Harnessing Information Communication Technology (ICT) For Effective Logistics Management (Study of Some Selected Nigeria Logistics Companies)

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ABSTRACT
With the graving acceptance of Logistics and Supply Chain Management as critical business concern, there is an emerging realisation that dramatic changes in information communication technology lead to this global logistics business. Managing logistics effectively is a complex and challenging task, as a result of the continuing trends of expanding product variety, short product life cycles, increased outsourcing, globalization of businesses and continuous advances in information technology. In recent years, Logistics Management has grown in acceptance and now at the forefront of every business planning. In this milieu, Information Communication Technology plays a pivotal role in ensuring continued Logistics firm competitiveness and success. The purpose of the study is to investigate the impact of Information Communication Technology in articulating effective Logistics operation. However, the theoretical basis of Information Communication Technology has not been fully understood within the context of Logistics Management, such that it will give a pointer to how these inherent costs could be managed or saved as well as supplier customer collaborative relationship. It is in the light of this that the study attempt to give theoretical considerations, through descriptive methodology approach, on how basic objectives of logistic can be achieved and its ultimate goal can be realized. The studies conclude that emphasis should be placed on attributes of Information Communication Technology in order to enhance Logistics efficiency and effectiveness and to support the support performance of global Logistics networks.

KEYWORDS: ICT, Logistics Management, Transport, Supply Chain Management

Introduction

With the growing acceptance of Logistics and Supply Chain Management as critical business concerns, there is an emerging realisation that more investment is needed to develop appropriate Information Communication Technology systems. Globally, Logistics has emerged as a significant growth factor in most nations' economy. Nigeria as one of Africa's fastest growing economy and manufacturing hub is witnessing increasing demand for logistics and supply chain services.

For Nigeria logistics firms to survive in a global economy in the 21st century, they need to exploit all the available resources as a means of achieving competitive advantage. One resource recently recognised as providing a source of competitive advantage is Information Communication Technology systems. Definition of system is significant to definition of information. For instance, Information is that intellectual that in a certain domain can be acquired, preserved, transferred and applied as non-empty sets of information elements, such that each element determines a certain aspect entity (Long 2003). Hence, the definition of an information communication system then means systems that can manage knowledge. "Information system is a system for collecting adaptation, storage, transferred presentation of information in an, for the user of the information system, effective way. The information system can be totally or partially computerised."(Lambert, 2004).

This study arises from the need to efficiently and effectively manage logistics operation. The rapid growth of logistics and supply chain compares, increase in technological changes, environmental variability and degree of competition, acute shortage of skilled labour and operational damage have forced forms to strategists incorporate ICT component into their operations (logistics). These industry issues and problems demand that logistics companies should continually adopt and access the various ICT components if it is to remain competitive. However, proving research are quite limited in investigating the impact of ICT on logistics in terms of cost effectiveness.

Research Objectives

Specifically they study is intents to achieve the following objecting;

1. To identify and examine the various ICT components
2. To investigate the impact of ICT components on effective logistics operation.
3. To examine how ICT components can ensure/bring cost-effectives in logistics operation.

LITERATURE REVIEW

The Concept of Information Communication Technology in Logistics

ICT is increasingly regarded as a vital resource that supports many business processes (Alshawi, 2001). In the logistics industry, ICT such as internet, extranet, electronic data interchange (EDI), facilitates the integration of logistics activities (Angeles, 2000). The importance of ICT in logistics and supply chain operation in ICT'S contribution to the provision of timely and accurate information sharing both within the from and between logistics partners and enhancing organisational decision making (Aldin and Stasher, 2003).

Bower six, ital. (2002) outline four major reasons for the increasing importance of ICT as a valuable logistics resource. First, customers appreciate timely information about order status, product availability, delivery schedules and invoice settlement, which are increasingly enhanced by rapid advances in ICT.

Second, timely information is essential for inventing planning and resource scheduling.

Third, timely information increases logistics flexibility with regard to how, when, and where resources may be utilized to gain strategic advantage.

Forth, enhanced information transfer and capability exchange utilising the internet is charging relationships between suppliers and buyers and redefining channel relationships. Therefore the ability to utilize ICT skills and knowledge to enhance Logistics operation is fast becoming an indispensable resource for Logistics Service Providers (LSPs). The application of ICT to transportation has led to the emergence of Intelligent Transport System (ITS) (OECD, 2001). ITS links individual transportation elements and combines them into a single system through the use of advanced information technologies. It also integrates various technologies and institutional functions to realise efficient, safe and environmental friendly transport system. It offers the potential to improve the efficiency of use of transportation systems by generating additional capacity from existing physical infrastructure (OECD, 2001)

Importance of secured ICT as a source of competitive advantage in logistics management

The effectiveness of the information communication technology capabilities hinders significantly on the security of the ICT facilities in use, such as internet, intranet, extranet, electronic data interchange, intelligent transportation systems and logistics management information systems (Calza and Pissarro, 1997; Angeles 2000). In a highly competitive market, like that of Nigeria, information leakage is a primary concern of logistics service providers (Alshawi, 2001; Aldine and Stasher, 2003). Information communication technology security, or the ability to protect proprietary information can give LSPs an edge over their competitors thus, enhancing their logistics capabilities. Therefore, the ability of any logistics service provider to secure its ICT base will guarantee secured information sharing and information flow between partners, control systems of operation at the various logistics ends, thereby making e=fleet management, e-commerce and e-data interchange flexible.

