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THE IMPACT OF THE USE OF INFORMATION TECHNOLOGY (IT) IN THE SUPPLY CHAIN ON COST AND QUALITY OF SERVICES PROVIDED TO CUSTOMERS – A CASE STUDY ORANGE LIBERIA.

A Thesis

Submitted in partial fulfilment of the Requirements for the Degree of Executive Master in Business Administration

Adolphus D. Dopoh

ID#: 2018044

Supply Chain Management with Emphasis Procurement

ALEXANDER BENEDICT CUMMINGS SCHOOL OF GRADUATE STUDIES

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I, Adolphus D. Dopoh, hereby declare that this thesis is a result of my own original research and that no part of it has been presented for any degree in this University or any other University elsewhere. I do grant permission to the University to give full access to anyone who may wish to consult this thesis.

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I hereby certify that **Mr. Adolphus D. Dopoh** a registered student of Alexander B. Cummings School of Graduate Studies, African Methodist Episcopal University has completed his Executive Master in Supply Chain Management with emphasis in Procurement and four (4) identical copies of his work have been produced in accordance with the requirements of the University and are acceptable for examination.

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_____   _____

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RECOMMENDATION FOR ORAL EXAMINATION

In partial fulfilment for the degree of Executive Master in Business Administration (Executive Master in Supply Chain Management with concentration in Procurement Management) this Master's Thesis entitled: "The Impact of the Use of Information Technology (IT) In the Supply Chain on Cost and Quality of Services Provided to Customers – A Case Study Orange Liberia." Prepared and submitted by (Mr. Adolphus D. Dopoh) is hereby recommended for Oral Examination.

_____

Program Coordinator

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ORAL EXAMINATION APPROVAL

In partial fulfilment for the degree of Executive Master in Supply Chain Management with concentration in Procurement and based on the recommendation of the Oral Examination Committee, this thesis, presented by (Mr Adolphus D. Dopoh) on June 14, 2021 is hereby:

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ABSTRACT

The study revealed that SMEs have various challenges such as implementation and maintenance cost concerns, lack of technical literacy and skills, unstable electricity, security issues, changing role of employees, etc. in relation to IT's use in managing supply chain operations. From the findings of the study it was discovered that the impact of IT in supply chain management which has been observed in various aspects such as increased transparency of supply operations, efficiency, cost reductions, real time information access, products tracking, communication, coordination, relationship among internal and external supply chain participants. It also has improved the processes of transactions across the various functions and it is integrated in such a way that information flows along the various functions between procurement and planning; logistics and warehouse. The various technologies used have reduced costs of operations in the supply chain and a lot of savings have been achieved. It is also noted that lead time for orders have reduced. There have been improved customer services where both internal and external customers are happy due to quality of service delivery and faster response from the supply chain.

The results from the primary analysis revealed some positive impacts of the use of IT in planning, logistics tracking and product delivery in the supply chain of SMEs. Based on the findings, some recommendations are made that companies especially in the SMEs should implement IT in their supply chain operations to improve efficiencies, effectiveness and flexibility as indicated in the diagrams.

The purpose of this study was to investigate the impact of the use of Information Technology (IT) in the Supply Chain on Cost and Quality of Services provided to Customers – A Case Study Orange Liberia. The methodology for this study followed a mixed method (qualitative and quantitative) study design. The primary data was drawn from qualitative technique, a survey questionnaires method and an interview method from different operating heads in the supply chain departments.

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The secondary research was done through relevant existing literature review to obtain secondary data to develop theoretical understanding of the study topic and objectives. The secondary data obtained have supported the findings of the primary data to a great extent.

The study recommends that companies especially SMEs should implement IT in their supply chain operations to improve efficiencies as indicated in the diagrams, as an impetus to increase their sales and quality of customers' service. The study also recommends organizations are to integrate the supply chain function with the other functions that are involved in its running to enhance the overall effectiveness and also have a competitive edge over competitors through the resultant better prices and products.

In addition, the adoption of technologies that assists in increasing the effectiveness of the supply chain for both the customers and the suppliers. These should be systems that enhance transparency which will in turn improve the goodwill in the organization. Moreover, the study also advised businesses into manufacturing and production to collaborate with technological firms to gain awareness of new IT technologies cost, benefits and training requirements.

Keywords: Supply Chain Management, Information Technology, Customers Satisfaction, Quality of Services, and Cost Reduction.

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DEDICATION

This is a dedication to my lovely wife, the mother of the girls, Mrs. Asatta B. T. Dopoh and to my beautiful daughters, Ida W. Dopoh, Adolphlyn Dopoh, Blessing Bendu-Selbatu Dopoh and Anura Blessed Dopoh. They were a great support throughout the whole EMBA process.

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ABBREVIATIONS

B2B	Business to Business
B2C	Business to Consumer
C2B	Consumer to Business
C2C	Consumer to Consumer
CCTV	Closed Circuit Television
CRM	Customer Relationship Management
EDI	Electronic Data Interchange
FMCG	Fast Moving Consumer Goods
FMS	Flexible Manufacturing Companies
GM	General Manager
GPS	Geographical Positioning System
GPRS	Geographical Positioning Reference System
GRN	Goods Received Note
POS	Point Of Sale
PO	Purchase Order
RBV	Resource Bases View
RFID	Radio-Frequency Identification Device
RFQ	Request For Quotation
SMEs	Small and Medium Enterprises
WMS	Warehouse Management System
E-SCM	Electronic Supply Chain Management
ERP	Enterprise Resource Planning
JIT	Just-In- Time

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CHAPTER I

1.0 Introduction

Supply chain management (SCM) has been noted as an increasingly important management field to help enterprises improve supply chain operations (Markus 2000). According to the Council of Supply Chain Management Professionals (CSCMP, 2013), SCM encompasses the planning and management of all activities involved in the supply, acquisition, conversion, management and logistics, within and between companies, with the function of integrating the main business functions and processes through a cohesive and high-performance business model. These logistics processes include activities such as procurement, warehousing, inventory control, manufacturing, distribution and sales order of a business. It is a whole commercial chain that is embedded in the network with a common goal of efficiency and effectiveness (Hertz 2001).

Furthermore, Ackerman (2003) states that performance measurement is seen as an important management task to achieve objectives. According to Hald (2007), supply chain performance is supposed to evaluate the extent to which supply chain itself is currently delivering customer value and outline how it could be improved. Performance in a supply chain is measured in three dimensions which are efficiency, effectiveness and flexibility (Hald, 2007). Efficiency is a cost related advantage while effectiveness is an advantage of customer responsiveness. In order to provide the best customer service, there consistence high order fill rates, delivery rates should be high and on time and the rate of products being returned by customers should be low (Hugos, 2011).

In addition, Information Technology (IT) is playing critical role in optimizing decisions of the supply chain network flow for achieving organizational competitiveness, improving higher service level, lowering inventory, supply chain costs and reducing electronic risks (Varma & Khan, 2017). Information Technology (IT) is usually one of the best ways to cut costs and also improve the performance of the firm. Most large firms use Information Technology to synchronize processes along their supply chain. These processes include upstream procurement, internal production, downstream sales, customer service as well as information sharing along the supply chain (Da Silveira and Cagliano, 2006). As a result of the competition now between supply chains, Information Technology (IT) links can connect all the processes of a supply chain into an integrated and coordinated system that is fast, responsive flexible and able to produce a high volume of customized products at low costs (Shah, 2009).

1.1 Background of the Study

The growth of internet and the advancements in information technology (IT) overtime has led to efficiency in the provision of real time information, timely access, sharing and exchange of data/information, improvements in coordination and interactions, logistics and other supply chain management (Manochehri, Esmail and Ashrafi, 2012). These advancements have influenced the design and cost of supply chain management, and consequently the relationship among supply chain participants such as suppliers, vendors, employees, customers. The supply chain management plays various roles in different industries. In SMEs supply chain operation starts from ordering a product, which is then transported by a logistics company and then received by the customer which in other words called network of end-to-end (B2B) operations. Accordingly, many have recognized the application of IT technologies in supply chain management. Information Technology field has also contributed in the internationalization of production and distribution networks in various industrial units. As many organizations are participating in more than one supply chain in the dynamic business environment, IT tools have been recognized to lead global supply chains to develop comparative advantage for market competitiveness.

Moreover, IT tools are majorly being used in supply chain areas such as order placement, inventory management, shipment tracking, exchange of information/transactions with vendors, e-payment information exchange with suppliers, mobile connectivity and cloud - based services (De Marchi, Di Maria and Gereffi, 2017). In particular, manufacturers and retailers in many developing nations are using IT tools in supply chain to enhance their operational promptness, efficiency and economic performance. From all the research findings there was a gap in the study in the impact of IT in small-medium enterprises (SMEs) in Liberia. In the Global System for Mobile Communications (GSM) retail sectors, IT investments are growing rapidly to improve efficiency in supply chain and profit margins. The SMEs forms an important retail industry in Liberia.

On the other hand, there also exist inefficiencies in managing multiple supply chains as the business grow and expand and in terms of collaboration and communication with supply chain partners which affects the business performances and profit margins. The effective solution towards this has been recognized with the use of information technologies.

1.2 Statement of the problem

The deployment of IT tools has been more prominent in management of global supply chain in large grocery stores such as supermarkets and hypermarkets to lower operational costs and become value added retail providers. Information Technology has been an influencing factor for automation in supply chain operations. However, the practical use of IT in small and medium Enterprises (SMEs) is at its initial stage (Heeks, Subramanian and Jones, 2015).

Bandeira & Maçada (2008) emphasize that as a result of globalization, companies have started to concern themselves with information technology and the supply chain in order to obtain planned cost reductions. IT now supports the operations of companies, unites distant links of the supply chain and increasingly interconnects companies with its customers (CARR, 2003).

Additionally, Gibson&Novak (2008) have noted that companies today are putting more efforts on Information Technology in order to become more innovative, attain a competitive edge and adapt to the fast and complex environment. The invention of Information Technology in the world has increased the demand of customers.

Undoubtedly, the use of Information Technology in the supply chain has helped many businesses across the globe to reduce transaction costs. However, The SMEs have been slow in the adoption of IT tools in leading and managing supply chain despite the numerous benefits present in the implementation and use of IT.

Additionally, many Small and Medium Enterprises (SMEs) in Liberia are not taking advantage of the use of IT, something which has made them less competitive in terms of their pricing structure, the quality of services they provide and close up their domestic economy to the world.

1.3 Objectives of the Study

1.4.1 General objective

The main / general objective of this research is to promote the adoption and integration of Information Technology (IT) within the Supply Chain of SMEs to reduce their transaction cost and improve the quality of service they provide to their customers.

1.3.2. Specific Objectives

The specific objectives of the study are to achieve the following;

1. To illuminate the benefits of IT in SMEs in term of cost minimization and the quality of service provided to customers.

2. To establish the various IT applications used in the SMEs and how they have direct impact on the organization supply chain to maintain its competitive advantage position.

3. To identify the constraints preventing SMES from adapting the use of IT in their supply Chain.

4. To determine whether the use of IT in the supply chain affects the efficiency and effectiveness of supply chains in terms of cost reduction and the quality of service to customers.

1.4 Research Questions

1. Why it's important to make use of IT within the Supply Chain (SC)?

2. What role does IT play in affecting the costs of SMEs in the supply chain?

3. What are the constraints preventing the adoption and integration of IT within the supply chain of SMEs in Liberia?

4. Does the use of IT affect the performance of a firm's Supply Chain and improves its profitability and quality of service?

1.5 Research Hypotheses

The study was designed to test the following hypotheses:

Ho: There is no significant impact in relation to integrating Information Technology (IT) and Supply Chain Management in cost reduction and quality of services provides to customers.

H1: There is a significant impact in relation to the integration of Information Technology (IT) and supply Chain Management in cost reduction and quality of services delivers to customers.

1.6 Significance of the Study

Small and medium firms that practice supply chain in their daily activities will also benefit from the study. It is noted that most of these firms do not have improved Information Technology systems that help them improve the activities to have competitive edge on their price structure. The study will also benefit the stakeholders/players in the supply chain. This is because they will be able to appreciate the value that Information Technology has on the Supply Chain and how they can improve their services in the supply chain in order to attain a competitive edge. It will also be beneficial to retail supermarkets   as it will assist them in giving more attention to information technology on their supply chain so as to improve efficiency and effectiveness in their operations.

