THE IMPACT OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) ON SUPPLY CHAIN MANAGEMENT: A case study of Uganda Christian University Mukono

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DECLARATION

I, Beatrice Ijang John, with Registration Number IS19B00/011 hereby certify that the work at hand is the actual records of the Research Study I undertook in order to get enough data on the Research topic. Additionally, it was carried out under the direction and supervision of Mr.Pascal Muloosi. As per the university values of integrity and diligence, I have not received any unauthorized assistance while working on this paper. I declare that the work is authentically mine and to the best of my knowledge, it contains no traces of plagiarism or any other unethical practices. The only work used that has already been published by other persons has been purely for reference purposes.

Signature..... Date..06/09/2023

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APPROVAL

I, the undersigned, certify that I have read and hereby recommend this paper to be submitted for examination with my approval.

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ABSTRACT

The integration of Information Communication Technology (ICT) in supply chain management (SCM) has emerged as a critical determinant of organizational success and competitiveness. This dissertation explores the impact of ICT on supply chain management efficiency at Uganda Christian University Mukono. The specific objectives are to investigate the relationship between ICT and SCM, examine the challenges of implementing ICT in SCM, and propose strategies to overcome these challenges. The research adopts a mixed-methods approach, encompassing both qualitative and quantitative data collection techniques. The findings reveal that the adoption of ICT tools, such as Management Information Systems (MIS), Cloud-Based Systems, and Enterprise Resource Planning (ERP) Systems, has substantially improved SCM processes at the university. Real-time data accessibility and enhanced visibility facilitated by these tools have led to faster decision-making, reduced lead times, and increased overall process efficiency. Moreover, the integration of ICT tools has positively impacted product quality within the SCM framework, as evidenced by improved quality control and compliance monitoring. However, certain challenges in ICT adoption were identified, including initial investment costs, data security concerns, and the need for continuous staff training. Strategies to address these challenges were proposed, such as investing in robust ICT infrastructure, implementing data security measures, and providing regular training programs for supply chain personnel. The research further recommends exploring areas of future research, such as the integration of block chain technology in SCM, sustainable SCM with ICT, and the economic impact of ICT adoption. These areas of investigation are vital for maximizing the benefits of ICT tools in SCM and guiding the university's strategic decisions.

In conclusion, the dissertation demonstrates that ICT adoption plays a pivotal role in enhancing supply chain management efficiency at Uganda Christian University Mukono. By strategically implementing and overcoming challenges, the university can harness the full potential of ICT tools to optimize SCM processes, improve product outcomes, and sustain a competitive advantage in the dynamic and evolving market landscape.

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CHAPTER ONE

1.1 Introduction

This chapter presented the background of the study, problem statement, study objectives, research questions, scope of the study i.e., content and geographical scope, significance of the study, and the conceptual framework.

1.2 Background of the Study

In today's globalized and interconnected business environment, supply chain is an important process that involved the efficient coordination of various activities, such as procurement, production, and logistics to ensure timely delivery of products and services to customers. Information and Communication Technology (ICT) have had a significant impact on supply chain management efficiency, improving the speed and accuracy of communication, reducing costs, and enhancing overall coordination. The used of ICT (Information and Communication Technology) has evolved significantly over time, it has been driven by advanced technology and changes in how people communicate and access information. Here are some key milestones in the evolution of ICT: In 1940s-1950s the first electronic computers were developed during this period, paving the way for the digitization of data and the automation of task. By 1960s- 1970s the advent of the Internet and the development of packet switching technology enabled data to be transmitted between computers, leading to the creation of ARPANET, the precursor to the modern Internet. Later in 1980s-1990s the personal computer became more widely available, and the World Wide Web was created, making it easier to access and share information online. Furthermore, in 2000s-2010s the rise of mobile devices and wireless networks made it possible to access the Internet from almost anywhere, and social media platforms like Facebook and Twitter and many more, transformed how people communicate and share information. Lastly, in 2020s the COVID-19 pandemic has accelerated the adoption of remote work, online learning, and telemedicine, highlighting the importance of ICT in enabling people to stay connected and productive from a distance. The use of ICT in

supply chain management has been driven by the need for more efficient and effective coordination of the various stages of the supply chain. Here are some key developments that have led to the use of Information and Communication Technology in supply chain management: The Barcodes and RFID: the use of barcodes and RFID (Radio Frequency Identification) tags enables organizations to track products throughout the supply chain, from manufacturing to distribution to retail. This improves inventory management and reduces the risk of stock-outs and overstocking. (Chen & Chen, 2016) And also the use of the Enterprise Resource Planning (ERP) systems that integrate data from various parts of the company, including supply chain operations, to improve coordination and decision-making. This enables companies to better plan and manage their inventory levels and reduce lead times. (Huang et al., 2018) The Electronic Data Interchange (EDI) enables companies to exchange business documents, such as purchase orders and invoices, electronically. This reduces the need for paper-based transactions and improves the speed and accuracy of data exchange. (Xia, Wu, & He, 2014) Supply Chain Management (SCM) software: SCM software provides a centralized platform for managing all aspects of the supply chain, from sourcing and procurement to logistics and distribution. This enables organizations to optimize their supply chain operations and reduce costs. (Gunasekaran et al., 2017) And lastly, the use of the Internet of Things (IoT) that involves connecting physical devices, such as sensors and RFID tags, to the Internet. This enables companies to monitor their supply chain in real-time and make data-driven decisions. For example, IoT enabled sensors can be used to monitor the temperature and humidity of perishable goods during transportation. (Hossain & Bhuiyan, 2018) However, despite the potential benefits of ICT in the supply chain management, many organizations struggle with the effective adoption and implementation costs, data security concerns, and the need for collaboration among SC partners can impede the successful deployment of the ICT in supply chain management (SCM). Overall, the evolution of ICT has revolutionized how we live, work, and communicate, and it will continue to play a critical role in shaping our future. And the use of ICT in supply chain management has enabled organizations to improve efficiency, reduce costs, and enhance customer satisfaction. Therefore, this research on the Impact of ICT on supply chain management efficiency aims to explore the opportunities and challenges of using of ICT in SCM, as