Information Communication Technology (ICT) Development for Supporting Logistics

Internet is rapidly becoming a powerful business tool because of its online commercial services and e-commerce capabilities. The net is ready to become a medium by which companies trade, make contracts, exchange data and information, discuss designs and locate components (OECD, 2001). The application of ICT to transportation has also led to the emergence of intelligent transport systems (ITS) which links individual transportation elements and combines them into a single system through the use of advanced information technologies (Yoshimoto and Nemoto, 2005). ITSs integrate various technologies and institutional functions to realise efficient, safe and environmentally friendly transport systems. It offers the potential to improve the efficiency of use of transportation systems by generating additional capacity from existing physical infrastructure (Yoshimoto and Nemoto, 2005). Strategic applications off innovative information such as Global Positioning System (GPS), ITS, Electronic Data Interchange (EDI), and Electronic commerce integrated through the internet will become inevitable for supporting logistics. The existence of high-performance information infrastructure will dictate the logistics competence of any logistics service provider (LSPs) in

Nigeria or around the globe. These complex and sophisticated information infrastructures will induce interactive processes in logistics functions.

ICT and technological innovation effects in the performance of logistics

The use of ICT has improved the exchange of logistics function information, leading to the development of integrated logistics management systems and improving performance in many ways. Commercial transaction flow and physical distribution have both witnessed dramatic change in the way they are managed due to Electronic Data Interchange (EDI) (Somuyiwa; 2010).

Enabling logistics and supply chain structures

The rapid development of ICT has influenced not only Logistics and supply chain performance but has also changed industry structures and produced new services. The easy availability of information to all parties in the supply chain poses a threat to partners in the chain (e.g Agents) who traditionally earn their living through their access to scarce information (OECD, 2001). Certain roles in the supply chain may become redundant. Forwarders, wholesalers and retailers will face more competition by internet sales channels, since a large part of their business stemmed from matching supply and demand. However, ICT has created a new non-asset type business. A particular service has emerged which is referred to as the "virtual logistics chain". A virtual logistics chain is an internet based communication system with a centralised database, which integrates all aspects of logistics operations, and can be accessed by interested parties to check relevant logistics information and communicate in real time (OECD, 2001). Value-Added Network (VAN) companies which transmit information between customers and transportation service providers serve as integrators by functioning as databanks for checking cargo location, purchase orders and other forms of information. For example, PARIS (Planning And Routing Intermodal System) which simultaneously plans the hinterland transport of containers to and from parts of several shippers and several transport companies, thereby increasing efficiency has emerged in Europe (OECD, 2001). Also a new type of third party logistics (3PL) provider, called Information Clearing House (ICH) has emerged in the United States. These service companies create web sites which list available truck capacities of member truck companies and enable transportation arrangements to be made between the truck companies and subscribed consignors. This increases truckload efficiently and contributes to environmentally friendly transport by reducing the number of less than truckload consignments (OECD, 2001).

ICT contributing to Modal Shift and Intermodal Transport

Developments in logistics and transport technology have the potential in increase the competitiveness of intermodal transport. The application of ICT in logistics and supply chain enable information a transport orders and shipments to be made available at an early stage. This means that transit times of transport operations can be better managed, thus creating new transport opportunities, including intermodal transport, which were not feasible before (OECD, 2001). Efficient information technology has reduced processing time and cost and created seamless links, thereby facilitating intermodal transport. The third party companies have developed services that link the various modal systems. The use of ICT to identify and track cargo has been significantly applied to intermodal operations. Improvements in intermodal transportation through the application of ICT and ITS have promoted the concept of just-in-time inventory management and delivery. These improvements increase the efficiency of intermodal transport.

ICT effects on the demand for freight transport

ICT will not reduce the need to transport goods. Their dematerialisation and distribution through the internet are transforming the direct delivery of products such as videos and software. However, the net reduction in the volume of freight movement resulting from the dematerialisation and electronic distribution of 'info-products' is likely to be very small exceeded by the additional freight traffic generated by wider sourcing of supplies, reinforced by internet trading.

ICT in Logistics and Supply Chain functions

Information Communication Technology implies a number of technologies, which may, but need not be internet-based, in a setting of logistics. Bowersox et al (2002) distinguished between transaction systems, operational planning systems and control system. These may be computer mediated (extranets and intranets) or based on internet or web technology.

ICT in logistics transaction systems

Electronic Data Interchange (EDI, the electronic transfer of structure data by agreed message standards from one computer application, with a minimum of human intervention, connecting all parties in a logistics function), interactive telephone systems, and e-commerce e.g. Business-to-Business (B2B), e-market places, for the global procurement of inputs; contracting of logistics services, directly by the shipper or by a 3PL or Business-to-Customer (B2C) online sales to consumers.

ICT in Operational Planning System

These include all sorts of logistics decision support and route planning software, e.g Advanced Planning and Scheduling (APS), enabling the design, planning and operation of logistics functions, including performance measurement for all participants in the chain; Enterprises Resource Planning (ERP) systems, enabling the processing, recording and fulfilment of orders, e.g. in warehouses or stores; and Route Planning Software (RPS) designed to avoid congested roads based on digital maps and real-find traffic information (Bowersox et al 2002)

ICT in Logistics Control Systems

These include mobile communication system (phones), enabling easy access of information, tracking-and-tracing systems (Barcode-scanning for packages and palettes), tracking vehicles with Global Positioning System (GPS), measuring vehicle performance with "black boxes" (containing logistics data), and Automatic Equipment Identification (AEI). All these contribute in no small measure in ensuring effective and efficient logistics operation. Order processing, order assignment, distribution operations, inventory management, transportation and shipping, and procurement are important logistics functions where operational information is required. Therefore, effective control system (use of ICT) will ensure timely and accurate information for effective logistics systems design and operation (Bowersox et al, 2002)

Uses of Information Communication Technology (ICT) in Logistics and Supply Chain

ICT in the logistics and supply chain has enabled the gathering, storing, and analysis of unprecedented amounts of data. It equally facilitates planning at all levels through data analysis and sharing, which enable planning to occur at the strategic, tactical, and operational levels. Similarly, ICT gathers, integrates, and analyses logistical data to streamline local and global logistic network functions. Every logistics partner in the chain must be working from the same

data shared in real time through a common hub. Logistics and cost information aspects of each physical materials flow are performed electronically for better reliability and velocity, lower cost, and higher levels customer service. Electronic cash flows such as secure Electronic Fund Transfer (EFT) free up cash faster for reinvestment (Somuyiwa and Adewoye, 2010).