Additionally, academicians will also benefit from the study. They need to put more emphasis on the importance of Information Technology in the supply chain field. Organizations are gearing towards green supply chain where they are reducing waste generated by the supply chain. They need to gain enlightenment on how IT can reduce paperwork and encourage paperless transactions (automation). Previous studies have shown that information technology is being used by firms for integrated supply chain management. This integration leads to better efficiency and effectiveness (Lan &Unhelkar, 2008)

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1.7 Delimitation

Initially, this study will confine itself to interviewing, review of empirical literature specific to the topic the impact of IT in the supply chain on cost and quality of service to customers and observing the SMEs Supply Chain Management. Moreover, the study used to collect opinions from Top Managers, Seniors Managers, Junior Managers, Directors, Supervisors and Staffs who are directly involve with the Supply Chain about a research project being considered with the main / general objective of promoting the adoption and integration of Information Technology (IT) within the Supply Chain of Small and Medium Enterprises (SMEs) to reduce their transaction cost and improves the quality of service they provide to their customers.

1.8 Limitation

The researcher was not able to get 100% response from the various respondents, mostly due to the tight schedules they were working under. This limited the time they had to respond to the questions they were asked.

Most of the respondents were a bit conservative with information. They for feared that the information might be shared with competitors. This decreased the accuracy of the data collected.

Delay resulting from postponement of most set appointments with the respondents. This meant that the researcher had to visit the premises more times than planned and also had to make changes on their schedule.

Biasness from the respondents since the researcher is an employee of one of their competitors of the organization that was being studied.

The increased visits to the organization and also the process of recording the responses collected, was costly to the researcher. The services involved in the analysis of the responses gathered were also an additional cost.

1.10 Justification of the Study

The study into the area of the integrating the use of Information Technology (IT) in the supply chain on cost reduction and quality of service (QoS) delivers customers of small and medium enterprises in Liberia, its influence to service delivery in the supply chain is relevant for several reasons. First, it is going to help the SMEs to be efficient and effective integrating IT in their supply chain as a policy, practices & control measures for the cost and quality of service delivery. Thus, the study will bring out how the SMEs will manage its IT integration so as to be responsive and at the same time efficient in its downstream activities thereby increasing the value chain of the supply chain to have competitive advantages of others.

Second, the study will also be beneficial to the general public and the academicians because it will come up with appropriate suggestions and recommendations on how timely and in the right quantities delivery is done due to the integration of Information Technology in the supply chain.

Third, this research is very significant to promote the price structuring of SMEs in this digitalization age which will enhance efficiency and effectiveness in the supply chain. The economy of the country also stands to benefit from the research in this area since it is going to help more Liberian owned business to migrate from paper based supply chain to use of automation on the supply chain to improve in their inventory control system to Just-in- Time (JIT). Fourth, the benefit of sharing information among researchers is another reason for the study. Thus, the information provided in the study will be useful to researchers who might want to undertake further research into the area of the Impact of Information Technology in the supply chain on cost and quality of services provided to customers. This study is undertaken to enhance the frontiers of knowledge by adding up to local literature on impact of IT in supply chain management practices in SMEs (private sector) and its influence on the service that is delivered to downstream.

1.11 Definition of Operational Terms

❖ **Supply Chain Performance measure** – is an approach to judge or evaluate the extent to which supply chain itself is currently delivering customer value and outline how it could be improved (Hald, 2007).

❖ **Efficiency /quantitative measures**- is a cost related advantage (order-to-delivery lead time, supply chain response time, flexibility, resource utilization, delivery performance, Just- in-Time, etc) (Melanie 2019).

❖ **Effectiveness / qualitative measures**– is an advantage of customer responsiveness (customer satisfaction and product quality) (Melanie 2019).

❖ **Supply Chain Management** – is the management of flow of products, services, information and finances from supplier's suppliers through intermediate organizations out to the customer's customers (Gibson and Novack,, 2008)

❖ **Information Technology (IT)** – is the creation of computer systems and applications, especially those that move data around a computer network, between clients and servers, or over the internet (Shah, 2009).

❖ **Competitive Advantage** – something that places a company or a business above the competition.(Millar 2016)

❖ **Supply Chain Integration** – is defined as a close calibration and collaboration within a supply chain, mostly with the application of shared management information systems.(Millar 2016)

❖ **Just-In- Time_** it is a production and inventory control system in which materials are purchased and units are produced only as needed to meet actual customer demand (Hutchins 1999).

❖ **Service delivery_** is an arrangement made by an institution or entity to periodically supply a customer's needs. This means that service delivery is a deliberate obligation

decision by an institution's management to deliver or serve goods and services to the beneficiary.

❖ **Cycle Time –** is often called the lead time. It can be simply defined as the end-to-end delay in a business process.

❖ **Order-to-Delivery lead time** – is defined as the time of delay in the middle of the placement of order by a customer and the delivery of products to the customer.

❖ **Supply chain process lead time**- is defined as the time taken by the supply chain to transform the raw materials into final products along with the time required to reach the products to the customer's destination address.

❖ **Data warehouse** – is defined as a store comprising all the databases. It is a centralized databased that is prolonged independently from the production system database of a company.

❖ **Enterprise Resource Planning (ERP)**- A set of packaged business application software modules, with an integrated architecture and infrastructure that can be used by organizations as their primary engine for integrating data, processes and information technology, in real time, across internal and external value chains (Marnewick et al, 2005)

❖ **Electronic Supply Chain Management (E-SCM) –** the integration of technology to speed the flow of information through the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities.

1.12   Theoretical Framework

According to Global Supply Chain Forum (GSCF,2020), SCM means the integration of key business processes from the point of consumption until the point of origin, processes that are derived from products, services and information that add value for consumers and other stakeholders. According to Ballou (2004), the target of SCM is to develop processes that will lead the organization to achieve its overall results through the development of activities that result in the maximum possible return in the shortest period. In practice, the integration of multiple organizations can become a complex process that is difficult to manage. To support this process, IT can provide a number of tools to facilitate, streamline and increase the reliability of communications and the exchange of information between organizations.

This study employs the main concepts and characteristics of two business models applied to SCM. One developed by the Global Supply Chain Forum GSCF, and the other called Supply Chain Operations Reference-Model (SCOR). These models are used in this study to identify the processes that benefit most from the adoption of technologies in the SCM macro process.

1.13 Organization of the Study

 This study is in five Chapters. The first chapter covers the introduction of the study, problem statement, Background study, objectives and research questions as well as the significant, delimitation, limitations and theoretical framework. Chapter 2 covers the review of relevant existing literature on the subject being investigated. Chapter three dealt with the methodology employed in the study. It involved the outlining of the research design chosen, the population and the sample for the study. Chapter four present the empirical study of data analysis, findings and discussion of study. Chapter 5 summarizes the findings of the study and offers a conclusion, recommendation to the thesis.

CHAPTER II: REVIEW OF RELEVANT EXISTING LITERATURE

2.1 Theoretical concepts

2.1.1 Supply Chain management (SCM)

According to Blanchard (2010) defines supply chain management as streamlining the processes towards flow of goods from its conversion from raw material into final products. Organization's which provide products to end users represent the cumulative effort due to which these organizations are referred to as the supply chain and when the supply chain exists for a long period, most organizations only pay attention to what happens within their organizations. There are other areas such as logistics, procurement, information technology as well as inventory that are considered under the supply chain management. In the views of Wilhelm, Blome, Bhakoo and Paulraj (2016) supply chain management is a concept that is applied within the organization to manage the flow of goods and services, which includes the storage of raw materials and of work-in-progress inventory. At the same time, Wong and Boon (2015) opine that supply chain management is the essential part for every organization whether it is small or large. It is the dynamic management of the activities of the supply chain to increase the customer values and to achieve maintainable competitive advantages. Supply chain management signifies a conscious attempt through supply chain organizations for developing and running supply chain with the most effectual ways probable. In addition, Genovese, Acquaye, Figueroa and Koh (2017) mention that there are various activities of the supply chain from product development, logistics, sourcing, production as well as an information system that is required to organize these activities. Similarly, according to Bayraktar, Demirbag, Koh, Tatoglu and Zaim (2009), SCM is the management of activities directed by information system from sourcing to production to product development to distribution to maximize customer value. The authors also mention that supply chain management engages resources, information, processes, technology, and planning together to manufacture, store and distribute finished goods to the customers. In the words of Carter, Rogers and Choi (2015), supply chain management is defined as the design, execution, control, monitoring, and planning of supply chain processes with the intention of creating new values, building a competitive infrastructure, synchronizing supply along with demand and evaluating performance internationally.

According to Crandall and Chen (2014), the management of supply chain focuses on the integration of information system with supply chain participants' network such as organizational members, suppliers, retailers, vendors, and distribution centers. This integration is to help achieve efficiency by lowering cost and increasing profits.

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It is important to note that SCM integrates operations, production, logistics, transportation, and shipments with coordination and communication management.

2.1.2 Information Technologies (IT)

According to Majchrzak, Markus and Wareham (2016), information technology is a crucial part of the organization required for its development. IT have become more pertinent for every organization to actualize its plan. Bloom, Garicano, Sadun and Van Reenen, (2014) define IT as technologies that focus on communication and technologies that offer access to information. IT is used in the organization to perform several tasks related to planning, the process of transactions and decision making. In respect to the works of Dwivedi, Shareef, Simintiras and Weerakkody (2016), it can also be explained that Information technology is defined as the components and infrastructure which is essential to allow modern computing. IT also permit's the people as well as organizations to interact with the digital world. According to Donnellan, Sheridan and Curry (2011), IT is defined as an extension in the field of information technology which make use of telecommunications. In recent years, information technology has become an interchangeable name with ICT (Bloom et al., 2014). Kushwaha (2011) describes IT as an information system tool necessary for the coordination and collaboration between organizations and markets to form a buyer-seller relationship.

Furthermore, IT is based on the use of internet, computer networks, mobile phones, as well as wireless network for information exchange, sharing and accessing timely information to enhance performance. The authors also mention that IT involves hardware, software, IT services, networking and communication to form a junction for diverse technologies to provide information access in real time. From the above views, it can be said that IT focuses on communication technologies and applications to offer informational access and exchange in digital form for internal and external contact. In IT, the internet-enabled sphere and the mobile powered by wireless networks are also included.

The antiquated technologies such as landlines telephones, televisions broadcast, and radio are also included in it. In the other words of Hilty and Aebischer (2015), it is explained that the above-mentioned technologies are still broadly used beside cutting-edge IT pieces, for example, robotic and artificial intelligence. In addition, IT also refers to the extremely famous and speedily developing area of information and communication technology and it can also be determined that IT is relatively comprehensive and includes a broad range of products and services in it. The key tasks of IT are discussed and mentioned by the authors Ilomäki, Paavola, Lakkala and Kantosalo (2016) that it provides its products and services to its users with the functionalities which require these products and services for the help of their corporate procedures.

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So, it can be examined that information systems are usually the shipper of functionalities. Thus, from the above perspective, the users of functionality are not only the corporate entities, clients, partner, company employees and other parties, but they are also some other system. The progress in the IT field has also contributed to efficiency and profits in service sectors in logistics, transport and retailing sectors. The increasing market competition in order to achieve competitive edge over rivals has stressed the need as well as use of IT solutions in SCM to deal with time issue, communication breakdown, real time information needs and fast customer delivery (Kushwaha, 2011).

2.1.3 Small and medium Enterprises (SMEs)

In the opinion of Weeratunge, Bene, Siriwardane and Charles (2014) it is stated that generally, the small-medium scale occupy the significant place in every country's economy due to their service potentials and their input to all over industrial productivity as well as exports. In this regard, the government of every country takes adequate measures to ensure they are successful. Even then, the internal, as well as external competitions are faced by the small scale and medium industries. In the views of Sannino and Engeström (2017), no clear difference is found between small-scale and medium industries. Although it was discovered that the small scale industry operates completely through the members of the family and in against to this, medium-scale industry hires workers as well as laborer's. According to Singh, Garg and Deshmukh (2010), the medium-scale are distinguished based on their sizes. The medium represent medium business format of industrial units. The study of Harris, Riley and Hand (2017) mention small scale format in retail grocery unit as convenience store/shop, delicatessen store, greengrocer shop, health food store and local general store. The study of Singh et al., (2010) also mention small scale characterized by the requirement of less capital in their set up in comparison to large scale industrial units. The authors also state that small scale sectors are easily established by the young entrepreneurs. From the above views, it can be said that small scale sectors represent small sized business with less capital requirement for their establishment and imply ease of initiating small scale unit by new generation individual entrepreneurs. In relation to the significance of the small-scale sector, Rao (2015) points that the small-scale sectors contribute to the exports of a country.

