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RESEARCH ARTICLE



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EFFECT OF THE CHALLENGES FACING USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY ON INVENTORY MANAGEMENT AMONGST BREWERIES IN NIGERIA

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ABSTRACT

Information and communications technology (ICT) in recent times has become a viable strategic policy option adopted by many businesses in order to compete favorably in a competitive and dynamic ICT driven market. This strategic move by business organizations is being hindered by some challenges which has invariably reduced the benefits accruable from ICT deployment for business operations especially in the inventory management. Primary data formed the methodology of the study. Descriptive and inferential statistics were used to analyze data obtained through the administration of structured questionnaire. It was established during the field survey that challenges facing the use of ICT had impacted negatively on the performance of inventory management in the Nigerian brewery industry during the period under study. It was also revealed that the cost of software was a major challenge in the industry and conclude that the identified challenges had significant effect on customers' satisfaction of the firms in the Nigerian brewery industry. It is recommended that management of firms in the Nigerian brewery industry should collaborate with software developers in Nigerian to develop a software that will be a replica of ERP but should be efficient, effective and affordable for inventory management and other operations in the industry.

Keywords: efficiency, ICT challenges, inventory management system, inventory, performance

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INTRODUCTION

It is conspicuously known fact that inventories occupy the greatest strategic place in the arrangement of working capital of most commercial enterprises; likewise, firms in the brewery industry are not an exception. Inventories constitute the major element of liquid assets in nearly all business ventures. Considering the scope of venture capital, managing inventory is seen as a major difficulty to the firms in the brewery industry because close to 67% of the current assets of firms in the industry are being seized in inventories (Mathur; 2010). The revenue from inventory is a principal determinant of the turnover of working capital of business organizations and the firms in the Nigerian brewery are not an exception. It is therefore quite expected that inventory which helps in making the most of turnover occupies the most substantial place among current assets.

Momanyi & Sanewu (2014), while writing on information communications and technology's influence on inventory control system, submitted that in present-day's business setting, both small and medium scale industries now depend on computer-based systems for managing their inventories. Without doubt, purchase and deployment of an automated inventory tracking system might be an extravagant use of financial assets for certain paltry industries like comfort stores, boot stores, or plant sales outlet. Tracking inventory electronically has developed as a vital constituent of business approaches directed on snowballing output and sustaining competitive edges for organizations working in businesses that are characterized by large volume revenue of natural resources and/or refined goods.

Odesola & Akinola (2018) said that sound and flexible inventory management are germane to the successful operations of any manufacturing outfit. In manufacturing industries, like firms in the Nigerian brewery, inventory management could be likening to the heart of a human being. Inventory management denotes appropriate techniques put in place to manage raw materials, work-in-progress as well as finished goods to minimize cost in a bid to achieve the set organizational goals and objectives. Inventories are resources of an organization that are being kept by the organization for future use. As Itod, Maji and Abdu (2010) posited, managing this asset is an indispensable task if an organization will continue to exist, hence favourable procedures of safeguarding this resource in order to use it at the correct time, right place and accurate quantity must be put in place. This is because massive amounts of money have been invested on inventory which may result in the serious scarcity of funds for other investments in the manufacturing sector of most economies.

Information and communications technology (ICT) is referred to as a general term that embraces all cutting-edge technologies in manipulating and communicating information (Musa, 2013). Hence, the deployment of ICT to manufacturing activities will boost corporations' competence and its competitive advantage, enhanced conversation, consumers' satisfaction, cost savings and complementing organizations' expansion and achievements (Vu, 2004).