TABLE 1: ICT and application for logistics

FUNCTION	ACTIVITY	ICT TECHNOLOGY
Information and Data Sharing	Access and use of data and information by supply chain partners	- Database - Data warehouse - EDI
Information Transfer	Communication of information between logistics and supply chain partners	- EDI - E-mail - Group ware - Internet/web
Information use for logistics and supply chain planning	Data and e-document processing in decision making and operations planning of logistics and supply chain	- EIA - Advanced AI - CAD - CAE - ERP - MRP - Multimedia

Source: Adapted from Collins (2005) and Somuyiwa (2010)

Framework for analyzing the impact of ICT on Logistics and Supply Chain Management

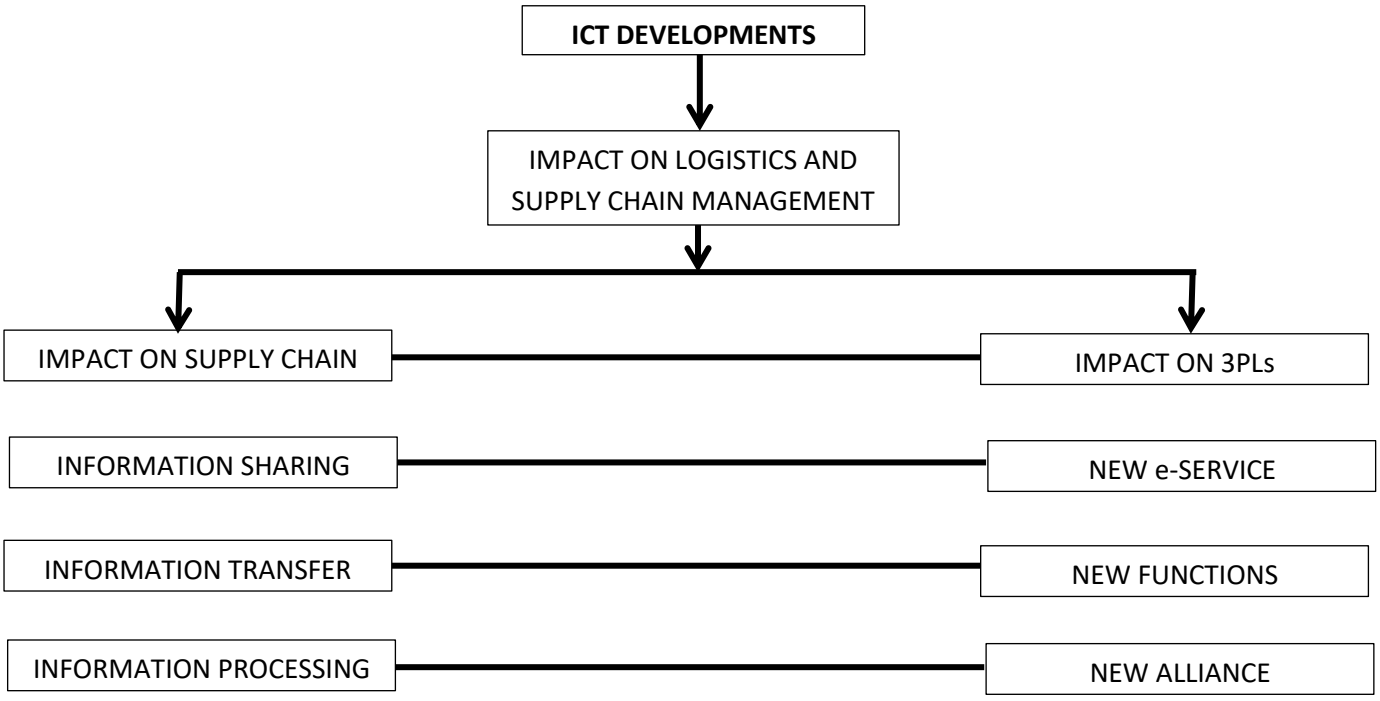


FIG. 1. Source: Adapted from Carlson (2005) and Collins (2005)

Logistics System Stakeholders

Logistics system stakeholders include all parties involved in ensuring effective and efficient logistics operation. They include the shipper(s), logistics service providers (L), consumers of their services (C), and the Government (G) (Yoshimoto and Nemoto, 2005).To enable a closer examination of the role of logistics-related e-commerce, we classify shippers (s) into (manufacturers, wholesalers, and retailers) and logistics service providers (L) into (transport companies, forwarding and warehousing companies). However, both shippers (S) and logistics service providers (L) are grouped as Business (B). Business over the internet includes Business-to-Customer (B2C) transactions as well as Business-to-Business (B2B) transactions. Generally, when people refer to B2B in logistics, they mean S2S. ICT has the greatest impact on logistical efficiency at the point between the logistics service provider and the shipper (L2S) where the shipper purchases logistics services.