However, Sahu (2017) state that the small-scale sector in the developing countries contributes to economic development at the local and regional level. Rao (2015) discusses that many developing economies do have capital infrastructure and other resources to set up large scale industries for a strong industrial base. This indicates that dependence on small scale sector is high for social and economic progress in the developing countries. Singh et al., (2010)

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viewed that manpower is better utilized for the economy development in small scale sector. On the other side, Sahu (2017) argues that development of small scale sector in developing countries has been advantageous in dealing with poverty, local development and inequality issue at the regional level. It is also stated by Harris, Riley and Hand (2017) that small scale sector sustains better employer- employee relationship thus, have healthier industrial relations. Differently, Alam and Noor (2009) point to the problems in the small-scale sector for the progressive state which stress on the need for development of strong physical and technical infrastructure for transportation and new technologies respectively to fulfill the requirements of the small-scale sector.

2.2 Use of IT tools in the SMEs

IT tools provide promising opportunities in small- medium scale business sector to explore its benefits. According to Ahuja, Yang and Shankar (2009), the use of IT in under developing nations like Liberia is surrounded by several issues which have affected its progress rate of new technologies in small-medium scale sector. In order to survive in the current highly competitive marketplace each and every business company has to be more innovative and find new ways to streamline their supply chain and optimize productivity. With the use of modern technology all the firms can have a better control over their supply chain, which will help them stay ahead of the competition in the business. Technology can also help to simplify supply chain management, which will enable businesses to operate more efficiently, give business more visibility and control over their inventory, and help to reduce their operational costs. Additionally, through a more stable and efficient supply chain, firms can greatly enhance customer satisfaction and retention.

Oyebiyi, Misra, Maskeliunas and Damasevicius (2017) categorized challenges in terms of internal and external. The internal barriers are related to implementation and maintenance cost, return on investment, limited capital and other resources, electricity, lack of IT literacy whereas the external barrier to IT use are political, economic, socio-cultural, technological and regulatory issues. In the retail industry, Behera, Panda, Behera, Nayak and Jena (2015) discuss that the use of IT helps to achieve effectiveness and efficiency in the logistics and distribution area of supply chain management. The application of radio frequency identification (RFID) technology is used in retail sector in both organized and unorganized retail sector which comprises of medium and small businesses. Radio Frequency Identification (RFID) is a vital piece of technology that can provide innumerable benefits to the business owner. According to Ahuja et al., (2009) RFID chips or tags are placed on every product and provide a way for business owners to easily track their inventory. Due to the increased visibility RFID chips or tags provide, they substantially improve supply chain

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efficiency by detecting any order anomalies as they occur, enabling employees to immediately correct mistakes. In addition, it allows for easier and more consistent tracking, enabling business owners to have maximum control and visibility over their products at all times. Since RFID chips provide computerized product management, they can eliminate the potential for errors, simplify the supply chain, and reduce operating costs. The study of Irefin, Abdul and Tijani (2012) mention the various types of IT tools used by small and medium business such as e-mail, web portals, video conferencing and social media.

With all the new modern technologies and Internet-based software, businesses can simplify the supply chain process and eventually reduce shipping mistakes. Software's like FlashView enables some intelligent business owners to consolidate all aspects of their supply chain in one place. The software allows firms to digitally organize inventory data, monitor and manage shipping and tracking information, and create electronic invoices with ease.

Through the use of supply chain management technologies, businesses can greatly reduce the time spent shipping, receiving, tracking, and compiling order data, which will save the company both time and money (Nuamah-Gyambrah, Agyeiwaa and Offie, 2016). Not only will FlashView improve the operational efficiency of supply chain, it will also greatly enhance the customer experience by providing consumers with the ability to continuously track the status of their orders. Through digitalized tracking, businesses can significantly reduce shipping errors and more rapidly respond to the errors that do occur. Currently, having technologies like FlashView are essential to running a thriving corporation that is both business and consumer-friendly (Eze, Ayigbe, Eberechi and Jordan, 2015). According to Rufai (2014), social media sites are also another popular technology that has swept the world. With over 288 million Twitter users and 1.23 billion Facebook users, it's no wonder many businesses are turning to social media to gain visibility for their company. In fact, over 70 percent of all Fortune 500 companies rely on social media as part of their marketing strategy and supply chain management. Through the use of social media, firms can create more open communication with customers, increase the visibility of your company, improve the demand on their products, utilize cost-effective and time-efficient marketing strategies, lower their operational costs, and enhance the company's overall productivity (Rufai, 2014). Social media can be used to interact with customers, respond to questions, report accidents or weather conditions that may impede delivery schedules, and create automated updates about the inventory. Also with the use of WMS carry out functions such as planning commands and running day to day operations of a warehouse. This system covers areas such as receipt of goods, allocation of storage locations, and inventory replenishment of picking locations, generation of picking lists, order picking and issue of goods. These systems also keep track of

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inventory in warehouses (Graham et.al, 2013). It greatly reduced logistics and inventory cost and improving the profitability of the organizations with control.

2.3 Factors influencing IT use in small-medium Enterprises in relation to retail industry

The study of authors Tan et al., (2012) points out the use of IT in mobile technologies in the area of logistics and transportation by the retailers owing to the need for real time shipment tracking and for the monitoring of delivery systems. However, according to Behera et al., (2015), many retailers incorporate new IT technologies to maintain market competitiveness. The author also states that in incorporation, the cost of new technology implementation and risk in transition from old to new technology are the factors influencing the use of IT in small scale businesses. Hashim (2007) put forward that the fast rate of technological development in IT solutions influences the use of IT tools as it creates an unbalance between the cost of implementation and benefits from new technology for small scale business. Alternatively, Apulu, Latham and Moreton (2011) point that IT solutions are also influenced by the concern for security, privacy and low confidence in IT solutions for small scale businesses owing to low ICT literacy and due to unstable electricity. The Retailers are beginning to notice that technology's role is one of the enablers in a fast-developing supply chain sector. Essentially, IT can speed up processes and deliver cost saving benefits to the company. The retail industry faces many specific challenges related to IT management. Many retailers struggle with information overload because they're required to collect and sift through mass amounts of customer data, and then convert it into useful information in a customer-centric industry.

On the other hand, Olatunji (2015) depicts that retailers must increase transparency between systems, as well as obtain better tracking to integrate systems from manufacturer through to the consumer while obtaining customer and sales information. Ongori (2009) depicts that due to radio frequency identification/electronic product coding; the entire supply chain has become more intelligent. Retailers must enable the use of real-time data to watch inventory levels.

In addition, radio frequency identification tagging positions the company to be able to safeguard its shipments by allowing products to be tracked from manufacturer through the entire supply chain. At the same time, PCI Security Compliance addresses the retailer's internal security setup and practices, in order to mitigate payment security risks. Every business engaged in credit card payment processing is required to comply with PCI Security Standards. If a retailer collects or stores credit card information that becomes compromised, the retailer may lose the ability to accept credit card payments.

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Other possible consequences include lawsuits, insurance claims, cancelled accounts, and government fines. The retailers who take advantage of outsourcing IT will obtain optimal advice and benefit from outsourcing (Ongori, 2009). Many retailers have turned towards IT outsourcing as a way to control costs and improve their service in delivery.

2.4 Role of IT solutions in supply chain management in the SMEs sector

The study of Christopher (2016), highlight the role of information technologies in the supply chain to enhance the relationship between supplies, retailers and the firm. It can be stated that IT role has transformed the traditional supply chain in its ability to share data, exchange information, process information at real time to improve communication among external supply chain participants and organizational members. Similarly, Wang, Rodrigues and Evans (2015) are of the view that IT plays a major role in enhancing retail organization capabilities in terms of obtaining, processing and exchanging transactional information which has led to improved cooperation, coordination and communication in leading the supply chain business operations from supplier to manufacturing units to distribution centers to wholesalers/retailers to customers. Mangiaracina, Melacini and Perego, (2012) investigated the role of IT in small medium enterprises in retail store. The authors discovered that IT has been a driving force in the integration of supply chain to create new opportunities to improve the relationships with suppliers and customers. As stated by Christopher (2016), IT tools help to improve the efficiency and effectiveness of supply chain by means of customization and its adaptation in the business environment. It can be said that customization helps in integration of planning activities across the operations of the supply chain management. On the other hand, the findings of Wang et al., (2015) highlight that IT solutions provide an opportunity in road freight transport by reducing carbon emissions in the grocery retail industry in the United Kingdom.

According to Tan et al., (2012) IT on Supply chain management is a concept involves sharing of information between stakeholders of the retail industry chain i.e. retailer, manufacturer and distributor in order to achieve high efficiencies and also reducing the cost of the products sold by reducing lead times and inventory cost, as well as improving the quality of products to be delivered. Over the years, there has been rapid development in the use of Information technology in logistics and SCM.

IT today is being applied in many organizations over a wide range of operational areas. It has provided new ways to store, process, distribute and exchange information both within companies and with customers and suppliers in the supply chain.

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Researchers have also suggested that the adoption of IT is spreading rapidly in Supply chain management (Tan et al., 2012). As competition is increasing, all the companies are implementing new strategies to improve their supply chain efficiency through increased integration, where IT can be considered as a key enabler for supply chain management by supporting information sharing and overcoming operational inefficiencies raised due to various reasons. Research work that deals with recognizing Information Technology as an enabler in supply chain management, which emphasizes information sharing and reducing inconsistencies and uncertainties as exemplified in the Bullwhip effect. This implies further focus on information sharing on the basis of which supply chain automation can be achieved. For example, the research, which describes the vendormanaged inventory (VMI) and the collaborative planning, forecasting and replenishment (CPFR) as initiatives that require automation in both the transportation of physical materials and the exchange of information between companies, is used to improve the efficiency in the supply chain operations of the company (Singh et al., 2010).

The bullwhip effect phenomenon has been observed in different industries and occurs whenever demand uncertainties and variability become magnified when viewed by managers at each link in the supply chain. It is one of the most important causes of inefficiency in a supply chain. The impact of the technology in SCM reduces the bullwhip effect which removes supply chain inefficiencies and ultimately reduces cost, lead-time and maintains quality. The major uncertainties in Supply Chain Management can be overcome by specifically tailored systems of information sharing and implementation of ICT infrastructure (Llach and Alonso- Almeida, 2015). Information sharing in the supply chain management among the stakeholders has become the desired aspect of managing a supply chain of a superstore while electronic means of sharing information is the key component to sustain the competitive advantage in the industry (Rao, 2015). In other words, information sharing and the way it is managed has now become the most important factor in sustaining competitive advantage. The focus is towards planning and strategically implementing the process with the help of technology to achieve the desired results in a strategic relationship. The partners in the supply chain of the superstores i.e. retailers, manufacturers and distributors have entered a promising and challenging period in their relationships as they realize the importance of working closely together to achieve improved operational efficiencies and service standards (Oyebiyi et al., 2017). Some studies, while establishing the importance of IT, have laid emphasis upon the requirement of integration of IT into an organization's culture and the reorganization of work for an effective competitive advantage strategy.

Current literature describes the effects of IT as improvements in areas of supply chain with reduced production instability, optimum inventory levels, less expensive logistics and streamlined procurement systems (Majchrzak et al., 2016). Thus, various studies recognize that the implementation of IT in SCM has an impact on the **price, quality** and **lead time**. Most successful businesses have now reorganized themselves to take advantage of information technology and are re-establishing the way work is done in their organizations resulting in consumer benefits and enabling them to select from a wide range of high quality products at lower prices. While SCM is as old as trade itself, new information technologies have made today's supply chains better, faster and cheaper. Information engineering that combines new information technologies with improved production, inventory, distribution and procurement methods has revolutionized supply chain operations (Mangiaracina et al., 2012).

2.5 Benefits of Integrating IT in Supply Chain Management of SMEs

There are several benefits of IT tools use in the SCM in retailing. De Marchi et al., (2017) state that IT solutions help to improve the efficiency level in the supply chain process. The authors also state that IT transforms into modern the traditional supply chain management which is flexible and offer reliable information exchange and sharing at real time. It can be said that the use of cloud computing technologies, mobile and wireless technologies in retail sector has brought improvements in precision, efficiency and transparency in business operations in supply chain management. In SME retail stores, Mangiaracina et al., (2012) identified the benefit of IT solution in terms of improvement in supply chain control, reduced logistics costs, reduced lead time (LT) and increased customer loyalty owing to long-term relationship and trust development.