Africa has been reported to have an end user market of more than one billion population of beer consumption, average Gross Domestic Product gain of 5% up to 2020 and 9 liters as beer consumption per capita (vs. 25-liter peer average) (Olawale, 2014). It is clear that the growth of beer market in the continent is doubtless credible. This type of market will be host to many brewery firms as being witnessed. Also, Olawale (2014) said that of all the countries in Africa, Nigeria was the focus of all prospective investors as far as beer consumption is concerned being a heavily populated nation and largest (still growing) economic life in Africa, with considerable latent for a double-

digit development. The Nigerian brewery industry is not completely left to mainly Nigerian investors as leading international players like Heineken N.V controls 70% of Nigerian beer market with majority stake in Nigerian Breweries Plc and Champion Breweries Plc while Diageo controls 27% through its ownership of Guinness Nigeria Plc and SABMiller controls 3% through its stake in the Pabod breweries Ltd and International breweries Plc (IB).

STATEMENT OF THE PROBLEM

Deployment of an ICT solution is one of the strategic initiatives embraced by organizations in order to have competitive advantages over others so as to make more profits and continue to exist (Angulo, 2007). Akinola and Odesola (2018) observed that virtually all sectors of the economy now depend and deploy an ICT based systems either as a competitive strategic move or to improve effectiveness, productivity, efficiency or costs reduction. With the proliferation of ICT tools and systems comes some challenges which have continued to hinder the positive impacts of ICT. For instance, Petter, DeLone and McLean (2008) submitted that worries around financial conditions and growing rivalry had immense pressures on organizations to decrease costs associated with ICT, which necessitate them to quantify and scrutinize the profits and expenditures of deploying an ICT system. The authors stated that business outfits are more concerned about the yield their expenditures will accrue to them as a result of deploying and implementing an ICT solution. Organizations knew that the influences of ICT are frequently unintended and are influenced by anthropological, structural, and environmental factors; therefore, quantification of information systems (IS) or ICT success is both intricate and misleading.

Also, there were a lot of expectations from ICT powered inventory management system but a research by Zhang, Lee, Huanga, Zhang, and Huang (2005) discovered that ERP (Enterprise Resource Planning) systems were on the average, resulting in an over bloated budget of 178 per cent, used 2.5 periods longer than anticipated and achieved just only 30 per cent of what were promised as benefits. This view was also corroborated by a study carried out by the duo of Wang and Chen (2006) where it was revealed that well over 90 per cent of Enterprise Resource Planning systems implemented has to be deferred coupled with extra budget amounts. Dutta and Coury (2003) while writing on ICT challenges for Arab world identified some challenges of ICT in un-industrialized countries. These studies have not been conducted on the challenges facing the adoption and use of ICT for inventory management amongst breweries in Nigeria as well as its associated effects on inventory management ; hence the need for this study.

AIMS AND OBJECTIVES OF THE STUDY

The aim of this study is to examine the effect of challenges facing use of ICT for inventory management in the Nigerian Brewery industry. The specific objectives are:

- a. to investigate the challenges facing the use of ICT for inventory management in the Nigerian brewery industry;
- b. to analyze the challenges being faced by individual firm implementing ICT for inventory management in the industry;
- c. to examine the effect of the identified challenges facing use of ICT for inventory management on customers' satisfaction; and

d. to determine the impact of the identified challenges facing use of ICT for inventory management on performance of the inventory management system.

CONCEPTUAL REVIEW

INVENTORY

Inventory is stock of resources that are put in a specified position or arrangement or set aside for future use of a firm. Nearly all institutions whether it is industrial, educational, sole ownership, health, and government institutions among others have had cause to preserve one type of inventory or the other in the course of carrying out the firm's operations. In a real-life situation, demand and supply of specific product or raw materials are not constantly the same and so there is the need to keep inventory in an organization all the time in order to reduce the costs connected with the inventory control. In another vein, inventory can also be termed as inactive but utilizable stock of materials that do not bring in any income to the organization when static. It is obvious that experts managing a business need goods that can be kept for one future use or the other in the organization. It will not be out of place to conclude that in an organization there are various types of items that are usually stored as inventory (Adedayo, Ojo and Obamiro; 2010).