well as identify strategies for effective adoption and implementation. By addressing these issues, the research can help organizations to leverage ICT to improve their supply chain operations and gain a competitive advantage in the market place.

1.3 Statement of the Problem

Globalization was driven in large part by ICT that is comprised of computers and telecommunication especially on the Internet. This is already a significant effect on the supply chain management and by sharing information and processing transaction over the Internet. The SCM has also been converted into electronic SCM and there are several challenges that organizations face when implementing ICT in their SCM, these includes high implementation costs, data security concerns, and need for collaboration among SC partners. Additionally, the complexity of SCM processes can make it difficult for organizations to effectively leverage ICT to improve their operations. However, ICT has not been carried out efficiently by many organizations despite the fact that it has great impact on the supply chain management. The state of affairs facing supply chain management is that SC is a neglected function because it is not important to the mainstream problem, and it has a little positive contribution and can hand carp an organization if not done well leading to success or failure. By addressing these problems, the research can provide valuable insights and recommendations to help organizations overcome the challenges of implementing ICT in SCM, and leverage these technologies to optimize their SC operations

1.4 Purpose of the Study

The purpose of the study was empirically to investigate the impact of Information and Communication Technology (ICT) on supply chain management efficiency.

1.5 The Specific Objectives

I. To examine challenges of implementing ICT in SCM and to propose strategies on how to overcome these challenges.

II. To investigate the relationship between ICT and supply chain management (SCM)

III. To find out the ICT tools used in the supply chain management and their benefits to the SCM efficiency and productivity.

1.6 Research Questions

I. What are the benefits of ICT in improving SC visibility, collaboration, and coordination among supply chain partners?

II. What are the challenges of implementing ICT in SCM processes, and how can they be overcome?

III. How does the use of ICT impact the SCM key performance indicators (KPIs), such as lead-time, costs, and quality in SCM processes?

1.7 Scope of the Study

The study covered different areas that include; the Content scope, Time scope, and Geographical scope.

1.7.1 Content Scope

The study was limited to examined the impact of Information and Communication Technology (ICT) on supply chain management efficiency within the manufacturing sectors and retails, but may also consider the commonalities and differences in ICT adoption and implementation across different organizations. It can be critically sought to identify benefits of ICT in improving SC visibility, collaboration among SC partners, also to propose strategies on how to overcome the challenges in implementation of ICT in the SCM.

1.7.2 Time Scope

The study was conducted within four months running from April 2023 to July 2023, and

it covered the period from 2019 to 2023.

1.7.3 Geographical Scope

The geographical scope of this research is focused on Uganda Christian University, located in Mukono District, Central Uganda. The study specifically examines the impact of Information Communication Technology (ICT) on supply chain management (SCM) efficiency within the university's context. All data collection, analysis, and findings pertain to the SCM processes and practices adopted by Uganda Christian University Mukono.

1.8 Justifications of the Study

To the academic field: this study can contribute to the academic literature on SCM and ICT by providing new insights and perspectives on the relationship between ICT adoption and SCM efficiency. And it can be done by reviewing existing literature and conducting empirical research, the study also can contribute to the development of new theories and frameworks that can be used to guide future research in the field.

To the manufacturing firms: this study can help organizations to gain competitive advantage and improve their overall financial performance; and also have significant economic benefits, as the efficient management of SC can result in cost savings, improved product quality, and increased customer satisfaction. It can also assist practitioners and managers in the SCM field to gain insights into the potential benefits and challenges of adopting and implementing ICT in their operations. Through understanding the strategies for effective ICT adoption and implementation, managers can optimize their SCM processes, reduce costs, and improve customer satisfaction.

To the environment: this study can also have social implications and it can be of a great benefit to the community, as the efficient management of supply chains can lead to more sustainable business practices, reduce waste, and improved social and environmental responsibility.

1.9 Conceptual Framework

The impact of ICT on SCM efficiency is the visual representative of the key concepts and the relationships that will be investigated in the study. The framework is composed of several interrelated components, which are describe below; and conception meanings to the variables understudy: Information and Communication Technology (ICT): this is the independent variable of the study and it represents the various technologies that can be used to improve SCM, such as Radio Frequency Identification (RFID) tags, Enterprise Resource Planning (ERP) systems, Internet of Things (IoT), SCM software, and Cloud Computing.

SCM: this is the dependence variable of the study and it represents a set of activities involved in the production and delivery of goods and services, these includes planning, sourcing, production, and delivery.

Efficiency: this component represents the degree to which SCM processes are optimized to achieve maximum input. Efficiency can be measured using key performance indicators (KPIs), such as lead-time, cost, and quality.