In the findings of Lu and Swatman (2009), IT solutions have benefitted the SMEs retail sector in Australia in terms of better data collection functionalities, integration of supply chain planning with producers, and improved information access through use of mobile technologies. The use of IT in grocery stores, shops, supermarkets has become integral in recent years owing to the benefits provided by IT is different areas like handling store operations, inventory and stock management, marketing, etc. The study of Nurmi, Salovaara, Forsblom, Bohnert and Floreen (2014) found that IT benefits in gaining promotional edge over traditional and non-computerized form of promotion. The benefit of IT in small-medium sector as pointed in study of Donner and Escobari (2010) state that use of emails has benefited the retailers in fast communication to suppliers in cost effective manner. Sin Tan, Choy Chong, Lin and Cyril Eze (2010) state that online promotion provides a cost-effective

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benefit to retailers in reaching their target customer and interact more effectively use of mobile phones apps. On the other hand, the study of Nurmi et al., (2014) revealed that the benefit of using ICT in SMEs business facilitates better decision making. IT tools capture, process and share real time information which help the retailer to make quick and effective decisions to manage day to day business operations according to Novotny, David and Csafor (2015). At the same time, Sin Tan et al., (2010) remind that IT tools help in identification of potential opportunities as well as threats for business so that retailer could respond early to take decisions or actions.

The study of Kurnia, Choudrie, Mahbubur, Alzougool (2015) found that IT has benefited the business by automation of different business process which has reduced errors and enhanced the productivity. The author also states that the use of email, video conferencing and mobile communication has provided advantage of greater collaboration among the employees, suppliers and business partners. Increased collaboration has led to create stronger teamwork, reduce lead time and faster pace of new products to market. This can be useful to develop competitive edge in the marketplace. The opportunity of using IT can be to increase the competitiveness of small-medium sector.

Apart from this, Nurmi et al., (2014) discuss that IT has benefit the SME sector in improving their customer service quality as use of IT solution allow the retailer to provide fast responses to customer inquiries, feedback and complaints to ensure their satisfaction. IT also allow to obtain customer information, purchase history and preferences which helps to provide high customer service. It can be said that increased knowledge about customer helps the retailer to use that information to leverage the opportunities to sell additional products. Another opportunity of using IT is to meet the informational needs of the organization to increase the efficiency and effectiveness of organizational learning as stated by Lopez-Nicolas, and Soto-Acosta (2010).

On the other side, the benefit of IT as recognized by the study of Kurnia et al., (2015) point that IT tools and solutions help in reducing the cost and increasing revenue by improving efficiency of work process, improving productivity and reducing errors. It can be said that benefit of IT is to improve the financial performance of the firms in the SMEs.

According to Alexandre Pinheiro de Barrosa et al (2015), propose a new conceptual model for the evaluation of the benefits or impacts of the adoption of IT in SCM, which is comprised of the following dimensions represented by the diagram shown in Figure 1:

    i. **Cost reduction**/ **cost-efficiency** by monitoring the ratio of the output produced to the **costs** incurred.

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chain process efficiency in supply chain management. Differently, from the finding of Hudnurkar, Jakhar and Rathod (2014) it can be stated that selection or choice of IT tool should be done in accordance with the position of small business in the supply chain for efficiency and cost effectiveness in supply operations.

Apart from this, the study of Arora et al. (2018), mention the collaboration among the technological firms and retail firms to develop IT solution for supply chain management as per the business requirement to promote use of IT in tremendous market potential like Monrovia capitol of Liberia. Similarly, Deman and Tuyishime (2009) state that poor physical infrastructure affects the use of IT tools in supply chain management practices which need to be developed to promote IT use in small scale retail sector in emerging market of Liberia. The authors also point out to the knowledge and skill development for effective use of IT in Liberian retail industry.

2.7 Theories Guiding the Literature View

2.7.1 Theory of Competitive Advantage

This theory argues that in today's complex connected world, supply chain is more and more recognised as a key source of competitive advantage and differentiation. Companies strive to build powerful supply chains that will enable them to get their products to market faster, more efficiently and more economically than their competition (Millar 2017). For many businesses – particularly those in high tech, consumer electronics, pharmaceutical and fresh produce - time to market and effective distribution channels are critical success factors, and therefore supply chain management competencies and capabilities are what drive competitive advantage. Taking the broadest perspective, these functions together embrace all of the mission-critical business activities of a company - with IT, HR and Finance playing important supporting roles.

With marketing comprising the four P's of Product, Price, Promotion and Place and supply chain encompassing the five operational activities of Plan, Source, Make, Deliver and Return, then Logistics becomes the point of intersection and convergence – the essential linkage between the Deliver function of supply chain and the Place (distribution) function of marketing.

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2.7.2 Virtual Integration Theory of Improved Supply-Chain Performance

Virtual integration theory allows a firm to substitute ownership with partnership by integrating a set of suppliers through IT for tighter collaborative operation execution and process planning and control [Wang, Tai, and Wei 2006]. Vertical integration has been proposed as a useful governance structure for countering environmental uncertainty through reduced price uncertainty and lower transaction costs, but it also can result in low flexibility and incur additional administrative and production costs associated with required adaptability [Wei 2017]. In contrast, market transactions and outsourcing have also been recognized as an alternative for firms to achieve manufacturing flexibility by leveraging production capacity, shortening the learning curve, reducing risks, and expanding the firm's resource base through collaboration with qualified suppliers (Tai,2006). Although interfirm collaboration seems to satisfy a firm's adaptation needs in a dynamic environment (Taylor,2010), it may actually be more costly than vertical integration. We propose virtual integration as an alternative governance mechanism, which can achieve both manufacturing flexibility and cost advantage by increasing internal and external control. Consequently, the management of external suppliers becomes an important source of firm competitiveness (Tai,2006), and IT-enabled integration probably is the most effective and efficient mechanism (Wei, 2019).

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter helps to explain the research parameters needed to understand and justify the suitable research process and instruments to source, collect, analyse and interpret the research data. Thus, this chapter helped the researcher to understand and define different research methods and tools to select the appropriate one to address the research aim and objectives. This chapter includes philosophy, approach, design, techniques, methodology methods for data sampling, collection and analysis, limitation of the research and ethics considered by the researcher.

3.1 Research Philosophy

The research philosophy underlines the fundamental assumptions that helped the researcher to source and collect the data, and guide its data analysis to arrive at conclusion in a systematic manner. Research philosophy forms the research grounds to comprehend nature of research problem by building the contextual knowledge. The research philosophies are positivism, interpretivism, pragmatism, and realism. These philosophies guide research in shaping the premises of the research and identify significant thoughts to understand the research nature. Each philosophy is attached with specific theoretical values that provide guidance to the researcher to settle on research tools, techniques and approaches (Creswell, 2013).

In this study, the researcher has considered the interpretivism philosophy over the other research philosophies. This philosophy has guided the researcher for data collection and analysis techniques to gain detailed knowledge of the research problem nature for subjective judgment in reality. The philosophy also guided the researcher to shape the assumptions in order to develop an appropriate research structure to investigate the impact of the use of information technology (IT) in the supply chain on cost and quality of services provided to

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customers. The researcher took the into fact that it will be difficult to get in contact with many participants from all over Liberia with experience in SMEs, so the research was focused to a particular entity which is the Orange GSM Liberia.

3.2 Research Approach

Research approach justifies selection of data sourcing, collection, analysis and interpretation methods to address research objectives and questions with an actual analysis. The research approach has helped the researcher in selecting a specific research technique and also to arrange the research plan in a systematic manner by choosing specific research instruments and techniques as per the research nature. The research approaches are deductive, inductive and abduction (i.e. combination of inductive and deductive) (Hair Jr, Wolfinbarger, Money, Samouel and Page, 2015). In this research, the researcher study has employed the inductive approach which also aligns with interpretivism philosophy (Creswell, 2013). The inductive approach reasoning is based on working from specific to a more general way (Jebreen, 2012) therefore; this approach was useful for the researcher to be involved in specific observations to move towards broad generalization as the research progressed. It also permitted the use of secondary data to develop theoretical awareness to develop new observation from explanation of primary data.

3.4 Research Purpose

The research purpose facilitated the researcher to outline research goal by understanding the research nature. The research purpose can be explanatory and descriptive. The researcher states the purpose of the existing study as descriptive in nature. The descriptive research purpose was considered in this study as it provides the researcher with required understanding of the research objectives. The descriptive purpose serves to explore to obtain more detailed explanation of the research topic to answer in the form of 'what is' the impact of integrating information technologies in SCM. The purpose of this research is the find how

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adoption and integration of Information Technology (IT) within the Supply Chain of SMEs to reduce their transaction cost and improve the quality of service they provide to their customers? and how does it improve a supply chain of a business?

3.5 Research Design and Methodology

The research design provides shape to the research process. The design of a research helps in conceptualizing the problem of research with the use of suitable research tools and methods. The research design helped the researcher to link the thought of research problem with an appropriate research tools to make the research achievable (Bell, 2014).

The methodology is therefore, used to recognize the research design to fulfil the data requirement. The three popular research methods are qualitative, quantitative, and mixed research method (i.e. combination of qualitative and quantitative designs). In this study, the researcher has followed research design method of mixed research method considering the nature of research. The mixed design was useful for the researcher to obtain and collect inclusive information and quality data to realize research objectives with an in-depth perspective using mixed data collection technique (Bryman and Bell, 2015). This design also supported the researcher in developing specific observations to wider overview (Bahari, 2010) to arrive at conclusive results to realize the association of IT with supply chain management. As Liberia has many small-scale businesses and it would be a huge task in getting in contact with as many people from the sector with long term experience and it will also take more time in getting an appointment for interview as well as asking the participant to fill the survey in the middle of their busy schedule. So, then the researcher chose to focus only on Orange GSM where with the contacts of the researcher it was somewhat easier to get in contact with the participants in that area and get the information needed for this research. These are all the main reasons for this study in this focused area.

3.6 Methods of data collection

 This step is essential to fulfil the data requirement of a research process. The research data needs can be fulfilled by obtained data from different sources depending on the research nature (Bell, 2014) and need for specific information to realize the study aim and objectives. The main methods of data collection are primary methods and secondary methods. The primary data collection method helps in the collection of new data using methods such as interview, direct observation, experimentation, survey, focus group, questionnaire, opinion poll. The secondary data collection method helps to collect existing data from the sources such as books, articles, journals, published market researches, business magazines, news articles, websites, etc. The selection of different method under primary or secondary is influenced by cost and time factor (Bell, 2014).

In this study, the researcher has followed both primary and secondary data collection methods to obtain new mixed research data method and exiting data/information from secondary sources. The primary data collection method was mixed method both questionnaires and interview were employed by the researcher from a focused set of people in that particular field, whereas the secondary data was collected with the review of existing literature from books, published market research, journals and articles. By taking survey of interview and questionnaires of distributed both on drop and collect method and via email was quick and time saving in collecting responses as the researcher collected responses from 20 specific people. Moreover, the survey provided researcher with flexibility in distributing survey questionnaires through direct email and drop and collect from the target audience to fill the online questionnaires form. The secondary data was collected by the researcher to secondary data collection enhance the reliability of the existing research. In this study the researcher chose both qualitative and quantitative/ industry with experience.

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3.7 Data Collection Instruments

A total of twenty questions were designed for the survey. The questionnaires were closed-ended question to get detailed response. The question theme is about IT use, Factors influencing IT in SMEs, role and benefits of IT integration in the supply chain management, challenges in IT use and strategies to overcome challenges, future scope of IT in Supply Chain Management and way to enhance IT contribution in SMEs supply chain management.

3.8 Sampling Method and Sample Size

3.8.1 Sampling method

The sampling is important to recognize and choose an appropriate subgroup from the target population. The subgroup/sample represents the entire population. For this study, the researcher has preferred to use the probability sampling method over the non-probability method. Under the probability sampling, the researcher has employed simple random sampling. This sampling method is used because it allows the researcher to provide each participant an equal chance of getting chosen in the research process from the target population (Weiss and Weiss, 2012). The simple random sampling also permitted the researcher to choose samples randomly with ease and flexibility to avoid researcher and selection related bias.