The objectives of inventory management, as explained by Mathur (2010), are, among others, to regulate asset such as property, goods in stock and retain it at an optimal level, safeguard the inventory against decline, obsolescence and unapproved use, reduce the carrying cost and time and to preserve adequate stock of basic natural resources in time of scarcity and expected price fluctuations. Other objectives noted by this author are to minimize funds used to acquire inventories, so that manufactured goods are offered for onward carriage to customers in a bid to satisfy requests, well-organized client service, guarantee materials availability for use in manufacturing and manufacturing operations at the appropriate time, guarantee a constant release of basic material to manufacturing department thereby enabling continuous manufacturing operations; and to keep satisfactory stock of finished goods for unhindered sales operations.

INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT)

Information is the backbone of today's business organizations, institutions and industries (Musa, 2013). It was discovered from the materials reviewed that the term ICT is sometimes used in preference to information technology (IT) or "InfoTech" which is defined as the processing and dissemination of data using computer hardware and software, telecommunications, and digital electronics. Herselman and Hay (2003) defines ICT as know-hows encouraging communication and collaboration of human beings and their businesses and the formation. In another vein, ICT involves a collection of automated analog and digital tools that include television, radio, fixed and mobile telephones, computers, electronic-based media example of which includes digital text and audio-video recording, and the internet, but does not include the non-electronic technologies (Rwashana and Williams, 2008).

INFORMATION AND COMMUNICATIONS TECHNOLOGY IN INVENTORY MANAGEMENT

Inventory management systems according to Prasanna (2014) track the quantity of each item a business maintains, activating a request for extra stock when the quantities of the stock fall below a fixed amount. In order to manage inventory effectively, companies need to retain adequate stock to meet demand without investing in more than they

needed. The inventory management system has to be linked to a point-of-sale (POS) system in order to make the best use of the system. The POS system ensures that each time an item is sold; one of those items is removed from the inventory sum total, creating a closed information circle among all departments in an organization.

Detailing what could be described as the impact of ICT in inventory management, Prasanna (2014) listed the following; (a) bridging the cultural gap - this, the author said that information and communications technology does not permit cultural obstacles that have always hinder international business in many cases to hinder businesses from different continents of the world to transact business especially the desire of firms to get inventory items from other countries). (b) cost effectiveness - this according to Prasanna (2014) is of interest to operations manager because the manager's primary motive is to produce at a minimal cost with a resultant super profit. It is the profit-making drive that makes this benefit from deploying information and communications technology system of remarkable importance to any multi-national corporations as it helped to computerize the business processes thus rearranging businesses to make them cost-effective money-making machines. (c) communication - following the introduction of information communications and technology, it is now very easy to communicate with anyone around the globe by means of text messages or an email for an almost instantaneous response.

With the help of information and communications technology, communication has also become cheaper, quicker, and more efficient. The internet has in addition to the above unlocked face to face uninterrupted communication from diverse parts of this planet kudos to video conferencing. It will not be difficult to interact with consumers and suppliers among others, (d) more time - deployment of information and communications technology, Prasanna (2014) said that it has made it possible for a business to open at anytime, anywhere, transacting business with other parties from different countries in a very easy, convenient and efficient manner. With ICT in place it is possible for businesses to open 24 hours a day and for 7 days a week and transact business with interested parties from different part of the world. It is now easy for businesses to order for inventory items at anytime, anywhere or anytime. (e) globalization - Prasanna (2014) said that the introduction of information and communications technology has turn the whole world into an inclusive village through which one can transact business with another in a far country that is not humanly without being physically present. Apart from bringing the world nearer, the deployment of ICT has also permitted the world's economy to become a single mutually dependent system.