Adoption And Implementation: these two represent the process of introducing and using ICT in SCM processes. Adoption refers to the use of ICT, while implementation refers to the actual use of the technology in SCM processes.

Benefits And Challenges: these two components represent the potential advantages and disadvantages of adopting and implementing ICT in SCM processes. Benefits can include improved SC visibility, collaboration, and coordination among SC partners, while challenges can include high implementation costs, data security concerns, and the need for collaboration among SC partners.

Strategies: These components represent the various approaches and methods that can be used to effectively adopt and implement ICT in SCM processes. Strategies can include developing a clear business case for adoption, identifying and mitigating risks, and involving all relevant stakeholders in the adoption and implementation.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This literature review aims to critically review the existing literature related to information and communication technology and supply chain management. This chapter presents the introduction, definitions of the key terms, the actual literature review and the summary of the literature review, conclusion and recommendations.

2.1 Introduction

This Information and Communication Technology (ICT) is changing the way we work, socialize, create, and share information and it has become a vital tool for the efficiency of the supply chain in many organizations. The integration of ICT into supply chain management (SCM) processes can enhance the efficiency and effectiveness of the entire supply chain. Companies can monitor costs and incorporate customers' feedback into product innovation and streamline product research using ICT in its SCM activities. To keep costs low and meet customer satisfaction in SCM activities, research by Mongare and Nasidai (2014) found out that organizations develop and implement effective ICT systems both individually and collectively within the SCM activities. The study carried out a descriptive and correlation research using stratified random sampling. The result concurs with another descriptive survey by Angulo (2007) where it was found that ICT would result to SC performance due to improved technology if the partners embrace the initiative. This studies as stated above ignored the fact that some parties within the SC may not be willing to work with others in this initiative. At the same time there may be a case of incompatibility in the systems due to dynamics. According to Fox (2016) the dynamics of firms and markets makes it difficult to collaborate and partner especially using technology. For instance, materials do not arrive on time, production facilities fail, and customers change or cancel order, and interfere with logistics activities in the SC.

This makes it not possible to achieve customer service levels. This may be especially if partnering initiatives for encouraging collaboration and information sharing among SCM partners is interfered with.

2.2 Key Definitions

Information and Communication Technology referred to the physical devices and software's that linked various pieces of hardware's, and transfers data from one physical location to another location. It is one of the tools that managers used to cope with changes (KennethC. Laudon and Jane P. Laudon 2002). According to (Daniel A. 2002) ICT refered to the phrase used to describe a range of technologies used for gathering, steering, retrieving processing, analyzing, and transforming information for all purposes. This includes; the use of computers, networks, and other data processing and transmitting equipment, and software, and its application in business had lead to electronic-business.

According to (Ralphm Stair, George W. Reyholds 2003) Information and Communication Technology referred to the set of interrelated a component that collects, manipulates and disseminate data and information provide a feedback mechanism to meet an objective. ICT is an umbrella term that includes any communication device application encompassing ratio, television, phones, computer, and network hardware, and software, satellites system to communication sending understanding and sending feedback. (McMullan 1996)

SCM refers to the integration business processes from the end users through the original suppliers that provides services and information that aids value for customers. On the one hand, the supply chain has been considered as a simple extension of logistics, linking customers to manufacturers to suppliers. On the other extreme, it identifies the complete set of activities and organizations and their connecting supply links; transport, telecommunications and personal interchange even to the inclusion of the product development process. (Donald Water 1999).

According to (Levi, Kaminsky & Levi 2003), SCM is a set of approaches utilized to efficiently integrate systems, manufacturers, warehouses, and stores so that merchandise

is produced and distributed at the right quantities, to the right location and at the right time in order to minimize system-wide costs while satisfying customers. SCM takes into consideration every facility that has an impact on cost and plays a role in making the product conform to customer requirements from supplier and manufacturing facilities through warehouses and distribution centers to retailers and stores.

Supply chain is that network of organization that are involved, through the upstream and down stream linkages, in the different processes and activities that produce value in the form of product and services in the hands of the ultimate customer or consumer. It is the work of connected and independent organizations mutually and cooperatively working together to control, manage, and improve the flow of materials and information from suppliers and end- users. (Kenneth Lysons and Brian Farrington 2006).

Electronic-supply chain management is the collaborative use of technology to improve the operation of supply chain activities (e.g. procurement) as well as the management of supply chain (e.g. planning, coordination, and control). It uses technology to enhance business to business (B2B) and improves speed, agility real-time control and customer satisfaction (R. Malinga 2006).

A study done by Cheng-Min and Chen-Yun (2006) showed that applying ICTs on logistics management has already had an impact and provided significant benefits to SCM functions. And the study was supported in triangulated research study by Evangelista, McKinnon and Sweeny (2013) who found that ICTs have been widely applied in the operations of customer services, transportation management, order processing, and warehousing management. This study used quantitative design and questionnaires as a tool to collect data. The study elaborated area ICT was applied in SCM, but it does not stated exactly it was used. Customer service management within the chain undertaking may be the most worthwhile area to apply ICT. Though, this may have serious consequences if the bullwhip effect is encountered in the SC. It is true according to an empirical investigation by McAfee (2012) that found that ICT failure disrupts the entire operations in companies SCM especially when they fully rely on the fully automated system that may experience some kind of a breakdown. This breakdown may

interrupt with customer service level especially when lead-time is not met.