3.8.2 Population and Sample size

The target population for this study is the employees of Orange GSM Liberia. The total population of employees is approximate 200 plus. The sample size includes the number of participants the researcher has chosen for the research process to provide wide generalization for the target population. As the research is both quantitative and qualitative in nature, the researcher has chosen small sample size which is sufficient to address the research aim and objective. Therefore, the sample size for this mixed research was 20 participants (existing employees) from Top Managers, Seniors Managers, Junior Managers, Directors, Supervisors

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and Staffs who are directly involve with the Supply Chain. These participants were selected by the researcher using known contacts in that area. The researcher chooses the participants as per their criteria of experience of working in supply chain management. The participants belong to the age group 30 to 52 years and the experience of the participants was more than 7 years to 29 years.

3.9 Data Analysis Method

The analysis of data forms a critical step in the research process. The data is analysed from information obtained from data collection methods in a systematic way to obtain meaningful data for research inferences. The methods of data analysis can be statistical analysis, content analysis, factor analysis, etc (Albright, Winston and Zappe, 2010). In this research, the researcher has used the method content analysis and quantitative data analysis from IBM (SPSS) GradPack software version 21 was used in running the statistical tests to analyses the text data to identify observations relevant to form conclusive inferences to fulfil and to realize the aim and objectives of the research. The content data analysis method has helped the researcher to develop clear and in-depth understanding of both qualitative and quantitative responses to realize observations that can be applied for broad generalizations.

3.10 Research Ethics

The researcher has considered the ethics of the research as ethics is regarded as a core aspect in the research process. The ethical consideration has helped the researcher to conduct the research efficiently with low risk of misinterpretation or errors to preserve the positive impact of the research. The researcher has employed ethical practices during the overall conduct of the research process and specific attention to ethics during the use of primary and secondary data collection techniques. The researcher has considered plagiarism, copyright, and privacy related issues. The researcher has made use of in-text citation to respect the work of other researchers and provided list of references from where the secondary information was

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collected by the researcher. The researcher has also maintained the confidentiality of survey participants (Ponterotto, 2013) involved in the research. The researcher has also ensured adherence to university guidelines in following the ethical practices in the research process. The online survey and direct email methods was adopted over the direct interview because it would be difficult go to different locations and get appointments and ask the questions and also due to privacy reasons people don't want to be recorded.

3.11 Pilot Study

Basically, this study is about the impact of the use of information technology (IT) in the supply chain on cost and quality of services provided to customers. For this research a qualitative approach was taken, first in order to frame the correct questions to be asked a serious of interviews were conducted by the researcher. By getting a lot of inputs and suggestions from the participants, the questionnaire was framed. Later, selected participants were approached and the interview questions were asked through survey and direct emails.

CHAPTER FOUR DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 Introduction

This chapter of the Thesis highlights the results obtained from primary and secondary studies and analyses of the collected data to provide meaningful findings and the discussion of the results of the study. In this chapter, responses of research participants from the interview questions are analyzed to determine to what extent, researcher has been successful to obtain answer to research questions to successfully achieve research objectives.

The chapter is organized as follows: section 4.2 describes the data presentation, analysis and the results of the study and section 4.3 discuss the presentation of findings of the study with regard to the objective of the study which was to determine the benefits of IT and the various IT applications used in supply chain activities.

4.2 Data Presentation and Analysis of the Result

The primary research data from the interview and questionnaire was obtained from staff of the different supply chain functions. The General Manager, Warehouse Manager, Procurement Officer, Sales and Planning Manager and the Logistics Manager. The data was analyzed on a thematic and content approach. Data given by the company was based on the last four years since they completed adopted.

4.2.1 Response Rate

From the data collected, out of the 20 questionnaires administered, 20 were filled and returned which represents a 100% response rate. Such a response rate is considered full excellence according to Mugenda and Mugenda (2003) who mentioned that a 50% response rate is adequate, 60% good and above, while 70% is rated very good. This also collaborates with Bailey's (2000) assertion that a response rate of 50% is adequate, while a response rate greater than 70% is very good.

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4.2.2 Demographic Profile of Participants

Table 1: Participants' Gender

Sex	Frequency	Percentage (%)
Males	12	60
Females	8	40
Total	**20**	**100**

A.Dopoh Research Field Survey, 2021

From the above table, 12 respondents representing 60% were males and 8 respondents representing 40% were females.

Table 2: Experience of Participants

Sex	Frequency	Percentage (%)
10 to 20 years	4	20
20 to 29 years	12	60
Over 29 years	4	20
Total	**20**	**100**

A.Dopoh Research Field Survey, 2021

The above Table indicated that participants experience is more than 10 years to 29 years. The results from the table revealed that 12 participants representing 60% had worked between 20 to 29 years; 4 participants representing 20% had worked over 20 years and 4 participants representing 20% had worked between 10 to 20 years.

Table 3: Participants Highest level of Education

Sex	Frequency	Percentage (%)
Bachelor degree	5	25
Master's degree	11	55
Doctoral degree	4	20
Total	20	100

A.Dopoh Research Field Survey, 2021

The above mentioned table presented the participants educational background. It was revealed that 5 of the participants represented 25% were bachelor degree, 11 participants which represented 55% obtained Masters, 4 participants represented 20% earned a doctorate masters' degree.

4.3 Orange Liberia GSM General Manager's Point of View on Information Technology (IT) and Supply Chain (SC)

IT plays a critical role in a firm's supply chain because of the information that flows along the supply chain. For companies to achieve a competitive advantage, they must maximize the use of Information Technology. This will enable SMEs to come up with ways of reducing inventory cost, improving the lead time for products, product innovation, improvement in business image, customers' satisfaction, and integrate supply chain with the various functions of an organization.

Managers need to be up to date on information such as inventory, customer demand and supply lead time. All this information flows at the different stages of supply chain. Supply chain managers need to have information on customer demand, supplier availability, inventory level, delivery, shipping locations and routes and also costs and margins. It has been noted that companies today are putting more efforts on Information Technology in order to become more innovative, attain a competitive edge and adapt to the fast and complex environment. The invention of Information Technology in the world has increased the demand of customers. The company has adopted the use of ERP and supply chain 21 management systems in the organization. One of the ERP systems is the WMS that is integrated across all functions of supply chain. This has generated more revenues from value added service operations and capture of labor and costs associated with work orders. The manager also observed that since the company started using IT, of the inventory has reduced.

He quoted the following "There was theft within the company due to lack of audit trails in the system. The company has expanded into neighboring countries and the procurement process is centralized making it hard to keep record is of purchase orders, invoices and track a requisition once raised. So IT was introduced in the company to simplify the procurement process. Once a requisition is raised, and a purchase is done, the warehouse or the stores people are able to create a Goods Received notes automatically in the oracle system instead of printing out a manual GRN and filing it. This automation has improved efficiency in operations; it is much easier to close out a Purchase order and forward it to finance for payment." "IT has changed the role and type of relationships between us and various players,

creating new value networks and developing new business models. We needed to choose a coordination mechanism in order to fill critical information gaps and serious challenges for supply chain managers, including misinformation and ultimately, mistrust.

In this view, IT is a key factor that has enabled for competitive advantage, by cementing relationships with our customers, enabling integration forward or backwards in the industry value chain, and establishing a technological lead." This is in comparison with literature review where it is stated that companies are always in the race of improving their competitiveness. Vickery et al., (2003) states that organizations in the 21st century view supply chain management as a global organization strategy for achieving organizations competence. The manager has stated very carefully that IT plays a very critical role in the firm's supply chain as it has helped the company maintain its competitive edge. This is also shown by sales revenues of the company that have increased from USD 1.6 billion in 2019 to 3.2 billion in 2021 as shown in the diagram below:

FIGURE 1: SALES REVENUE OVER THE PAST FOUR YEARS
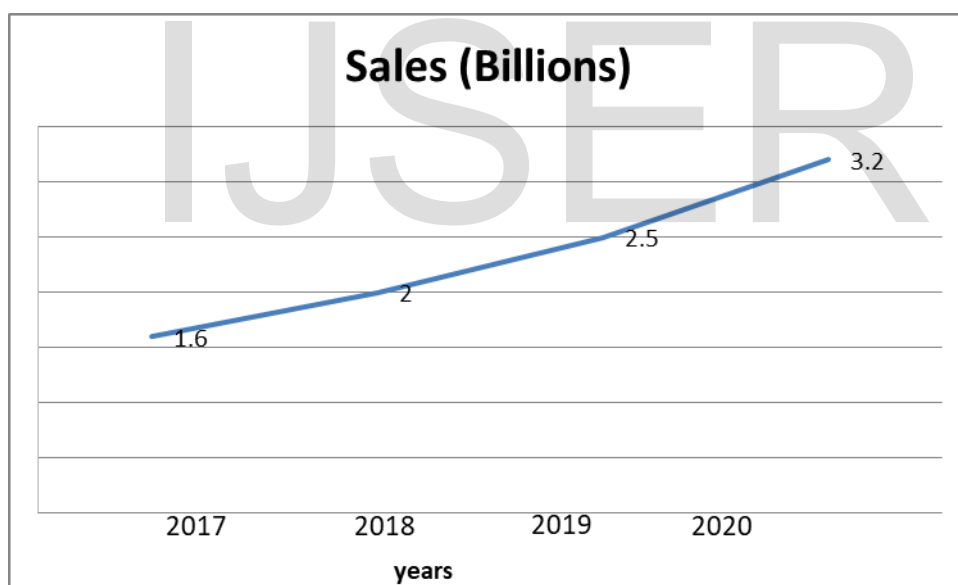
Source: orange's database

### 4.3.1 Sales and Planning Function:

IT is used in supply chain to manage supply and demand. As the manager put it, IT manages Demand by; Capturing all the end user requirements and consolidate their demands and needs, Preparation of records required to provide future forecast of demand verses trend and Consumption reports through transaction in the system that

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provide information on consumption trends on use of products Consolidating demand ensures that there is; Competitive pricing, cheap transport/shipping costs, Handling and clearing and also contracted supplier's regular identified requirements. IT on the other hand manages supply by capturing all information in the database on suppliers and deliveries, recording of previous suppliers used to forecast supplies, approval of purchase orders, managing suppliers by vetting them and blacklisting of suppliers through evaluation. Supplier details such as lead times, cost of production, shipping time, cost and point of sourcing are also determined. Avoiding stock outs and stock overruns is done by; Setting up of stock parameters in the systems, Provision of alerts on different levels of current stocks, Regular reports; daily, weekly and monthly and email correspondence with internal and external customers.

Since the invention of IT, the level of customer service has improved. This is because planning and marketing triggers buying through need identification gathered from the different users, departments, memos, minutes, proposals and projects. The needs are then approved in the database through the approval hierarchy. Items in the Oracle system are captured and coding, setup parameters and lead times are determined. The initial buying is triggered when a PDI is raised. The level of responsiveness from both internal and external customers has increased. WMS has been integrated for both planning and warehouse functions thus is possible to create and manage work orders across facilities to satisfy customers unique fulfillment requests based on demand or to stock in anticipation of demand. One of the elements in the literature review is the benefit of IT to supply chain management. It is stated that successful companies have developed focused e-business solutions for improving customer service elements such as product availability, distribution flexibility and order cycle time. As shown in the sales function, the sales and planning manager has emphasized very clearly how IT is used to manage demand and supply in the company by capturing end user requirements and capturing their needs and requirement.

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The end user is the customer and the sales and marketing people. Customer service for both suppliers and Customers increased from a scale of 2 to a scale of 7 in 2020. This is shown in the diagram below.