CHALLENGES FACING ICT IMPLEMENTATION

Despite the various benefits obtainable from the use of ICT in business operations as enumerated above, multinational organizations encounter a number of problems when deploying such systems. Nyaga (2014) said that ICT is seen as a requirement for development of any nation but when the developing countries is it put side by side with the advanced countries, a wide gap exist in the usage of ICT and its associated challenges between these two groups. This gap is referred to as "the Digital Divide" and can be seen within a country and between countries. In developing countries, ICT infrastructure is frail leading to limited internet access and ICT deployment for economic activities. The author in the study said that the digital divide was as a result of factors such as inappropriate products (in this case; computers), asking price, education, computer mastery, human resources, and government policies. Nigeria is a developing nation and so most if not all the challenges identified by Nyaga (2014) are evident in the country.

Oliveira (1989) and Gulati (2008) also listed some of the challenges being faced in the use of ICT to include the insufficiency of monetary resources(in the developing world as the available money will be expended mostly on basic needs like food, house and roads), the cost of ICT hardware, salaries of the ICT professionals, software related costs, cost of access to the internet, poor substructure in undeveloped countries like erratic electricity supply compounded, maintenance cost, burglary, fear by the administration and obsolete computers.

Parida, Johansson, Ylinenpää and Braunerhjelm (2010) opined that there are quite a lot of issues that may disallow industries from deploying and making the best use of ICT in their dealings. Factors influencing the deployment and use of ICT in businesses can significantly vary when comparing diverse sectors of the economy, nations and groups. These are unsuitable ICT for the kind of business a firm is doing, inadequate ICT skills or capability inside the firms, absence of consistent ICT associated applications, price factors, concerns with right to use to ICT, absence of trust, and legal reservations.

CONCEPTUAL MODEL

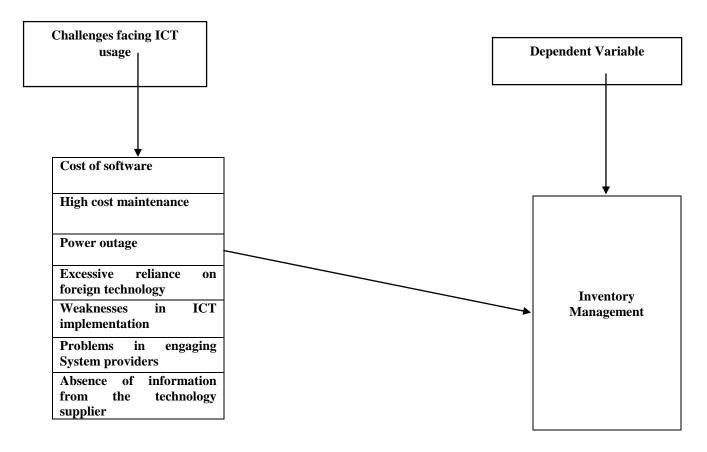


Figure 1: Schematic Diagram showing the relationship between challenges facing information and communications technology usage and Inventory Management.

THEORETICAL FRAMEWORK

The theory of constraints (TOC) is a system- management philosophy developed in the early 1980s by Eliyahu M. Goldratt. The fundamental thesis of TOC is that constraints limit the performance of any system. The theory of constraints (TOC) advocates that managers should focus on effective management of capacity and capability of these constraints if they are to improve the performance of their organizations. The theory of constraint is an organizational change method that is focused on profit improvement. A constraint is any factor that limits an organization from getting more of whatever it strives for, which is profit most times. These features justify the adoption of this theory for this study. In this case, the firms in the brewery industry may be hindered by challenges facing the deployment and use of ICT for inventory management thereby affecting their quests to gain competitive advantage over others in the Nigerian beer market that has latent for double digit growth.