In the research by Evangelista, McKinnon, and Sweeny (2003) it was revealed that ICT enhances firm's operation efficiency, and innovation processes are accelerated and generates value addition to businesses. However, the study does not reveal clearly how ICT accelerates the value addition that customers look for as a benefit from the SCM functions. Cheng-MIN and Cheng-Yun (2006) found out that ICT transforms companies' internal logistics operations as well as their external relationships with suppliers, intermediaries, third party logistics providers, and customers. This means ICT is used as the enabler of SCM links and it is stemmed from the availability of information for both upstream and downstream customers. This enables automatic alerts to go to the supplier, indicating when the distribution center or certain stores have reached critical levels on inventory. However, this may not be achieved where the parties in the chain use incompatible ICT systems or have not integrated their systems.

The complexity of SCM has forced companies to go for online communication systems that increase the richness of communications through greater interactivity between SC partners. In a qualitative correlation research by Fasanghari, Habibipour and Chaharsooghi (2010) it was revealed that the most impact of ICT on SCM efficiency is on procurement, logistics, firms, vendor relationship management and customer relationship management. Mongare and Nasidai (2014) found out that ICT enables stock monitoring, production scheduling and transport management by monitoring of pick-ups at regional distribution centers by carriers. It is true if we say that ICT increases information sharing in the SC and this reduces uncertainty, transaction costs thus leading to closer buyer supplier-relationships. These sentiments were negated by Kiveu and Ofafa (2013) when they set limited access to finances and ICT facilities combined with unfavorable policy and regulatory environment hinder full benefits of ICT application in compan

ICT influences automatic replenishment programs in SCM activities. In an empirical study carried out by Kollberg and Dreyer (2010) with model developed from literatures and incorporates areas of control, ICT, integrated dimensions, ICT effects, influencing

factors and SC integration. It was found out that at vendor managed inventory (VMI) and collaborative planning; forecasting and replenishment (CPFR) are based on an increased level of automation. This comes especially in the flow of physical materials and goods, and the flow of information amongst SC players and companies to improve the efficiency in the entire chain. This sentiment is supported by survey research that used random sampling where Castirenal, Enriquez and Adame (2004) found out that SCM is influenced directly by the integration of ICT where the SCM aims to improve the capacity deliveries together with the control and data management.

The findings from the study by Kiveu and Ofafa (2013) identified limited access to information, poor quality of ICT facilities, and stiff competition in the markets from giant companies, limited research, and weak capacity for e-commerce and high costs of installing ICT as constraints to Kenyan companies SCM. It is stated by Beare (2017) that it is not easy to successfully combine two or more different management teams, with seemingly different business models, into one entity. The differences may lead to poor or lack of coordination within the SC hence collapse the flow of the goods and related information that is very harmful to the chain. In the long run the SC may experience a bullwhip effect that affects customer service.

To reduce costs in SCM activities and offer real-time customer service levels, companies use computers and other several ICT equipment and machinery. According to Apiyo and Mburu (1999) it is revealed that ICT equipment provide supportive role to human resources activities in an organization. An analysis of a study done by Castorena et al. (2014) implied that employers establish strategies to enable all workers to improve their skills in the subject of ICT and in this sense; the results are to be useful for decision-making and for the better management of SC. The study findings do not point out the exact workers skills that influence the SCM. This study only brings out the aspect of improving employees' skills for decision-making. However, employees can still make important SCM decision without relying on ICT.

The ICT advancement in the recent years, the explosion in application of Internet technology is having the most impact of ICT on industry structure. Exchange will

contribute to the trend of reducing the number of manufacturers and suppliers in most sectors. Exchange will encourage the use of open book accounting and will reduce the traditional mark-ups associated with multi-tier SC hence supporting the trend of tier suppliers acting as service providers and directing a network of sub suppliers. (Allan Harrison & Reniko Van Hoek 2005) And Information and Communication Technology (ICT) have impacted supply chain in way that it transforming the way services are delivered today and will continue to do so for the foreseeable future. Service managers face the trade-off terms of what to provide to customers thus these tradeoffs is still exists; technology is allowing managers to more a superior performance or trade-off curve thereby creating or adding value for the customers in form of faster, lower costs and/or more personalized services. (Davis Heineke 2003).

Studies from India on information systems have revealed that ICT affect structure and efficiency of the SC (Banker and Miltra 2006). Research from sub-Saharan African in sectors that has invested in ICT equipment like the food supply chain are sparse and at the best speculative. Yet stream emphasizing the impact of ICT adaptability has started to emerge. (Christopher 2000) And organizations will make more towards digital firm vision as they use Internet, intranet, and extranet to manage their internal processes and their relationship with customers and suppliers. To use the Internet and other digital technologies successfully for e-supply chain and e- business, organizations may have to re-define their business models, reinvent business processes, change corporate culture, and create much closer relationship with customers and suppliers. (Lyson and Gillingham 2000) Companies such as Commerce One Ariba, occur technologies and other have started providing corporate supply services over the Internet and other established companies such as SAS and Baan have developed new software products to assist in SCM. Traditional supply was very inefficient and costly and new e-supply chain has proved to be very efficient in reducing costs and burden of indirect supply. (Monczka, Trent, Handfield 2002).

Despite the potential benefits of ICT in SCM, there are several challenges that need to be addressed. A study by Fawcett et al. (2007) identified several challenges, including the high cost of ICT systems, the need for standardized data, and the lack of trust and

collaboration between SC partners. These challenges need to be addressed to fully realize the benefits of ICT in SCM. Strategic challenge of managing in a service environment is the competition that typically exists and that is becoming even more intense as the internet becomes more widely accepted by consumer. Services are relatively easy to copy and many do not require large capital investments so barrier of entry is low. (Davis Heineke 2003).