FIGURE 2: CUSTOMER SERVICE IMPROVEMENT
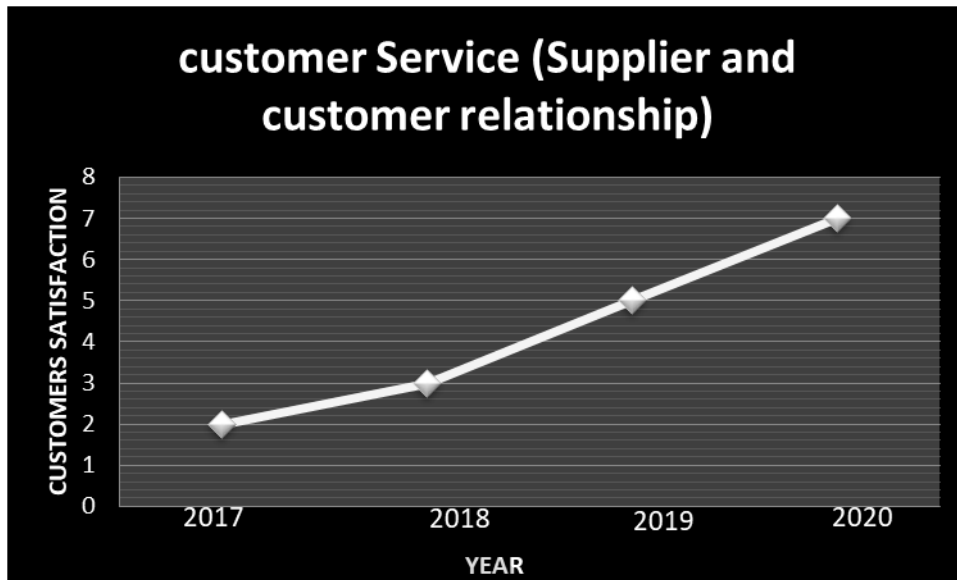
Source: orange's database

On a scale of 1-10, you can see that customer service has increased over time.

4.3.2   Warehouse function

According to the warehouse manager, IT is one of the technologies used to manage the warehouse operations in the organization. One of the warehouse management systems is the ERP system that is used. One of the advantages of the WMS is to enable a user to manage inbound receiving processes where the user gains through global visibility into the company's inbound shipments and track received inventories against Pos, advanced shipment notifications and blind receipts. The manager also noted that it is easier to manage and allocate inventory across the different warehouse locations. WMS has enabled advanced capabilities such as activity tracking and consigned inventory in all selected warehouses within the network.

Some of the benefits from the use of WMS include; establishment and measure of labor standards and performance, provision of condition based processing for returns management. There is better inventory accuracy within the cycle due to tracking. This has reduced inventory because the system can communicate to the users on items that are not available and also those that are running out of stock. Through this, users are able to plan on stocking.

In the literature review, the Point of sale tracking system is mentioned as another application used in supply chain management. It is known as a customer facing IT application (Shah, 2009) where the scanning system and the retailer's inventory management systems are connected. The goods are usually marked with a bar code and are scanned by a reader that recognizes the goods. The POS provides an instant record of transaction because the items are noted, tallied and a transaction is recorded. Shah (2009) notes that replenishment of products can be coordinated in real time to ensure that stock outs in the retail store are avoided. The diagram below shows how inventory cost has reduced over the past four years.

FIGURE 3: INVENTORY COSTS

Source: orange's database

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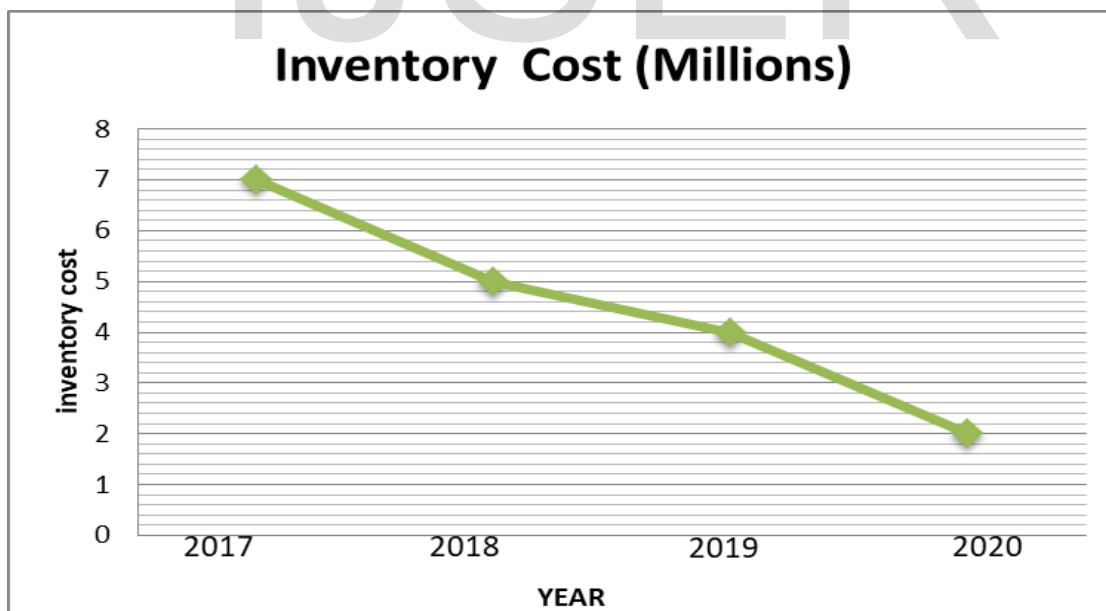
4.3.3 Procurement Function

 Procurement is one of the important functions in the supply chain because it is the procurement officer who has the right and mandate to communicate with the supplier. The officer has to source, procure and ensure through finance department that the supplier is paid. One of the systems used by the procurement is the oracle system where the purchase orders are auto created in the system after the generation of PDI. All the documents such as quotations and proforma invoices are attached in the oracle system.

According the procurement officer, an analysis has to be done through excel sheets where prices from different suppliers are analyzed and the cheapest vendor is chosen. Once the POs are created in the system, they are forwarded to the procurement manager who does a due diligence and approves the purchase order then it is automatically forwarded to the supplier. Suppliers such as Siemens have their own system where once the PDI states that the supplier is Siemens, the officer logs to the Siemens mall and creates a Purchase order that is submitted directly to the Siemens team and a reference number for the order is forwarded automatically to the users email. One of the benefits gained is that time taken to complete a transaction has reduced greatly with the use of IT in procurement as opposed to manual. This is shown in the diagram below. The maximum time it can take to complete a PO transaction is two weeks; these are mostly purchases that are high risks and need directors' approvals

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FIGURE 4: AVERAGE TIME OF TRANSCATIONS
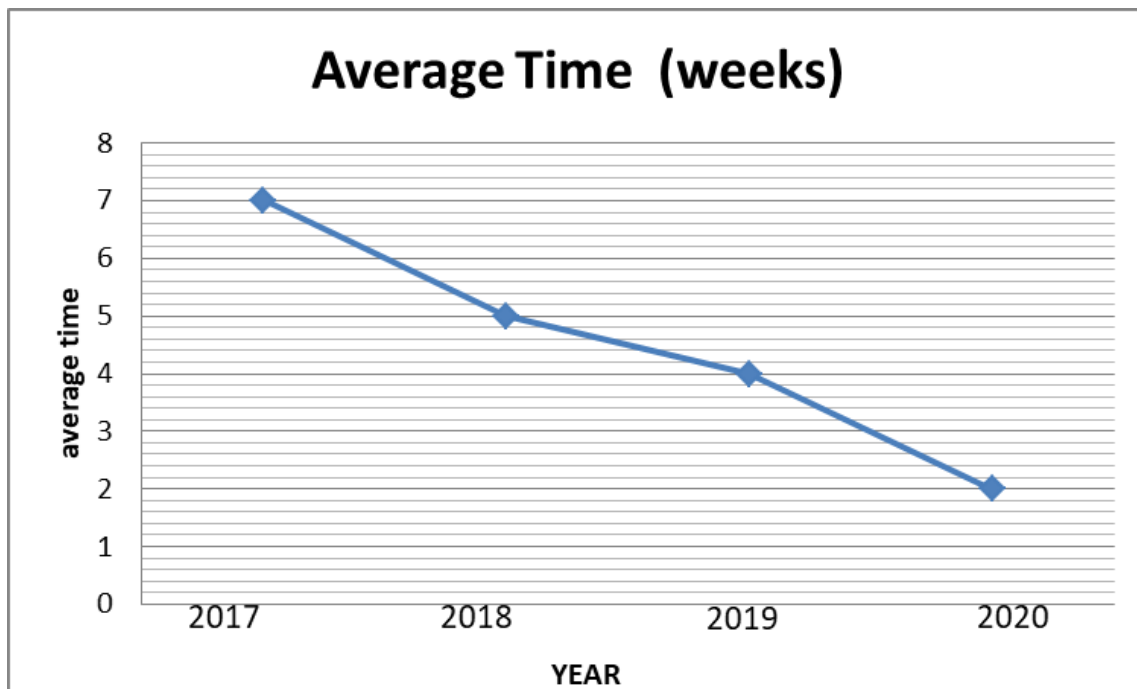
Source: orange's database

In the literature review, it was observed that most organizations focus on cost reduction in the supply chain while improving the lead-time. Supply chain effectiveness focus on improved customer service, increased market share, and increased sales, new product development. As Ramdas and Spekman (2000) put it, reduced inventory means that the inventory levels are maintained, there is time to market and break even. Order fulfillment should capture the extent to which a supply chain partner affects order processing time and shipment accuracy (Ramdas and Spekman, 2000) Lead time has also improved as shown in the diagram below:

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The logistics team track shipments to gather detailed information about a specific shipment while it is in transit. They are able to check on the status of a shipment and its routing information. When they track shipments, there is better control of the entire shipping process. Through the shipment tracking function, the team can locate shipments according to the carrier that is transporting the shipment. Additionally, carriers can provide tracking information through the internet, telephone, or some other means. It is possible to track shipments to know exactly where the shipments are, both physically and within the system.

This information enables the team to report on the product as it travels to customers. Technologies used to track the cargo that is enroute from suppliers place include; GPS and GPRS, RFID, E-commerce such as waybills, bill of lading, and dispatch notes. The supply chain network that is mentioned earlier in the literature review supports three types of flows that require careful planning and close co-ordination which is essential in logistics. One type of flow is the material flow that represents physical product flows from suppliers to customers as well as reserve flows for product returns, recycling and servicing. Information flow involves order transmissions and order tracking which coordinate physical flows and financial flows which represent credit terms, payment schedules and consignment and title ownership arrangements (Austin and Nolan, 1999). The network is supported by three pillars; Processes, which encompasses logistics, new product development and knowledge management; organizational structures which encompasses a range of relationships from total vertical integration to networked companies and enabling technologies is another pillar which encompasses both process technologies and information technologies. The Oracle system usually integrates the procurement side and the logistics such that a logistics officer will be able to log into the system and view what a certain buyer has purchased and the supplier from which the buyer is getting the materials from.

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From then the logistics officer will be able to determine the lead of the items, whether they require taxes and start alerting finance on the amount to pay. This advance payment increases efficiency.

4.4 Finding

This section has presented the extent to which integrating Information Technology in the supply chain by Orange GSM Liberia. A number of questions were asked to the participants who gave their responses on a scale of 1-6 where 1 represents never or very low , 2 – Hardly Ever or Low, 3 – Sometimes or Slightly low, 4 – Continued or slightly high 5-Almost always or High 6- Always or Very high

4.4.1 Integration of IT in the Supply Chain

Research Question 1: Why it's important to make use of IT within the Supply Chain (SC)?

Table 4: The Integration of IT in the Supply Chain

Please assign a value according to what you live in your company about the Integration of IT (Information Technology)	Weighted Mean	Verbal Interpretation
The company has a network of IT systems (ERP, CRM, SCM, Intranet, etc.) highly integrated with key suppliers	4.5	Slightly High
The company shares information in real time through IT with key suppliers	4.5	Slightly High
The company allows access and sharing of sensitive information through IT with key suppliers	4.5	Slightly High
The company works to have a better alignment of IT with key suppliers	4.5	Slightly High
The company shares information in real time through IT within the organization	5	Almost always
The company allows access and sharing of sensitive information through IT within the organization	5.2	Almost always
The company has a network of IT systems (ERP, CRM, SCM, Intranet, etc.) highly integrated with key customers	4.5	Slightly high
The company shares information in real time through IT with key customers	4.7	Slightly high
The company allows to access and share sensitive information through IT with key customers	4.5	Slightly high
The company works to have a better alignment of IT with key customers	5.0	Almost always
The company has a high degree of feedback through IT	5.0	Almost always
The company shares demand forecasts and production planning with suppliers	4.5	Slightly high
The company receives demand forecasts and production planning from its customers	4.5	Slightly high
.Please assign a value according to what you live in your company about the Flexibility of IT		
The company has an IT team that supports IT changes and updates	**5.5**	Almost always
The company has a high degree of connectivity within the organization and with	**4.2**	**Slighly high**

other organizations		
The company has compatible IT within the organization and with other organizations	3.5	**Slightly low**
The company can add, modify and remove IT components easily and without causing negative effects on performance	5.2	**Sligghly high**
Please assign a value according to what you live in your company about the IT Update		
The company uses the most advanced IT for the Supply Chain (CS)	4.3	**Sligghly high**
The company invests in IT to align its technology with that of its partners	4.2	**Sligghly high**
In relation to competitors, the IT of the company for the CS are the most advanced	4.2	**Sligghly high**
Average Weighted Mean	4.6	**Slightly high**

A.Dopoh Research field Survey, 2021

Research Question 2.: What role does IT play in affecting the costs of SMEs in the

supply chain?