In looking at the impact of ICT on logistics, we must specify the relationships between the stakeholders, including governments as well as shippers (S), LSPs (L) and consumers (L) (fig. 2)

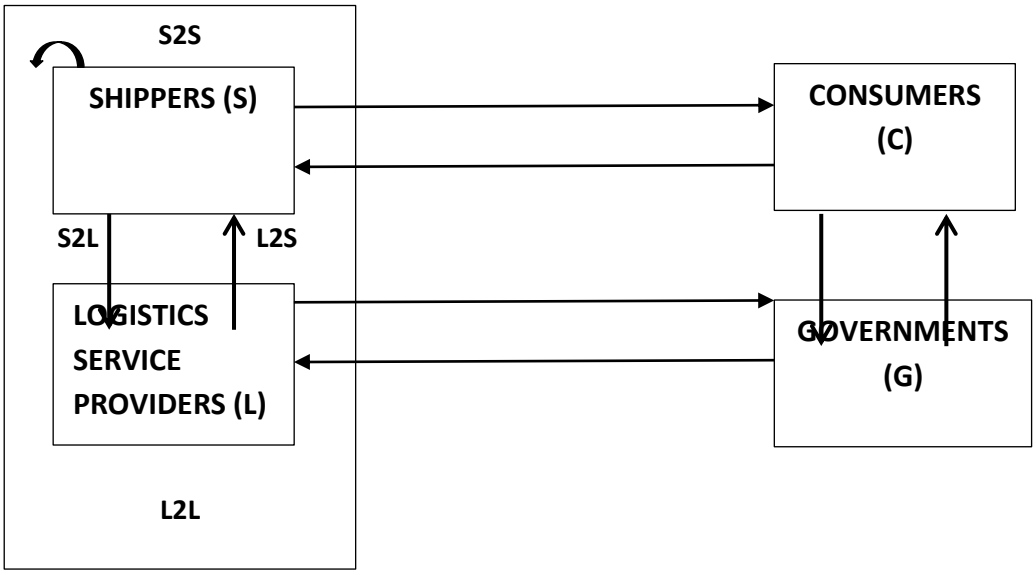


Fig 2.

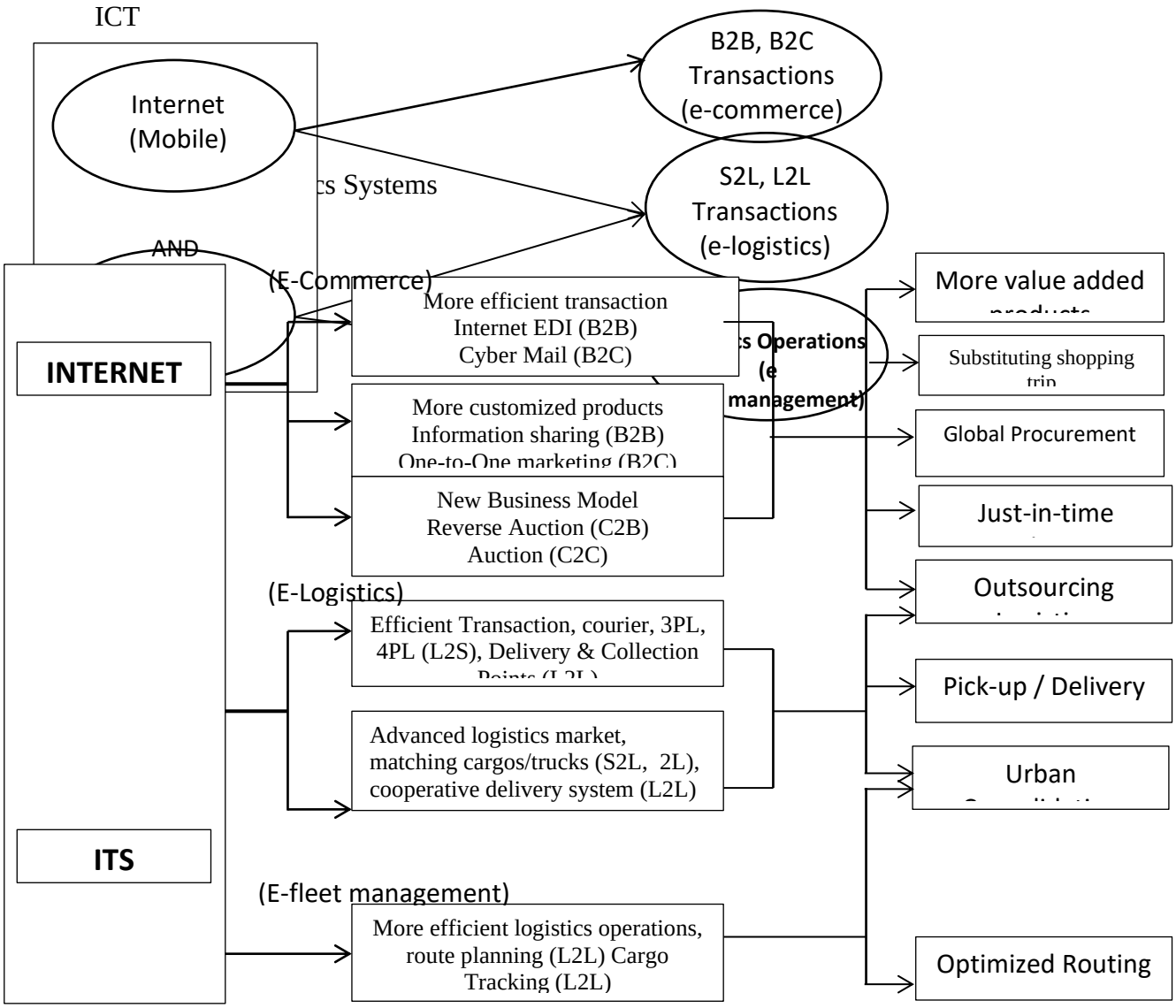
Logistics System Stakeholders

Source: Adapted from Yoshimoto (2005) and Nemoto (2005)

The impact of ICT on Logistics Systems

Information communication technologies, particularly the growth of the internet and ITS, are having a variety of effects in logistics systems such effects can be categorised into three (Fig 3).