THE REVIEW OF EMPIRICAL LITERATURE

Some of the results from related empirical researches, for examples, Oliveira (1989) and Gulati (2008), revealed that some of the challenges include scarcity of financial resources, the cost of ICT hardware, the salary of the ICT professionals, software related costs, cost of access to the internet, poor infrastructure in developing nations such as supply of electricity makes this worse, maintenance cost, burglary, fear by the administration and obsolete computers. Other challenges observed by Parida, Johansson, Ylinenpää & Braunerhjelm (2010) in their study in Sweden are, though vary across different sectors, countries and continents, unsuitable ICT for the firm's type of business, limited level of ICT skills or incompetence of ICT personnel within the firms, lack of standardized ICT related applications, cost factors, issues with access to ICT, lack of trust, and legal uncertainties. There is a need to carry a similar study in a manufacturing firm like the Nigerian brewery industry to see if the challenges are the same.

Summarily, developments in information and communications technology present a pack of solutions which can be implemented in varying degrees and business contexts from time to time at very huge costs. Although, the deployment and implementation of an ICT solution will influence inventory management differently and the firms' performance but these technologies are costly to adopt and may not provide commensurate benefits to justify the huge cost outlays borne by firms. For example, nearly all business organizations that had deployed and implemented an Enterprise Resource Planning system complained either on the time it took the system to perform, high cost of for license, an additional cost for implementation, an annual maintenance cost and that there were no immediate benefits noted from the installation.

STUDY HYPOTHESES

The following Null Hypotheses were declared for this study

(i) H₀: Identified challenges facing use of ICT for inventory management will not affect customers' satisfaction
(ii) H₀: Performance of the inventory management system does not depend on the identified challenges facing use of ICT for inventory management.

MATERIALS / METHODS

Primary data used in this research were obtained via the administration of well-structured questionnaire and the area of coverage was limited to South--western part of Nigeria where majority of the firms in the industry are located. This research employed a cross sectional research design because the research sought to find out the effect of the independent variable (ICT Challenges) on the dependent variable (inventory management). The three firms selected from the Nigerian Brewery Industry that are traded on the Nigerian Stock Exchange are International Breweries Plc (IB), Ilesa, Osun State, Nigerian Breweries Plc (NB), and Guinness Nigeria Plc (GN). Also, a purposive sampling technique was used in order to get appropriate data from the different categories of staff (technical and administrative) in the industry. One hundred (100) copies of questionnaire were administered and was distributed as follows, 20, 45, and 35 copies to IB Plc, NB Plc and GN Plc because of their staff strength. A pilot testing of the questionnaire was carried out and the results from the test helped in authenticating the suitability of the samples and the source of data collection. The research hypothesis was tested using chis-square.

RESULTS AND DISCUSSION

CHALLENGES FACING THE USE OF ICT IN INVENTORY MANAGEMENT AMONGST BREWERIES IN NIGERIA The result of the analysis showed that the challenges facing the use of ICT in inventory management amongst breweries in Nigeria are high cost of maintenance, high cost of software, excessive reliance on foreign technology and weaknesses in ICT implementation, as indicated by 5.6%, 30.4%, 12.4% and 15.7% of the respondents. Other challenges indicated by 20.2%, 1.1% and 14.6% are respectively power outage/irregularities in power supply, absence of information from the technology supplier when an updated versions of the system are deployed and problems in engaging providers in the system development processes (specifically medium scale organizations) (see Table 1below).

Challenges	Frequency	Percentage	
High cost of software	27	30.4	
Power outage/irregularities in power supply	18	20.2	
Weaknesses in ICT implementation Problems in engaging providers in the system development processes - specifically medium scale organizations – because of investment anticipated	14 13	15.7 14.6	
Excessive reliance on foreign technology	11	12.4	
High cost of maintenance	5	5.6	
Absence of information from the technology supplier when an updated version of the system is deployed	1	1.1	
Total	89	100%	

Table 1: Challenges facing use of ICT in inventory management amongst Breweries in Nigeria