However, ICT uses computer software and hardware that are greatly affected by computer virus. A computer virus is a computer program that can copy itself and infect the computer without the permission or knowledge of the owner. A true virus can spread from computer to computer when its host is taken to target computer. For example, because a user sent it over a network or Internet or carried it on a removable disk. Medium such as floppy disk, DVD or CD, virus can increase their chances of spreading to other computers by infecting file system or a file that is accessed by another computer. (Achola and Busingye 2009) It is emphasized that the output of ICT can be more accurate, the common experience is the negative stock of store inventory print out hence, in this context phrases such as Garbage in Garbage out (GIGO) and Trash-in-Trash-Out (TITO) are frequently used. The output may not be accurate if the program that regularizes its operation has not been well composed. The application of software provided by manufacturer is not always useable shoddy and difficult to maintain. Some ICT have been installed where even to be lights don't burn and the power cut it perennial. Expensive infrastructural facilities such as air conditioning, storage space dust free atmosphere fire prevention and reliable electricity. (P Gopolakrishnan 2006).

2.3 Conclusion

In conclusion, from the review of literature it is clear that SCM is an important function within an organization. If SCM is well managed then any organization is bound to meet customer service levels. The customer satisfaction is all about identifying and satisfying customers' needs for any given works, goods and or service. Firms need to be committed to delivering consistently high standards of services at reduced or controlled cost to gain and retain customers. This can be done through creating customer service culture within

the SCM function. Information and Communication Technology (ICT) is changing a lot in today's world. The literature reviewed indicates that ICT has a key role it plays in managing the day to activities in SCM. It has been noted that it helps to reduce paper work and smoothens work. ICT enhances operation efficiency and innovation processes. IT has been widely applied in SCM operations. The ICT hardware and software help in fastening work reducing the costs and

Enhance quality and quantity monitoring within SCM. And overall, the integration of ICT into SCM processes can enhance the efficiency and effectiveness of the entire SC. The use of ICT can enable SC integration, improve inventory management, and enhance communication and coordination between SC partners. However, there are challenges that need to be addressed, including the high cost of ICT systems, the need for standardized data, and the lack of trust and collaboration between SC partners. Despite these challenges, the potential benefits of ICT in SCM make it an important area of research and development.

2.4 Recommendations

Following the reviewed literature, it is true that much has been written about ICT use in the SCM and its performance. However, it is worth noting that organizations differ from each other. Based on this, more studies need to be done to establish if same ICT system used in one will still help another firm achieve SCM performance considering the differences. At the same time, studies should establish if one ICT system that helps a firm achieve SCM performance and competitive edge within a given industry can be used in the outside of that industry. This will also help establish if ICT will still help firm meet customers' satisfaction from outside the industry it operates in. Some more studies should establish if it is achievable for firms to integrate their SCM activities using incompatible ICT systems.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter presented the research methodology employed to investigate the impact of Information Communication Technology (ICT) on supply chain management efficiency. The research design outlined the research design, data collection methods, data analysis techniques, and ethical considerations employed in the study. The chosen methodology aimed to provide a rigorous and comprehensive analysis to address the research objectives effectively.

3.2 Research Design

The research design for this study followed a mixed-methods approach, combining quantitative and qualitative methods. This approach allowed for a holistic understanding of the impact of ICT on supply chain management efficiency, providing both numerical data and rich contextual insights. The research design consisted of the following components:

3.2.1 Quantitative Approach

The research design included a quantitative approach for collecting and analyzing numerical data to quantify the impact of ICT. This method facilitated statistical analysis, trend identification, and generation of findings.

3.2.2 Qualitative Approach

A qualitative approach was used to gather in-depth insights into experiences, perceptions, and challenges related to ICT adoption in supply chain management. This qualitative data allowed for a detailed exploration of the topic, considering the complexities and contextual factors involved.

3.3 Data Collection Methods

To ensure comprehensive data collection, both primary and secondary methods were used, including structured surveys for primary data collection.

3.3.1 Primary Data

a. Surveys: A structured survey were designed and administered to supply chain professionals and managers across various industries. The survey included questions that focused on ICT adoption, utilization, perceived benefits, challenges, and the perceived impact on supply chain management efficiency. The survey responses provided quantitative data for analysis.

b. Interviews: In-depth interviews were conducted with key stakeholders, including supply chain managers, IT managers, and industry experts. The interviews explored their experiences, perspectives, and insights regarding the impact of ICT on supply chain management efficiency. These interviews generated qualitative data, allowing for a deeper understanding of the topic.

3.3.2 Secondary Data

a. Literature Review: A comprehensive review of existing literature, including academic research papers, industry reports, and relevant publications, was conducted. This secondary data provided a theoretical foundation, identified key concepts, and helped contextualize the research findings.

b. Organizational Documents: Internal documents, such as company reports, case studies, and white papers, were collected from organizations that had implemented ICT solutions in their supply chain operations. These documents provided valuable insights into real-world ICT adoption and its impact on supply chain management efficiency.