1. The internet increases B2B and B2C transactions, leading to greater transportation demand (e-commerce)
2. The internet and ITS create more sophisticated markets for L2L and L2S transactions and promote freight consolidation (e-logistics)
3. ITS promotes optimization of fleet management based on traffic and other real-time information, leading to better transportation efficiency (e-fleet management)



The ability to adopt ICT components by logistics service providers (LSPs) in offering integrated logistics services, indirectly implies a capability to deal with a wider range of logistics functions in the supply chain operations such as procurement, processing/production, transportation, distribution and warehousing operations as well as logistics management information systems. The benefits that are accruable from the application of ICT can be seen in fig (3b) above.

METHODOLOGY

Some sample of logistics service providers (LSPs) for this study was taken from the list of logistics companies within the South-Eastern and South-Western regions of Nigeria. A total of Six (6) logistics companies were visited at the course of the study, thus constituting the participant size for the survey. In this survey, questionnaire survey method was been used to collect data. The full scale survey was conducted with a total of 155 questionnaires given out among the six selected Logistics firms in Nigeria.

Measurement Of Variables /Data

The survey data reported in this project draw on data collected as part of a larger study on logistics continues in the sample regions in Nigeria. The survey questionnaire used, therefore, contains many questions some of which were utilized in the analysis reported in this project and consist of three sections. Section (a) focuses on ICT components adopted for this study, each having items under them.

Section (b) seeks information on the logistics and supply chain capabilities (LSC capabilities) of these companies, focusing on effective Logistics operation. The final section, section (c), solicits data describing respondents' Bio data such as Age, Gender, Education level, length of service, then company's characteristics such as organization type, type of logistic offered. Respondents were asked to rate their agreement or disagreement to a series of single item constructs depicting the status quo of the factor being explored on a 5 point scale, with 1 denoting Strong Disagree, and 5, Strongly Agree.

Table 2 presents the description of the four sets of ICT Components and their items being examined in this study, as well as sets of LSC capabilities examined.

Table 2: VARIABLE DESCRIPTION

VARIABLE NAME	**DESCRIPTION**	**MEASUREMENT**
ICT COMPONENTS VARIABLES		**Perception measured on a 5 point likert scale 1 = SD; 5 = SA**
CONTROL SYSTEMS	Using Mobile phones to Communicate with parties. Tracking-and-tracing systems to avoid theft in transit. Monitoring over-speeding through tracking of vehicles using GPS. Measuring vehicle performance using 'black boxes' (containing Logistics data). Using Automatic Equipment Identification (AEI) systems.	**Perception measured on a 5 point Likert scale: 1=SD;5 = SA**
COMPUTERISED TRANSACTION SYSTEM	Supports the transfer of structured data by agreed message standards from one computer to another. Computerisation ensures minimum human intervention in Logistics operation. It ensures less paper work in the transaction process It supports Just-in-time (JIT) delivery to clients.	**Perception measured on a 5 point Likert scale; 1= SD; 5 = SA**
INTERNET (INTRANET/EXTRANET)	It supports Global e-commerce i.e. B2B, B2C, L2L, L2C. Internet supports e-marketplaces for global procurement of inputs. It aids the contracting of Logistic services directly by Shippers or 3PLs. It supports the use of GPS in monitoring of service delivery and other Logistics operations. It helps in finding backhaul freight for empty trucks.	

IT CONSULTANTS	Consultation is always carried out to bring innovative ideas to stay competitive in business; Partnership with IT firms to train our workers on the new technologies in vogue;	**Perception measured on a 5 point Likert scale: 1=SD; 5 = SA**
ILS CAPABILITY	We are capable of providing integrated logistics services to all our customers using our ICT facilities	**Perception measured on a 5 point Likert scale; 1= SD; 5 = SA**
ICT CAPABILITY	We possess advanced ICT capabilities to enhance the visibility of our customers' supply chains. Adoption of new technologies improves performance.	
FSC CAPABILITY	We are capable of offering flexible supply chain solutions to all out our customers with the aid of ICT facilities	
ISLE CAPABILITY	We have the capability to provide industry specific logistics expertise to customers using ICT Components.	
EFFECTIVE PERFORMANCE	Effective performance of LSPs is measured by organizational adoption of advanced ICT in its operation and training of its employees.	**Perception measured on a 5 point likert scale; 1 = SD; 5 = SA.**

Data Analysis Techniques

In order to test the hypothesis formulated, the data will be analysed by finding and grouping the proportion of each respondents that chose whatever response in the tables. The consensus of option of respondents is then measured by the application of Factor Analysis Techniques. Also, the Regression Analysis model, Correlation Matrix, Categorical Regression (CATREG) were used as data analysis techniques. In this case regression was used to describe how Effective Logistics operations and performance depend on ICT components (ICT Control systems, Computerised transaction systems, Internet, IT Consultants and LSPs capabilities). The resulting regression could be used to predict LSP's performance and effective operation for any combination of the independent variables.

