterprise Resource Planning, PLM = Product lifecycle Management, CRS= Customer Relationship Management, SCM = Supply Chain Management, TPS = Transaction Processing Systems, MIS = Management Information Systems, DSS = Decision Support Systems, ESS = Executive Support Systems, PDC = Portable Data Collection, VPN = Virtual Private Network.

3.1 Factors Affecting Adoption of ICT on Project Planning by the Firms

As shown in Table 2 the highest (52.8%) proportion of the firms' heads of department agreed that lack of adequate human resource capacity development will naturally affect the adoption of ICT tools. Besides, level of ICT investment was agreed (47.2%) and strongly agreed (38.9%) by majority of the heads of these firms to have a strong effects on the adoption of ICT tools. It is not surprising to know that the highest percentage of the respondents (41.7%) disagreed that government policy affected their level of ICT adoption in their firms. Although the analysis revealed that (36.1%) of the respondents were undecided on the effect of social factor on their level of ICT adoption, (27.8%) disagreed that social competition was not a strong reason for not adopting ICT. Furthermore, (27.8%) disagreed that economic status of the firms was a major factor for ICT adoption. The last factors identified were choice of technology which was agreed by the majority of the respondents (66.7%) to have affected their level of ICT adoption.

The summary of these results revealed that out of the seven factors that were identified and ranked proceeding to

the extraction exercised. Only three of these factors showed to influence the adoption of ICT on project planning of the firms. The implication of these results is that these three critical factors accounted for over 4.00 of the variances observed as ranked in the analysis.

Table 2. Factors affecting adoption of ICT

Parameters	SA%	A%	U%	D%	SD%	Mean Rank
HR Capacity	10(27.8)	19(52.8)	5(13.9)	1(2.8)	-	4.00
Investment and Finance	14(38.9)	17(47.2)	2(5.6)	3(8.3)	-	4.17
Government policy	1(2.8)	6(16.7)	11(30.6)	15(41.7)	3(8.3)	2.64
Social	2(5.6)	9(25.0)	13(36.1)	10(27.8)	2(5.6)	2.97
Economic	7(19.4)	7(19.4)	12(33.3)	10(27.8)	-	3.31
Employee ICT competency	9(25.0)	25(69.4)	1(2.8)	1(2.8)	-	4.17
Choice of Technology	4(11.1)	24(66.7)	7(19.4)	1(2.8)	-	3.86

Note. SA=Strongly Agree, A=Agree, U=Undecided, D=Disagree, SD=Strongly Disagree

3.2 Correlation Matrix of Factors Influencing Adoption of ICT on Project Planning Among the Selected Firms in Food and Beverage Industry

Table 3 showed the Correlation matrix of the existing association the listed factors have on ICT adoption. The result revealed that only two out of the seven identified factors Level of ICT Investment ($r = -.425^{**}$; $p < 0.05$) and Employee Competency on ICT ($r = -.634^{**}$; $p < 0.05$) were shown to have a significant correlations with the adoption of ICT in the firms. This corroborates the study of Duan et al. (2002) which documented that lack of ICT skills and knowledge was one of the major challenges faced by all European countries, particularly in the UK, Poland and Portugal in their study.

Table 3. Correlation Matrix of factors influencing ICT adoption on project planning

	1	2	3	4	5	6	7	8
Factors	1.00							
HR Capacity	-.382*	1.00						
Investment	-.610**	.224	1.00					
Government policy	-.114	.272	.177	1.00				
Social	-.118	.186	.280	.403**	1.00			
Economic	-.071	.173	.264	.458**	.373*	1.00		
Employee ICT competency	-.649**	.394**	.433**	.213	.179	.221	1.00	
Choice of Technology	.085	-.036	.027	-.181	.065	.022	.122	1.00

Note. *Significant at 0.05 (two tailed) **Significant at 0.05 (two tailed)

3.3 Regression Analysis of Factors Affecting Adoption of ICT among the Selected Firms

Table 4 shows the specific influence the factors have with ICT adoption. The result revealed that Level of ICT Investment ($\beta = -.050$, $t = -2.441$, $p < 0.05$) and Employee Competency on ICT ($\beta = -.117$, $t = -4.822$, $p < 0.05$) significantly Influence the adoption of ICT among the selected firms at = 0.05 level of significance. The regression analysis conformed with the result of the correlation analysis that these factors showed to be very critical to ICT adoption and it imply that the firm should pay more attention to these factors through training of staff in ICT related areas and employ more expertise in the areas of ICT deployment.