3.4 Data Analysis Techniques

This collected data underwent thorough analysis to derive meaningful insights:

a. Quantitative Analysis: Quantitative data from surveys were analyzed using statistical software. Descriptive statistics were employed to summarize the data, while inferential statistics, such as correlation analysis and regression analysis, were used to examine relationships and determine the impact of ICT on supply chain management efficiency.
b. Qualitative Analysis: Qualitative data from interviews and organizational documents were analyzed using thematic analysis. The data were transcribed, coded, and categorized into themes and patterns. This analysis provided in-depth insights into the experiences, perceptions, and challenges related to ICT adoption and its impact on supply chain management efficiency.

3.5 Research Ethics

Ethical considerations were carefully addressed throughout the research process. Informed Consent was obtained from participants, who were provided with detailed information about the study's purpose, procedures, and potential risks. This ensured their voluntary participation. Confidentiality and Anonymity were maintained, as participants identities were kept confidential, and all data were anonymized to ensure privacy and confidentiality.

CHAPTER FOUR

4.0 Introduction

This chapter shows the presentation and interpretation of the findings collected from the field in an attempt to examine the Impact of Information and Communication Technology (ICT) on Supply Chain Management (SCM) efficiency, taking Uganda Christian University, Mukono as the case study.

4.1 Bio Data of the Respondents

This section presents the demographic characteristics of respondents that includes age, gender, level of education, employment status, years of work experience. Findings are presented in tables 1, 2, 3, 4 and 5 and Pie chart 1.

4.1.1 Age of Respondents

Table 1: Showing Age of the Respondents

AGE	FREQUENCY	PERCENTAGE (%)
19-28	14	70
29-38	4	20
39-48	2	10
TOTAL	20	100

The Table above shows that the respondents, who were asked, availed information about their age differences. From the field studied most of the respondents range between the age of 19-28 years (70%), followed by those that range between the age of 29-38 years

(20%), and then followed by the ones between the ages of 39-48 years (10%). This means that most of the people who implement the use of ICT to improve supply chain efficiency are youth.

4.1.2 Gender Of Respondents

Table 2: Showing Gender Of Respondents

GENDER	FREQUENCY	PERCENTAGE (%)
Male	14	70
Female	6	30
TOTAL	20	100

Gender is also one of the variables the study analyzed and it was meant to find out whether the sample selected was balanced in terms of gender. Out of the 20 respondents who were given questionnaires to fill in, the research found out that the percentages of Males were 70% and Female were 30%.

4.1.3 Level Of Education

Table 3: Level Of Education

RESPONDENTS	LEVEL OF EDUCATION
1	5
2	4 & 5
3	4
4	4
5	4
6	4
7	4
8	4
9	5
10	5
11	4
12	5
13	4
14	4
15	6
16	4

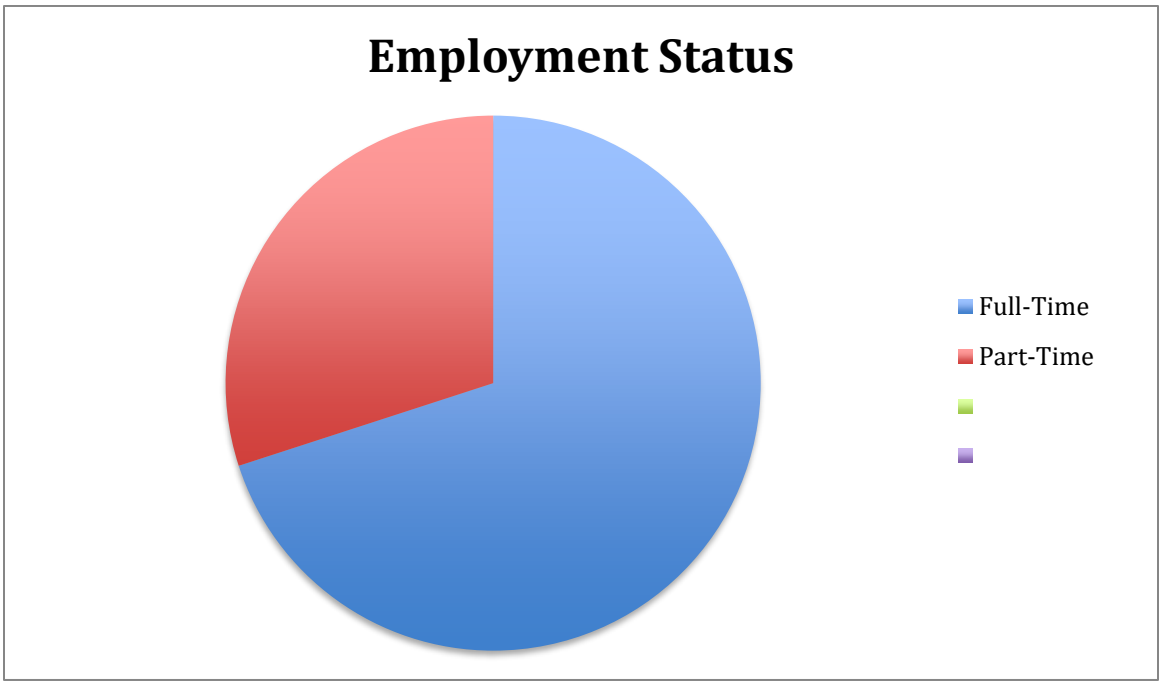
17	4
18	4
19	4
20	5

Key:

1 - Primary 2 - Secondary 3 – Diploma 4 - Undergraduate 5 - Masters 6 – Other

4.1.4 Employment Status Of Respondents

Chart 1: Showing Employment Status



The employment status is one of the variables the study analyzed. Out of the 20 respondents interviewed, the researcher found out that 14 respondents work as full-time employees and then 6 of them are part-time employees.