Data Analysis

Regression analysis was used to explore the impact ICT components have on each of the LSC capabilities and effective performance of LSPs. Descriptive statistics was used to project the respondents profile as well as the general patterns of variations in the ICT variables and Effective operation. Then the KMO-Bartlett Test, Factor Analysis, Correlation matrix and Scree plot were all conducted to investigate the impact and relationship between ICT Components and LSPs effective operation in the study. The KMO- Bartlett test was performed with data set to evaluate the pattern of correlation in the data that indicate that 'Factor Analysis' is suitable for the study. The KMO ranges from 0-1 where greater values indicate high level of suitability and value greater than 0.5 is statistically acceptable. For this study the KMO value is 0.698, and Bartlett test is significant (Chi-Square with 190 degree of freedom). Therefore Factor Analysis is considered as an appropriate technique for analysing factor loading. Moreover, the approximate chi-square statistics is 2,032.288 with 190 degree of freedom which

is significant at the 0.05 level. A Factor Analysis of the HRM variables produced a factor that explains 98.7 percent of the variance with high reliability (Cronbach a = 0.734). The need to specifically examine the individual impact of the various ICT Components on LSPs capabilities and performance informed the choice to use all these statistical techniques

RESULTS

TABLE 3: Demographic characteristics of respondents in LSPs (N = 94).

RESPONDENT CHARACTERISTICS	CATEGORY	PERCENTAGE
Gender	Male Female	74.7 25.3
Age	20-27 27-35 36-45 Above 45	16.4 14.6 28.7 40.3
Education	M.Sc. MBA Degree Others	26.3 20.3 42.4 22.0
ICT on-the-job Training	Yes No	77.1 23.9
Organization type (N=6)	Private owned Government owned Joint venture	68.4 32.6 -
Types of logistics offered *	Transportation/haulage Distribution/warehousing Courier service	76.2 23.8 10.0

Note * percentage exceed 100% as firms can offer more than one category of logistics services.

Table 4 presents the Factor Analysis Result. Principal Component Analysis (PCA) reduced the 25 variables into ten (10) main factors which explain about 58.1% of the total variable. Each factor was dominated by at least 1 variable. Factor component 1 (CS_1) has high significant loading which is related to Control Systems. These includes 'monitoring operations using mobile phones' (.923), 'Tracking-and-tracing of vehicles and cargo using GPS' (.917); 'Monitoring Logistics partners in the operation using ICT' (.898), 'We measure vehicle performance using Logistics information provided by the use of ICT' (.892); 'We operate Automatic Equipment Identification component' (.845). Factor component 2 was related to Computerised Logistics Transaction (CT_2). These includes items such as 'transferring of structured data' (.897); 'Computerisation minimises human intervention' (.841) '' (.840); 'less paper work involve with the use of ICT' (.803); 'ICT supports Just-in-Time delivery' (.792). Factor 3 (INT_3) was related to Internet usage and include items such as 'Internet supports e-commerce- L2L, L2C, B2B, B2C' (.866), 'Internet supports contracting directly with shippers or 3PLs' (.821), 'e-marketplace for procurement' (.796); 'online real time monitoring of operations' (.798); 'finding backhaul for empty trucks'(.730). Factor component 4 (IT_4) was related to IT Consultancy 'hiring people with specialized logistics skills (.871), organization

prefers training from within' (.836) 'hire people with IT innovative thinking' (.830), 'we train our employees on the latest ICT in vogue' (.760). Factor component 5 (LSC_5) was related to offering Integrated Logistics services with the help of ICT (.852), 'effective ILS is supported by innovative technologies' (.857). Factor component (LSC_6) related to flexible Logistics and Supply chain using ICT based technologies' (.962); Factor component 7 (LSC_7) related to offering Industry Specific logistics Expertise to our clients with the aid of ICT'(.831), Factor component 8 (LSC_8) 'Effective logistics operation can equally be achieved through outsourcing to experts (3PLs or 4PLs)' (.742). Factor component 9 (LSC_9) relates to training and re-training of employees to remain competitive in the challenging environment' (.510).Scree plot and Principal Component Analysis (Rotated Component Matrix) table 4 below with the analysed values in the table appearing in bold. To test the proposed hypothesis, regression analysis were conducted; it was found that ICT Components have significant impact on the overall effective performance of LSPs. The ICT Components are found to explain about 88.1% of the total variance in the logistics operation, which suggests that they are important factors which impact on firm performance (operation) and LSC capabilities of LSPs. Table 5 reports all the ICT Component variables being statistically significant. Thus, all formulated hypotheses are accepted at the 0.05 level of significance. The ICT Control Systems, Computerised transaction System, Internet, IT Consultancy services, LSC Capabilities are all positively and significantly related to effective operation and equally has a great impact on the Logistics efficient operation and LSP Capabilities.

TABLE 5: Regression Analysis of ICT Components and effective Logistics Operation

INDEPENDENT VARIABLE	**Unstandardized coefficient**		**Standardized Coefficients**		
	B	S.E.	Beta	t	Sig.
Constant	.719	1.335		.539	.592
ICT Control System	.311	.045	.285*	6.898	.000
Computerised Transaction	.416	.043	.359*	9.757	.000
Internet	.356	.031	.437*	11.612	.000
IT Consultancy Partners	.515	.051	.425*	10.028	.000
LSC Capabilities	.347	.041	.359*	8.443	.000
F test 154.685*					
R^2 Adjusted .986 .003					
N = 94					

Note: a. Dependent variable is Effective Logistics Operation,

sig. = significance level. b. *p < 0.05

Table 6 showing Categorical Regression was used to describe how effective Logistics Operation depend on the ICT Components. The resulting regression could be used to predict LSP performance for any combination of the independent variables. The following results were obtained in this instance.