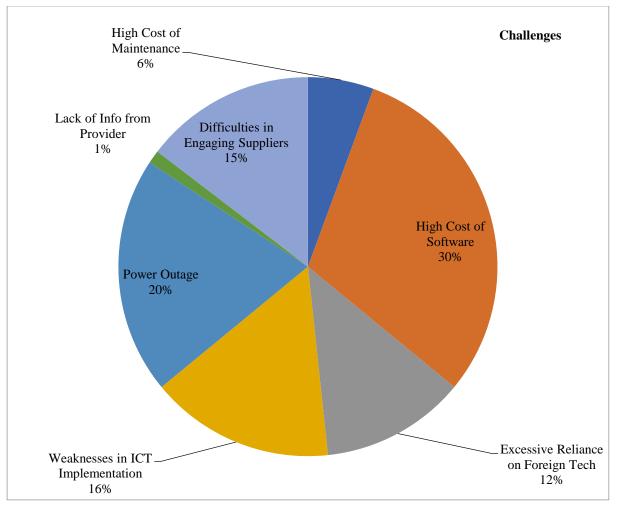


Figure 2: Challenges facing use of ICT

CHALLENGES FACED BY INDIVIDUAL BREWERIES

In order to have a clear picture of the challenges faced by individual breweries, a cross tabulation was carried out. This is depicted in Table 2 below. The analysis, as revealed from this cross-tabulation, indicated that the challenges faced by these companies in the use of ICT for inventory management, are high cost of software, indicated by Nigerian Brewery Plc and Guinness Nigeria Plc, irregularity in power supply, indicated by International Brewery Plc.

	Company Name			
Challenges	Guinness	Nigerian	International	
	Nigeria Plc	Brewery Plc	Brewery Plc	Total
1. High Cost of Maintenance	2	2	1	5
2. High Cost of Software	13	12	2	27
3. Excessive reliance on foreign technology	4	4	4	12
4. Weaknesses in ICT implementation	5	7	2	14
5. Power outage/Irregularities in Power Supply	5	8	5	18
6. Problems in engaging providers in the system				
development processes - specifically medium scale				
organizations – because of investment anticipated	0	1	0	1
7. Absence of information from the technology supplier				
when an updated version of the system is deployed	3	6	3	12
Total	32	40	17	89

Table 2: Challenges Faced by Individual Breweries

TESTING OF HYPOTHESES

For Hypothesis I: Identified challenges facing use ICT for inventory management has no effect on customers' satisfaction of firms in the Nigerian Brewery Industry. Respondents were asked if they strongly agree, agree, undecided, disagree or strongly disagree with the notion that challenges facing use ICT for inventory management by firms in the Nigerian Brewery Industry lead to customers' disloyalty, caused stock out, promote inconsistency in determining reorder levels, lead to unrealistic maximum and minimum inventory levels, caused decrease in product quality, increase in wastes, lead to increase in delivery time and increase in customer's complaints. Their responses were presented in table 3.

Table 3: Effect of Identified challenges on customers' satisfaction

Options	Frequency
Strongly Agree	55
Agree	21
Undecided	6
Disagree	4
Strongly Disagree	3
Total	89

Testing of the hypothesis:

Using $\chi^2 = \underline{\xi}$ (Observed frequency - expected frequency)² Expected frequency

Expected frequency = $\frac{55 + 21 + 6 + 4 + 3}{5} = \frac{89}{5} = 17.8$

Table 4:	Chi-square	Table
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Responses	Observed (O)	Expected (E)	О-Е	(O-E)2	<u>(O-E)2</u>
					E
Strongly Agreed	55	17.8	37.2	1383.84	77.74
Agree	21	17.8	3.2	10.24	0.58
Undecided	6	17.8	-11.8	139.24	7.82
Disagreed	4	17.8	-13.8	190.44	10.70
Strongly	3	17.8	-14.8	219.04	12.31
Disagreed					
Total	89				109.15

Calculated χ^2 is 109.15 while the χ^2 from the table is obtained by assuming 5% level of significance and using M = N - 1 for degree of freedom, where N is the number of row of the table for the chi-square. Here, N is 5, therefore degree of freedom (M) = 5-1 =4. Therefore, the χ^2 from the chi-square table is 9.488. Since the computed χ^2 ; 109.15 is greater than 9.488, we therefore reject the null hypothesis (H₀) and accept the alternate hypothesis (H₁). We conclude that Identified challenges facing use ICT for inventory management has strong effect on customers' satisfaction of firms in the Nigerian Brewery Industry.