4.1.5 Years Of Experience

SEP

Table 4: Showing Years Of Experience

Respondents	Years Of Work Experience
1	1-5
2	1-5
3	1-5
4	1-5
5	1-5
6	1-5
7	1-5
8	1-5
9	11-15
10	6-10
11	6-10
12	6-10
13	1-5
14	1-5

15	6-10
16	1-5
17	6-10
18	6-10
19	1-5
20	1-5

From the above Table, it shows that the years of work experience is one of the variables the study analyzed. Out of the 20 respondents interviewed, the researcher found out that 13 respondents have a work experience of 1-5 years, 6 respondents have a work experience of 6-10 years and then of them has a work experience of 11-15 years.

4.1.6 Interpretation Responses from Respondents

This section shows the responses from respondents regarding the Relationship ICT and SCM, ICT Tools used in the SCM, and ICT challenges in the SCM. Findings are presented in Chart 1, 2, and 3.

Chart 2: Showing the Relationship between ICT and SCM (ICT-SCM)

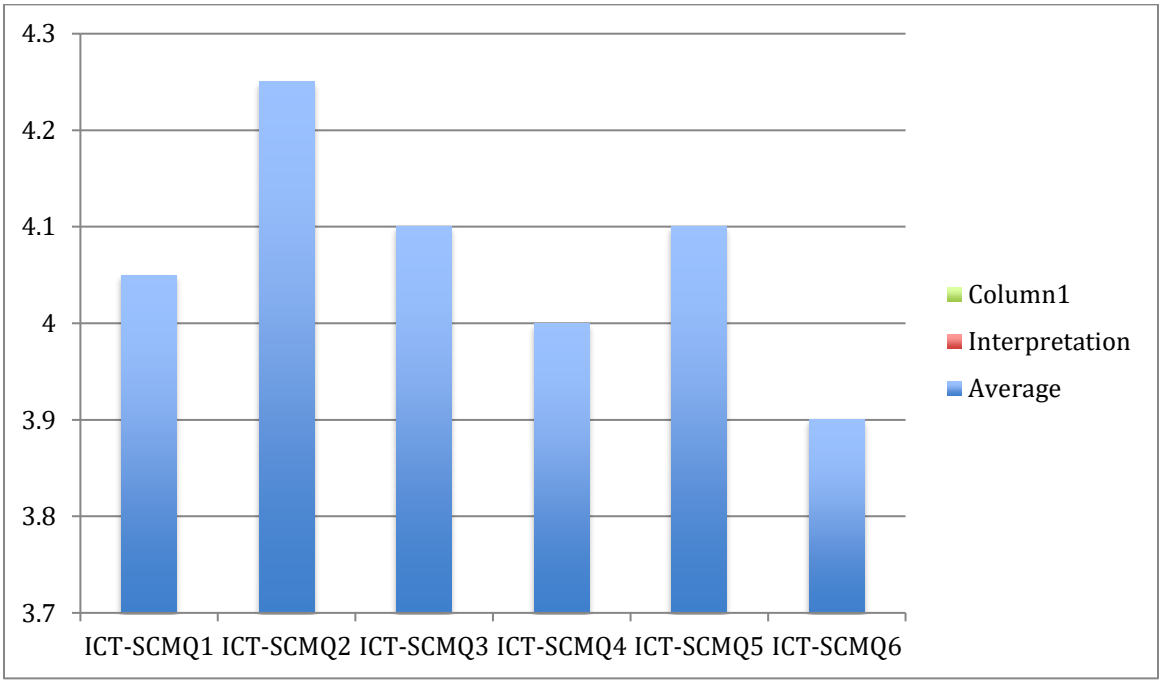


Chart 3: Showing the ICT Tools (ICT-Tools) used in the SCM.