TABLE 6: REGRESSION FOR CATEGORICAL DATA (CATREG)

Coefficients

ICT VARIABLES	Standardized Coefficients				
	Beta	Bootstrap (1000) Estimate of Std. Error	df	F	Sig.
ICT CONTROL SYSTEM	.416	.069	13	36.762	.000
COMPUTERIZED SYSTEM	.446	.059	15	56.160	.000
INTERNET(E-BUSINESS)	.390	.083	20	22.064	.000
IT CONSULTANCY	.408	.085	12	22.989	.000
LSC CAPABILITIES	.358	.064	15	30.814	.000

Dependent Variable: EFFECTIVE LOGISTICS OPERATION

Thus, firm performance (effective Logistics Operation) = .416 * ICT Control system + .446* Computerised transaction + .390* Internet activities+ .408* IT Consultancy services + .358* LSC Capabilities; R^2 = 99.7%

All the ICT Component variables of this predictive model are statistically significant and hence could be used in improving effective Logistics operation and LSC capabilities. It should be noted that all the variables through their standardized coefficients considered in the model will contribute substantially to efficiency in LSPs operation.

Table 4: ROTATED COMPONENT MATRIX[a]

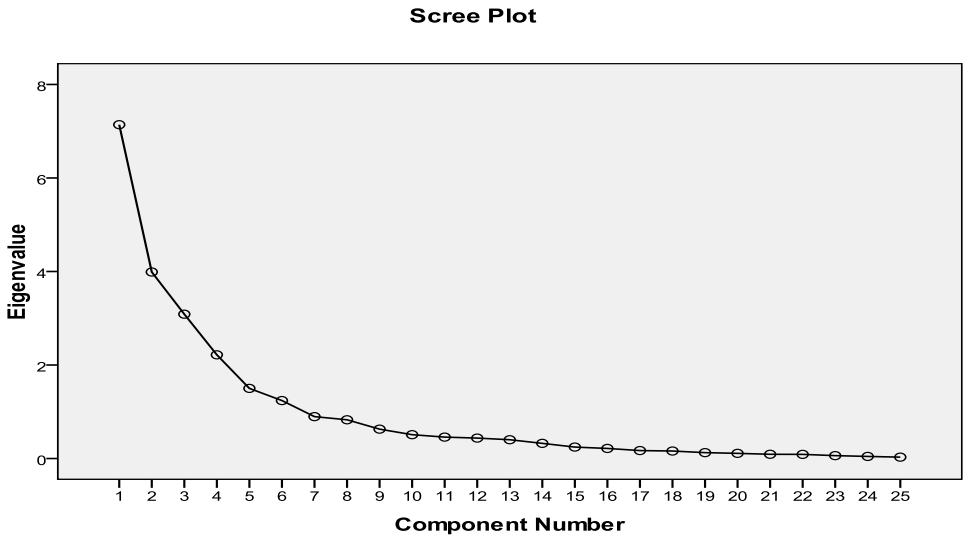


FIG. 4

Discussion on Findings

The field study result reveals that employees receive formal on-the-job training on ICT. Moreover, the majority of the respondents are degree holders followed by M.Sc. holders, other degrees and finally MBA holders. Most of the ICT Components have the high value of Means, approaching the highest possible score of five, suggesting that all variable are perceived by sample respondent employees and managers to have strong influence on effective Logistics Operation. The KMO and Bartlett's Kaiser – Meyer – Olkin test results also supported these findings and all the variables are found to have consistent high level of significance. All factors were found to have significant loadings. For example Factor 1 (CS_1) Control System had significant loadings on the five items. This observation suggests that firms in the LSPs should improve their control system to enhance effective operation. Factor 2 (CT_1) Computerised transaction had a high significant loading to suggest that firms are likely to benefit by providing computerised documentation and transaction, providing continuous ICT training programmes and hiring people with high ICT skills. Factor 3 (INT_1) – Internet had reasonably significant loading on e-market, e-commerce, global positioning system, tracking -and-tracing of vehicles in operation. Thus, management of LSPs is obliged to pay more attention to these factors to ensure Just-in-time delivery and curtail pilfering on transit. Factor 4 (IT) –IT consultancy service, had significant loading on 'hire people with specialized ICT skills', hire people with innovative thinking skills', 'organization prefers training from within to stay competitive'. That the impact of LSP Capabilities is not as high as other components and this could be due to the fact that the existing LSP capabilities are not very effective. This study's empirical results obviously suggest that the ICT Components are to be further improved, and it is particularly noted that the priority should be given to the control system they use, and computerised transaction and lastly using the Internet for effective contracting which received highest significant loading. The regression analysis results demonstrate that ICT components have a strong impact to overall effective LSPs' operations. The hypotheses focus on 'control system', 'computerised transaction', 'internet', 'IT consultancy services' and 'LSP capabilities'. They all have positive impact on firm effective operation as was hypothesized. It was found in this study that Control System in LSPs had a positive impact on LSPs' effective operation with a standardized coefficient of .285* ($P < 0.050$).

The second hypothesis (H_2) posited that effective computerised transaction is positively related with effective operation. The study results substantiate the hypothesis showing that computerised transaction is positively associated with LSPs' effective performance with a coefficient of .359* ($P < 0.05$). Thus LSPs are putting more emphasis on skills and qualified employees, and computerised operations.

The third hypothesis (H_3) stated that internet supports effective firm performance. In this study it was found that effective training and use of internet- based contracting in LSPs had a positive impact in effective operation with a coefficient of .437* ($P<0.05$). This result supports previous studies results (Vlachos 2008) which have found that training and development have relationship with firm performance.