Table 5: The Role of IT in affecting the costs of SMEs in the Supply Chain

. Please assign a value according to what you live in your company about Organizational Performance integrating IT in the SC	Weighted Mean	Verbal Interpretation
In relation to key competitors, the performance of the company in profitability is:	4.3	**Sligghly high**
In relation to competitors, the performance of the company is higher in Return on Investment (ROI)	4.2	**Sligghly high**
In relation to competitors, the performance of the company is greater in sales increment	4.2	**Sligghly high**
In relation to competitors, the performance of the company is greater in market development	4.6	**Slightly high**
In relation to competitors, the performance of the company is greater in product development	4.3	**Sligghly high**
The company has decreased costs as a result of initiatives in SC	4.2	**Sligghly high**
In relation to competitors, the performance of the company is greater in decreasing costs	4.2	**Sligghly high**
Please assign a value according to what is lived in your company as a result of the integration of IT in the Supply Chain (Benefits)		
Product innovation	4.3	**Sligghly high**
Process innovation	4.2	**Sligghly high**
Costs reduction	4.2	**Sligghly high**
Improvement in business image	4.6	**Slightly high**
Income increase	4.3	**Sligghly high**
Increase in income from organic products	4.2	**Sligghly high**
Higher product quality	4.2	**Sligghly high**
Greater ROI	4.6	**Slightly high**
Greater participation in the market	4.3	**Sligghly high**
Reduction of emissions/waste	4.2	**Sligghly high**
Energy saving	4.2	**Sligghly high**
Sales increase	4.6	**Slightly high**
Reduction of logistics costs	4.3	**Sligghly high**
Improvement in competitiveness (competitive advantage)	4.2	**Sligghly high**
Customer satisfaction	4.2	**Sligghly high**

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Promotes inter-organizational trust	**4.6**	**Slightly high**
Average Weighted Mean	**4.3**	**Slightly high**

A.Dopoh Research field Survey, 2021

Research Question 3: What are the constraints preventing the adoption and integration of IT within the supply chain of SMEs in Liberia?

Table 6: Constraints Preventing the adoption and integration of IT in the SC

.Assign a value according to what you live in your company preventing the adoption and integration of IT within the supply chain	Weighted Mean	Verbal Interpretation
The employees have an adequate knowledge of the different functions of the SC	3.5	Slightly low
The Implementation and maintenance cost of IT equipment in your company	3.5	Slightly low
Do your company have a stable electricity to maintain the IT Network	3.5	Slightly low
Your company have a cyber-security team to secure sensitive information between your internal system and external system	3.5	Slightly low
Employees identify ways to improve efficiency and effectiveness in the face of environmental changes	3.3	Slightly high
The company invests in talent acquisition in SC	3.2	Slightly low

A.Dopoh Research field Survey, 2021

Research Question 4.: Does the use of IT affect the performance of a firm's Supply Chain and improves its profitability and quality of service?

Table 7: The Integration of IT affect the performance of the firm's SC and improves its profitability and QoS

Please assign a value according to what you live in your company about the performance of the SC	Weighted Mean	Verbal Interpretation
The company can modify its products quickly to meet customer requirements	5.2	High
The company can quickly introduce new products in the market	5.2	High
The company responds quickly to changes in market demand	5.2	high
The company complies with the delivery dates and quantities promised consistently	5.5	high
The cycle time to comply with the orders of the clients is short	5.7	high
The company provides a high level of service to its key customers	5.2	high
The company considers the management of the SC as vital in the activities of the business	5.2	high
The company offers incentives for performance in SC	5.2	high
Please assign a value according to what you live in your company about Organizational Performance		
In relation to key competitors, the performance of the company in	5.2	high

profitability is:		
In relation to competitors, the performance of the company is higher in Return on Investment (ROI)	**5.2**	**high**
In relation to competitors, the performance of the company is greater in sales increment	**5.2**	**high**
In relation to competitors, the performance of the company is greater in market development	**5.5**	**high**
In relation to competitors, the performance of the company is greater in product development	**5.7**	**high**
The company has decreased costs as a result of initiatives in SC	**5.2**	**high**
In relation to competitors, the performance of the company is greater in decreasing costs	**5.2**	**high**
The company is willing to invest in green initiatives that do not generate return on investment (ROI)	**5.2**	**high**
Average Weighted Mean	**5.3**	**High**

A.Dopoh Research field Survey, 2021

4.4 Discussion

Figure one shows the increase in sales and revenue after the IT systems were implemented in the company. This shows how IT has increased revenues for the past four years. Figure two shows the increase in customer service which is a good indicator of supply chain performance and thus leading to increase in customer responsiveness and relationships with the suppliers. As shown in figure three, inventory cost has also reduced in the past years; this is an indicator of how the company has managed to improve its operations thus becoming more efficient. Figure four has also shown how transactions are now conducted faster through the use of IT thus increasing efficiency in the organization. Lead-time has improved through the use of IT as well. Another objective of the research was to determine the various IT applications used in the supply chain operations of the organization. The applications used are Oracle system and WMS which are ERP systems that integrate the various functions of the organization. Ecommerce is used for exchanging documents electronically and also exchanging emails and information between the various stakeholders. IT such as GPS, GPRS is one of the tracking systems used to track cargo that is enroute to customers or to the stores.

Table four show the importance of the integration of IT in the supply chain, Orange GSM Liberia fully integrated IT system in their supply chain. The result from the finding indicate

that the company has a network of IT systems (ERP, CRM, SCM, Intranet, etc.) highly integrated with key suppliers with the **highest mean weighted rating at (4.5),** The company shares information in real time through IT with key suppliers with the **highest mean weighted rate of (4.5), t**he company allows access and sharing of sensitive information through IT with key suppliers **highest mean weighted rate of (4.5),** the company works to have a better alignment of IT with key suppliers **highest mean weighted rate of (4.5),** the company shares information in real time through IT within the organization **highest mean weighted rate of (5.0),,** the company allows access and sharing of sensitive information through IT within the organization, the company has a network of IT systems (ERP, CRM, SCM, Intranet, etc.) highly integrated with key customers, the company shares information in real time through IT with key customers, the company allows to access and share sensitive information through IT with key customers, the company works to have a better alignment of IT with key customers, the company has a high degree of feedback through IT, the company shares demand forecasts and production planning with suppliers, the company receives demand forecasts and production planning from its customers, the company has an IT team that supports IT changes and updates, the company has a high degree of connectivity within the organization and with other organizations, the company has compatible IT within the organization and with other organizations, the company can add, modify and remove IT components easily and without causing negative effects on performance, the company uses the most advanced IT for the Supply Chain (CS), the company invests in IT to align its technology with that of its partners, in relation to competitors, the IT of the company for the CS are the most advanced. From the above finding result it's clearly states the important of integrating the use of IT within the Supply Chain with the overall **average weighted mean rate of (4.6) slightly high.** The study show that it is important to make use of IT within the supply Chain due to the finding that IT improve efficiencies of the supply chain as indicated in the table**.** From the finding of the study in the primary data results indicated in **Table five** clearly answers the research questions two that role IT play in affecting the costs of SMEs in

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the supply chain is clearly positivism in profitability, cost reductions, return on investment and the performance of the supply chain with the **overall average mean weighted rating of (4.3) slightly high.**

The third research question was clearly answered by table six, which indicates the **constraints preventing the adoption and integration of IT in the SC.** The study revealed that SMEs have various challenges such as implementation and maintenance cost concerns, lack of technical literacy and skills, unstable electricity, security issues, changing role of employees, etc. in relation to IT's use in managing supply chain operations with the overall ave**rage weighted mean rating of (3.2) interpreted as 'sometimes'**.The results of the study revealed in Table Seven, answer the research questions four that the Integration of IT affects the performance of the firm's SC and improves its profitability and QoS with the overall average weighted mean rating at (**5.3) which is interpreted as 'High or Almost always'**.

4.5 Relationship between IT integration and Supply Chain Management

The study proposed that there exist a significant relationship between it integration and supply chain management on cost and quality of services provided to customers. Regression analysis was used to come up with the model that can explain the relationship between variables. The table 8 shows the model summary of the coefficient of determination

Table 8: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.939	.939	.940	.36085

a. Predictors: (Constant), IT integration, Supply Chain Management, Cost and quality of service, Customer Relationship, Quality of Information sharing

The study proposed that there exist a significant impact in relation to the integration of information Technology (IT) and supply chain management in cost reduction and quality of services delivers to customers. From the correlation coefficient (r) is $r = 0.939$, sample correlation based on $n = 170$ based on the participants responds to the questionnaires.

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To test H0:ρ=0 against the alternative HA:ρ≠0, we obtain the following test statistic:

To obtain the *P*-value, the study compare the test statistic to a *t*-distribution with 168 degrees of freedom (since 170 - 2 = 168). In particular, the study find the probability that observe a test statistic more extreme than 35.39, and then,

Figure 5 :Test Statistic calculation

$$t^* = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$
$$= \frac{0.939\sqrt{170-2}}{\sqrt{1-0.939^2}}$$
$$= 35.39$$

The output tells us that the probability of getting a test-statistic smaller than 35.39 is greater than 0.999. Therefore, the probability of getting a test-statistic greater than 35.39 is less than 0.001. As illustrated in the following graph, from the study both side multiply by 2 and determine that the P-value is less than 0.002.

Figure 6: the graph showing the relationship in testing the hypothesis
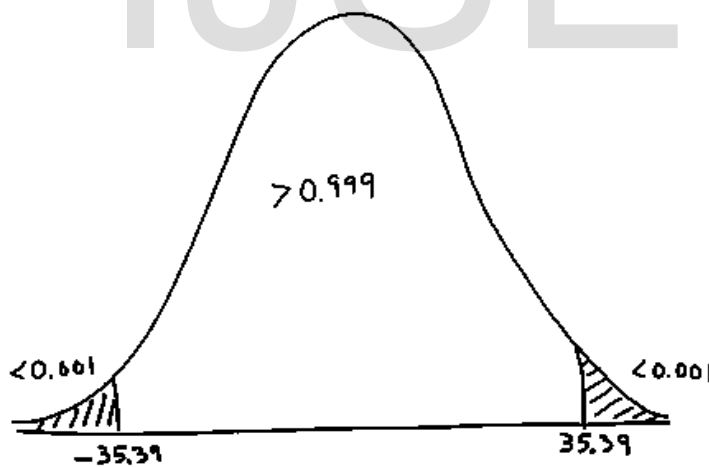
From the above observation doing the study, the *P*-value is small — smaller than 0.05, say — the study reject the null hypothesis, and accept the alternative that there is sufficient statistical evidence at the α=0.05 level to conclude that there is a significant linear relationship between a the integration of information Technology (IT) and supply chain management in cost reduction and quality of service delivers to customer

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CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The paper examines the use of Information Technology in supply chain and how IT is used to increase performance of the supply chain. The study was carried out to benefit the SMEs and professionals in the supply chain so that they can enhance the use of IT to improve the supply chain performance and attain a competitive edge in their businesses. The main objective of the study was to determine the benefits of IT in supply chains and also understand the various IT applications used in supply chain activities. In order to get the information, a case study was done in Orange GSM Liberia which is an SME and qualitative data was collected from the various staff who works in the supply chain.

An important observation is that IT has improved the processes of transactions across the various functions and also it is integrated in such a way that information flows along the various functions between procurement and planning; logistics and warehouse. The various technologies used have reduced costs of operations in the supply chain and a lot of savings have been achieved. It is also noted that lead time for orders have reduced. There has been improvement in customer services where both internal and external customers are happy due to faster response from the supply chain. Important information is the increase in communication across the various users of the supply chain.