For Hypothesis II: Performance of the inventory management system does not depend on the identified challenges facing use ICT for inventory management by firms in the Nigerian Brewery Industry. Respondents were asked if they strongly agree, agree, undecided, disagree or strongly disagree with the notion that challenges facing use ICT for inventory management by firms in the Industry lead to seasonal fluctuation, increase in wastes, aids increase in production costs, pave way for untimely deliveries, aid increase in inventory cycle time, pave way for increase in production breakdown and cause decrease in inventory turnover. Their responses were presented in table 4.

Table 5: Effect of Identified challenges facing use ICT for inventory management on the Performance of the
inventory management system

Options	Frequency	
Strongly Agree	45	
Agree	30	
Undecided	5	
Disagree	6	
Strongly Disagree	3	
Total	89	

Testing of the hypothesis: Using $\chi^2 = \underline{\xi}$ (Observed frequency - expected frequency)² Expected frequency

Expected frequency = $\frac{45 + 30 + 5 + 6 + 3}{5} = \frac{89}{5} = 17.8$

Responses	Observed (O)	Expected (E)	О-Е	(O-E)2	<u>(O-E)2</u>
-		_			E
Strongly Agreed	45	17.8	29.2	852.64	47.79
Agree	30	17.8	12.2	148.84	8.36
Undecided	5	17.8	-12.8	163.84	9.20
Disagreed	6	17.8	-11.8	139.24	7.82
Strongly	3	17.8	-14.8	219.04	12.31
Disagreed					
C					85.48

Calculated χ^2 is 85.48 while the χ^2 from the table is obtained by assuming 5% level of significance and using M = N - 1 for degree of freedom, where N is the number of row of the table for the chi-square. Here, N is 5, therefore degree of freedom (M) = 5-1 =4. Therefore, the χ^2 from the chi-square table is 9.488. Since the computed χ^2 ; 85.48 is greater than 9.488, we therefore reject the null hypothesis (H₀) and accept the alternate hypothesis (H₁). We conclude that performance of the inventory management system depends on the identified challenges facing use ICT for inventory management by firms in the Nigerian Brewery Industry.

These findings, as indicated above, are similar to the findings of previous empirical studies conducted from different countries of the world by Oliveira (1989) and Gulati (2008), Parida, Johansson, Ylinenpää and Braunerhjelm (2010), Muthuri (2014) and Dutta and Coury (2003). This paper agreed with the submission of these researchers that in undeveloped states, ICT challenges comprise of regulatory as well as legal problems, very feeble ICT policies, deficiency of research and development, too much dependence on overseas technology and weak ICT applications. Others are costly delays and errors, high maintenance costs and lack of the necessary IT infrastructure to great extents.

CONCLUSION AND RECOMMENDATIONS

This study investigated the effect of challenges facing the brewery industry in Nigeria in the use of ICT for inventory management. This is carried out through the administration of questionnaire and the responses were analyzed using appropriate statistics and concluded that there are challenges facing the use of ICT for inventory management in the industry; but the major challenge is the cost of software and that these challenges had positive significance on the performance of inventory management and customers' satisfaction. It is therefore recommended that management of firms in the Nigerian brewery industry should collaborate with software developers in Nigerian to develop a software that will be a replica of ERP but should be efficient, effective and affordable for inventory management and other operations in the industry. Governments also have important roles to play in order to remove the digital divide by cutting tax imposed on imported ICT products, relax the market for ICT hardware, telecommunication and the internet business. If Government can apply these measures the prices of ICT related products will come down and many firms will be able to afford them.

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