The fourth hypothesis (H_4) IT Consultancy had a positive impact on firm performance with a coefficient of .359* ($P<0.05$).

The fifth hypothesis (H_5) stated that LSP Capabilities would relate to firm's effective performance. In this study it was found that integrated Logistics capability in LSPs had a positive impact on performance, with a coefficient of .425* ($P <0.05$).

All these formulated hypotheses are accepted at the significance level of 0.05. More importantly, all the ICT components are highly and significantly related to firm's effective

performance in operation. Thus, the results of this study have several implications for firms in the LSP category.

Research Findings/ Implications

The findings of this research indicate a number of implications for LSPs and the application of ICT components. Most of the LSPs surveyed are privately owned. In order to better understand and develop more effective logistics operation, there is need for Logistics companies to be incorporate ICT as a system within the companies. The study findings provide some guidance for future direction to all stakeholders in LSPs for their business sustainability in the competitive business environment. One focus should be on individual talents and skills, while the other is characterized by team effort and collaboration ICT experts. Reward management presently practiced by LSPs in Nigeria appears to be concentrated directly towards individuals rather than teams thus, having little impact on team base capabilities. However, offering opportunities for individual career development and professional advancement has also been found to be an effective means to retain employees with ICT skills and reduce turnover (Armstrong 2007). Attention to reward management, performance appraisal, training and development programmes is likely to strengthen LSC capabilities and reduce staff turnover. Lastly, the research study has been limited to 6 LSPs only due to logistics problem on the part of the researcher. Further research should examine similar research objectives for as many LSPs as possible as sampling and sample size. Also, more ICT Components similar to those studied to an extent have to be studied to compare the result and also how the ICT components can help reduce operating cost of Logistics companies.

Conclusion & Recommendations

This study investigated the impact/relationship between ICT components and Logistics firm effective operations. Based on the empirical findings, most of the ICT components, namely ICT control systems, computerised transaction, Internet transaction, ITS, were all found to have a significant and positive impact on Logistics firm performance. This observation implies that firms should be encouraged to invest more in ICT systems improvement to enhance their operations and competitiveness.

The data collected and statistical results suggest that the sample LSPs would benefit by establishing some ICT related orientation programmes for new employees. These introduced programmes would provide continuous training for updating employee skills and knowledge on ICT usage in logistics operation. If these sample LSPs increase their ICT components investment both by off-the-job and on-the-job training, they should be able to improve their operation. Since attention in the global economy is on firm performance improvement, it is important that firms manage their ICT components well to enhance their overall performance for their competitiveness in the global market.

Trends towards globalisation, logistics and the development of ICT, including e-commerce, are combining to reshape the world's trading pattern and consequently physical trade flows. Such restructuring is leading to economic growth and greater freedom of choice for consumer services. ICTs are having enormous impact on logistics operation and increasing sophistication of fleet management globally. Information Communication Technologies for tracing and tracking the movement of freight, data processing for custom formalities and managing systems for determining inventories at warehouse and yards are required for efficient and effective globalised logistics operation. These innovative ICT technologies have played, and will continue to play, a key role in transforming logistics and supply chain planning and operation.

Therefore, ICT will be an important area for the development of policies to support the performance of various logistics networks. It needs to be understood that advanced logistics system, embracing intermodal transport, can be realised through the strategic use of ICT. This will bring just-in-time delivery of global consignments within a very tight timeframe, considering the pattern of distribution.

However, one major problem confronting logistics companies in the uptake of advanced/innovative ICT technologies is the increasing **investment risk**. This is an important development that imposes great uncertainties on the willingness of private companies to invest in ICT, particularly if there is uncertainty surrounding governments' communication policy and spectrum allocation. Hence, policy makers need to keep up with the rapid development of ICT and develop a stable communication framework that is conducive to logistics planning and operation in the country.

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APPENDIX

CATREG - Regression for Categorical Data

Model Summary

Multiple R	R Square	Adjusted R Square	Apparent Prediction Error
.999	.997	.986	.003

Dependent Variable: Effective Logistics Operations

Predictors: Control systems, Computerised transaction, Internet transaction, IT consultancy, LSC capabilities.

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	93.753	75	1.250	91.023	.000
Residual	.247	18	.014		
Total	94.000	93			

Dependent Variable: Effective Logistics Operations

Predictors: Control systems, Computerised transaction, Internet transaction, IT consultancy, LSC capabilities.

Coefficients

FACTORS	Standardized Coefficients		DF	F	Sig.
	Beta	Bootstrap (1000) Estimate of Std. Error			
ICT Control Systems	.416	.069	13	36.762	.000
Computerised Transaction	.446	.059	15	56.160	.000
IT consultancy service	.390	.083	20	22.064	.000
Internet (e-Business)	.408	.085	12	22.989	.000
LSC Capabilities	.358	.064	15	30.814	.000

Dependent Variable: Effective Logistics Operations

APPENDIX 3

Correlations and Tolerance

FACTORS	Correlations			Importance	Tolerance	
	Zero-Order	Partial	Part		After Transformation	Before Transformation
ICT Control systems	.467	.992	.404	.195	.943	.679
Computerised transactions	.596	.993	.431	.266	.935	.856
Internet (e-business)	.459	.990	.363	.179	.866	.819
IT Consultancy service	.455	.991	.377	.186	.857	.646
LSC Capabilities	.485	.989	.339	.174	.895	.643

Dependent Variable: Effective Logistics Operation

Reliability Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	94	100.0
	Excluded[a]	0	.0
	Total	94	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cornbrash's Alpha	N of Items
.734	35