The results corroborates with Eaglen et al. (2002) and Fair & Brook (2001) that training has positive impact on employee productivity, promoting customer satisfaction, and sustaining competitive advantage. Furthermore, investing more on training and deployment of appropriate ICT in all areas of project activities should not be an obstacle for food and beverage firms. Hence, there is a need for the firms to invest more on training and deployment of modern ICT.

Table 4. Regression analysis of factors affecting adoption of ICT among the selected firms

Summary of test of significant factor affecting adoption of ICT among the selected firms					
Factors	Unstandardized Coefficients		Standardizes Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	1.326	.159		8.323	.000
HR Capacity	-.009	.026	-.050	-.359	.722
Investment/Finance	-.050	.021	-.353	-2.441	.021
Government policy	.037	.025	.213	1.482	.150
Social/Competition	.041	.022	.247	1.880	.701
Economical	.012	.022	.076	.531	.600
Employee Competency on ICT	-.117	.024	-.582	-4.822	.000
Nature or Choice of Technology	.040	.031	.152	1.282	.210

Dependent Variable: adopted ICT on project planning

Note. Sig. at 0.05 level of significance.

4. Conclusion

The study identified the nature of ICT adopted on project planning by the Nigerian food and beverage Industry and investigated the factors of ICT adoption in the Industry. The result showed that the major ICT adopted by the firms are categorized under Enterprise System and Telecommunication System. This findings support the work of Laudon & Laudon, (2006) who established five categories of ICT classification. Reasons for this may be due to the fact that food and beverage firms make use of these ICT facilities in their project planning activities based on the features they possessed.

Laudon & Laudon (2006) also affirmed that “Telecommunication consists of network infrastructure while Enterprise systems are mainly project management software”. Project management software has the capacity to help plan, organize, and manage resource pools and develop resource estimates. Depending on the sophistication of the software, it can manage estimation and planning, scheduling, cost control and budget management, resource allocation, collaboration software, communication, decision-making, quality management and documentation or administration systems (Chandar, Tijjani, & Ramasamy, 2015).

The major task and activities of project management software are for scheduling and information transmission. One of the most common project management software tools is scheduling tools. Scheduling tools are used to sequence project activities and assign dates and resources to activities. Project planning software also provides information to various people or stakeholders, and used to measure and justify the level of effort required to complete the project.

The study also revealed that human resource capacity, investment and finance, and employee competency on the use of ICT were significant factors affecting the adoption of ICTs on project planning activities in the Nigeria food and beverage Industry. These results agreed with the findings of Ogaard et al. (2005) and Evans et al. (2006) that effective leadership will lead to higher organizational performance. The human resource capacity plays a strong role in creating a positive and productive workplace culture, and inspiring others to pursue those opportunities which have been identified. More so, a firm can only achieve higher productivity by employing the right individuals with the capacity and desire to contribute to its goals. Duan et al. (2002) also documented that lack of ICT skills and knowledge was one of the major challenges faced by all European countries, particularly in the UK, Poland and Portugal in their study.

The implication of these results is that while the contributions of other extracted factors should not be ignored, special attention has to be paid to these three critical factors in order of significance. The knowledge and understanding of the contributions of these major factors are very pertinent towards evolving strategies to accelerate the adoption of ICT in the food and beverage industry in Nigeria. The firms should pay much attention to level of investment on ICT and employee competency on ICT usage because they showed to have strong relationship with ICT adopted by the industry.

The adoption of Information and communication technology (ICT) in Nigerian food and beverage industry are majorly affected by human resource capacity, employee competency on the usage of ICT, investment and finance as shown in the findings of this study. Although other factors were revealed which have little weight on the adoption of these technologies.

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