Information flows from the sales and planning team to the procurement team and to the logistics team using the oracle system which is an ERP. Documents such as PoS, PO, invoices and requisitions are transmitted using the system and users do not need to physically exchange documents. Audit trails used in the organization have also led to minimal theft of stock in the organization.

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5.2 Conclusion

In general, the study has shown that companies should embrace the use of IT in the supply chain to minimize cost and maximize revenue. More focus should be put on the planning and sales function to regulate the buying since customer demands are high and can cost the company millions of money. In order to meet the current level of demand, the systems in place should facilitate the determination of the current level of demand and also predict future demands to curb stock outs or stock overruns.

Most SMEs do not consider supply chain as an essential function in the organization and procurement is seen as a finance activity. SMEs should consider implementing supply chain and use Information Technology to improve their operations as this will save the companies a lot. The companies should also use IT in planning their procurement activities and engage their stakeholders as well.

The results have also shown how communication is important in an organization that uses procurement. Most of the supply chain in SMEs is not transparent as the managers are known to have a conflict of interest. These results in poor revenues, bad customer service due to delay of product information to customers and also longer lead time. Through the user of IT, all these can be curbed and companies can enjoy longer benefits such as improved sales revenue and reduced inventory costs.

It can be concluded that IT's impact on SCM is affected by the limited technical knowledge and skills of workforce in the use of IT tools, Crucially, it is advised that businesses including SMEs improve the knowledge and upgraded the skills of their employees adoption of new communication technologies which can increase use of IT in supply chain operations management. Alongside this, it is also recommended that, the 35 upper management or senior managers must encourage the organizational learning on the benefits and use of new and emerging information communication technologies that are relevant to the SMEs businesses.

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5.3 Recommendations

1. The study recommends that companies especially SMEs should implement IT in their supply chain operations to improve efficiencies as indicated in the diagrams, as an impetus to increase their sales and quality of customers' service.

2. Organizations are to integrate the supply chain function with the other functions that are involved in its running to enhance the overall effectiveness and also have a competitive edge over competitors through the resultant better prices and products.

3. The study also recommends the adoption of technologies that assist in increasing the effectiveness of the supply chain for both the customers and the suppliers. These should be systems that enhance transparency which will in turn improve the goodwill in the organization.

4. The study also advised businesses into manufacturing and production to collaborate with technological firms to gain awareness of new IT technologies cost, benefits and training requirements.

5. Finally, it is also recommend that proper planning is advised for SMEs firms in planning to adopt new IT technologies for their supply chain practices as per the business requirements to ensure IT investment will get benefits that outweigh the acquiring and implementation costs of IT system.

5.4 Areas for further study

A suggestion for further research on the use of IT among the SMEs is to determine the factors that hinder the integration of IT in the SMEs in Liberia.

Research should also be carried out on why supply chain is not a function that is given preference in the operations of most SMEs.

The relationship between the supply chain and the other departments within the SMES should be determined along the effects of such relations on the overall performance of the SMEs.

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APPENDICES

Appendix A: *Demographic data*

Age: _____ *Educational Level:* _____

*Industrial sector:*_____

*Approximate number of employees:*_____

*Position of the interviewee:*_____

*Years of experience:*_____

*Gender:*_____

If you consider it important to add some other factor that impacts the integration of IT in Supply Chain's competence, please write your comment, Thank you very much for your participation

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Appendix B: Questionnaire to determine the impact of **the use of information technology (IT) in the supply chain on cost and quality of services provided to customers**

Background:

Thank you for agreeing to take part in this survey. The survey is being done by Adolphus D Dopoh, a student of the Alexander B. Cummings School of Graduate Studies, African Methodist Episcopal University (AMEU), 34 Camp Johnson Road, 1000- Monrovia, a Candidate of an Executive Master in Procurement and Supply Chain Management.

 The purpose of this survey is to collect opinions from Top Managers, Seniors Managers, Junior Managers, Directors, Supervisors and Staffs who are directly involve with the Supply Chain about a research project being considered with the main / general objective of promoting the adoption and integration of Information Technology (IT) within the Supply Chain of Small and Medium Enterprises (SMEs) to reduce their transaction cost and improves the quality of service they provide to their customers.

All of the answers you provide in this survey will be kept confidential. No identifying information will be provided to the AMEU Graduate School, or Orange GSM and Public Policy Center. The survey data will be reported in a summary fashion only and will not identify any individual person. This survey will take about 10 minutes to complete.

Given that the impact of the use of information technology in the supply chain on cost and quality of services provided to customers to create high degree of competitiveness, I'm focusing on analyzing the Supply Chain (CS) to identify the sources of competitive advantage that allow orange GSM to maintain its place in the market and obtain better performance. There is evidence that IT impact the supply chain in cost and quality of services and that I want to analyze the impact they have on their competence and on the performance of the organization.

1	2	3	4	5	6
Never	Hardly ever	Sometimes	Continued	Almost always	Always
Very Low	Low	Slightly low	Slightly high	High	Very high

1.Please assign a value according to what you live in your company about the Integration of IT (Information Technology)	1	2	3	4	5	6
The company has a network of IT systems (ERP, CRM, SCM, Intranet, etc.) highly integrated with key suppliers						
The company shares information in real time through IT with key suppliers						
The company allows access and sharing of sensitive information through IT with key suppliers						
The company works to have a better alignment of IT with key suppliers						

	1	2	3	4	5	6
The company shares information in real time through IT within the organization						
The company allows access and sharing of sensitive information through IT within the organization						
The company has a network of IT systems (ERP, CRM, SCM, Intranet, etc.) highly integrated with key customers						
The company shares information in real time through IT with key customers						
The company allows to access and share sensitive information through IT with key customers						
The company works to have a better alignment of IT with key customers						
The company has a high degree of feedback through IT						
The company shares demand forecasts and production planning with suppliers						
The company receives demand forecasts and production planning from its customers						
2.Please assign a value according to what you live in your company about the Flexibility of IT	**1**	**2**	**3**	**4**	**5**	**6**
The company has an IT team that supports IT changes and updates						
The company has a high degree of connectivity within the organization and with other organizations						
The company has compatible IT within the organization and with other organizations						
The company can add, modify and remove IT components easily and without causing negative effects on Performance						
3. Please assign a value according to what you live in your company about the IT Update	**1**	**2**	**3**	**4**	**5**	**6**
The company uses the most advanced IT for the Supply Chain (CS)						
The company invests in IT to align its technology with that of its partners						
In relation to competitors, the IT of the company for the CS are the most advanced						
4.Please assign a value according to what you live in your company about the integration of the CS	**1**	**2**	**3**	**4**	**5**	**6**
The company develops strategic plans and forecasts in collaboration with key suppliers						
The company has a small number of key suppliers						
The company shares information regarding sales, inventory levels and forecasts with key suppliers						
The company expects the relationship with key suppliers to be for a long term						
The company expects the relationship with customers to be for a long term						
The company offers services and support to its customers						
The company measures the satisfaction of its customers						
In the company there are inter-functional work groups where matters of materials and design are dealt with jointly						
Customers are part of the product design process						
The company measures the SC performance of its suppliers						
The company measures the SC performance of its clients						
The company has a high level of internal integration						
The company has a high degree of information on the status of the SC						
The company maintains a high level of interdepartmental communication						
The company maintains strategic relationships with key suppliers based on loyalty and trust						
5.Please assign a value according to what you live in your company about the Flexibility of the SC	**1**	**2**	**3**	**4**	**5**	**6**
In relation to competitors, we have processes that can adjust to changes in volume and mix of products quickly						
In relation to competitors, the SC of the company responds faster with quotes						
In relation to competitors, the SC of the company responds more quickly and effectively to changes and needs of the client						
In relation to competitors, the company develops and markets new products more quickly and effectively						
The company can ensure the availability of material against changes						
The company can adapt to delivery schedules and meet customer requirements						
The company maintains different SC configurations for different customer segments						
The company relies on inventories to meet the demand						
The company differentiates its products in relation to the life cycle in which they are found						
The company maintains different SC channels regarding product differentiation (product, channel, customer)						
The company can implement structural changes in the organization effectively						
6.Please assign a value according to what you live in your company about the Orientation to learning in the SC	**1**	**2**	**3**	**4**	**5**	**6**
The company provides appropriate training and a supportive work environment to develop new capabilities						
The company supports the experimental mentality through positive incentives that favor individual initiative						

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	1	2	3	4	5	6
and responsibility						
The company provides a psychologically safe environment in which individuals can examine their own mental models without fear of ridicule or harassment						
There is an exchange of knowledge within the organization based on the lessons learned						
There is knowledge transfer between the different SC partners						
7. Assign a value according to what you live in your company about the Role of the Manager	**1**	**2**	**3**	**4**	**5**	**6**
The manager shows a high commitment and support for the activities of the SC						
Managers identify changes in the marketplace and commit resources quickly to new courses of action						
Managers are used to making plans and following up						
The leaders are congruent with the fundamental values of the organization						
Leaders empower the individual, promote collaboration, communication and support						
8. Assign a value according to what you live in your company about the Employee Competency	**1**	**2**	**3**	**4**	**5**	**6**
The employees have an adequate knowledge of the different functions of the SC						
The employees communicate effectively with the different parts of the SC						
The employees are trained and continuously trained to perform the functions of the SC						
Employees work as a team constantly to implement inter-organizational projects						
Employees identify ways to improve efficiency and effectiveness in the face of environmental changes						
The company invests in talent acquisition in SC						
9. Please assign a value according to what you live in your company about the performance of the SC	**1**	**2**	**3**	**4**	**5**	**6**
The company can modify its products quickly to meet customer requirements						
The company can quickly introduce new products in the market						
The company responds quickly to changes in market demand						
The company complies with the delivery dates and quantities promised consistently						
The cycle time to comply with the orders of the clients is short						
The company provides a high level of service to its key customers						
The company considers the management of the SC as vital in the activities of the business						
The company offers incentives for performance in SC						
10. Please assign a value according to what you live in your company about Organizational Performance	**1**	**2**	**3**	**4**	**5**	**6**
In relation to key competitors, the performance of the company in profitability is:						
In relation to competitors, the performance of the company is higher in Return on Investment (ROI)						
In relation to competitors, the performance of the company is greater in sales increment						
In relation to competitors, the performance of the company is greater in market development						
In relation to competitors, the performance of the company is greater in product development						
The company has decreased costs as a result of initiatives in SC						
In relation to competitors, the performance of the company is greater in decreasing costs						
The company is willing to invest in green initiatives that do not generate return on investment (ROI)						
11. Please assign a value according to what is lived in your company as a result of the integration of IT in the Supply Chain (Benefits)	**1**	**2**	**3**	**4**	**5**	**6**
Product innovation						
Process innovation						
Costs reduction						
Improvement in business image						
Income increase						
Increase in income from organic products						
Higher product quality						
Greater ROI						
Greater participation in the market						
Reduction of emissions/waste						

Energy saving					
Sales increase					
Reduction of logistics costs					
Improvement in competitiveness (competitive advantage)					
Customer satisfaction					
Promotes inter-organizational trust					

Appendix C: Breakdown of Interview Questions Per Plays

HEAD OF SUPPLY CHAIN

1. What is your view on IT and Supply chain performance in the organization?

2. Why did you decide to use IT in the supply chain activities of the company?

3. How were the operations in the supply chain before the company decided to

implement systems in the organization?

4. How long have you been using IT in supply chain activities?

5. How has IT benefited the organization in terms of supply chain performance?

6. What Information technologies do you use for the supply chain activites of the firm?

7. Supply chain is the main base or the core department in this firm. How do you ensure

that the needs of all users are satisfied by avoiding stock outs due to technology?

PROCUREMENT OFFICER

1. Kindly explain the systems that you use in your day to day operations

2. How do you do purchase orders in the system?

3. Could you give me the advantages of using the system and how you have

benefited since you abandoned the manual system?

4. How has IT improved in creating rapport with your supplier?

5. How do you use technology to ensure that the goods purchased are as per the

quantity that you ordered?

WAREHOUSE MANAGER

1. There are several warehouses in this organization. How do you use IT to manage the operations of these warehouses?

2. How do you ensure that there is no theft of materials in the stores from your subordinates using the technology?

3. I have seen that WMS is one of the technologies used in the warehouses when checking stocks. Kindly explain how this technology works.

4. What benefit have you gained since you started using the WMS compared to the manual way of using bin cards and other paperwork?

5. How do you use IT to manage inventory replenishment in the organization?

6. How do you manage shipment codes and tracking information of shipments?