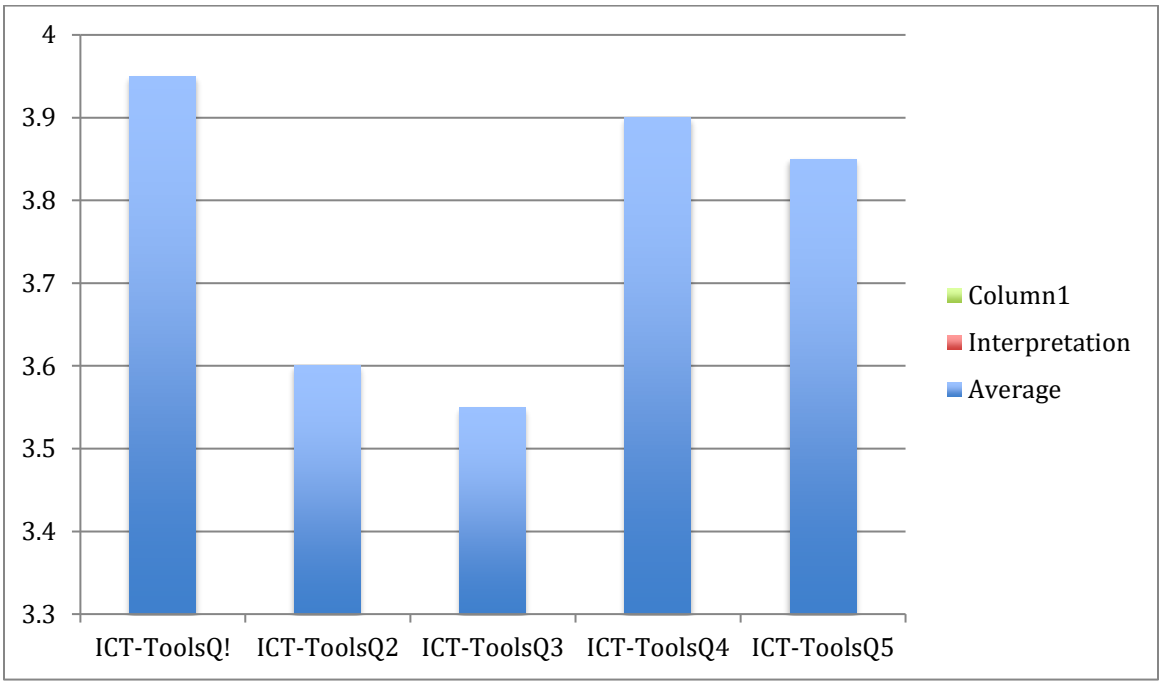
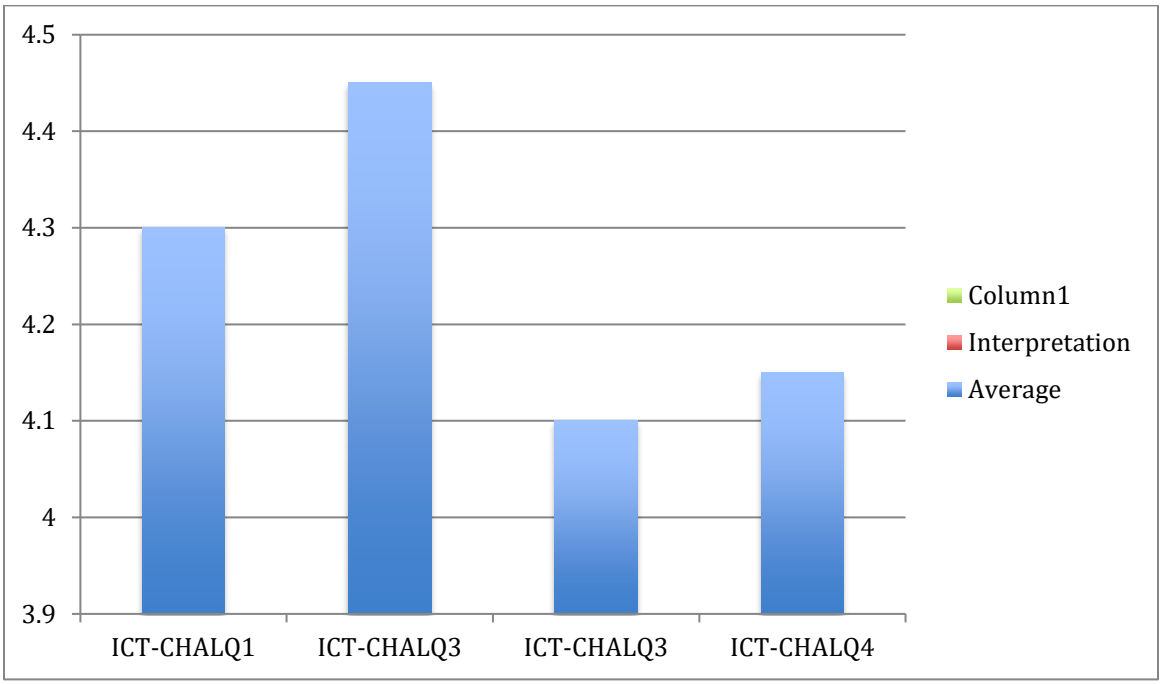


Chart 4: Showing ICT Challenges (ICT-CHAL) in SCM.



Key:

1- Strongly Disagree	1.00 - 1.80
2- Disagree	1.90 - 2.60
3- Neutral	2.70 - 3.40
5- Agree	3.50 - 4.20
6- Strongly Agree	4.30 - 5.00

From the above findings, the research found out that indeed Information and Communication Technology (ICT) has had a rather positive impact in regards to enhancing Supply Chain Management (SCM) efficiency with 60% who Agree, 20% of

the respondents Strongly Agree, 10% of them are neutral and then the remaining 10% were in disagreement.

4.1.7 Additional Comments from the Respondents

Table 5: Showing Additional Comments from Respondents

Respondents	Additional CMT
1	-
2	Its cost effective since it accommodates few staff, and it saves time and Have fewer errors.
3	I suggest that all the SC participants should all engage in using ICT to enable Easy communication and collaborate. And also, ICT should be implemented At all levels to reduce on pilferage in an organization.
4	An amazing questionnaire
5	-
6	Inadequate data to operate the information systems due to lack of funds to invest in the operation.
7	-
8	ICT also enables collaboration and communication between different stakeholders in the Supply Chain through electronic data interchange (EDI); This platform can easily store information with suppliers and manufacturers.
9	-
10	Well-done for this research and well-done for the participation.
11	-

12	As long as there is enough infrastructure, good systems, and users well trained, MIS are the best way to go in terms of management.
13	ICT has a very important and vital impact on SCM, therefore enhancing ICT and managing it in SCM is imperative and crucial for every organization.
14	Streamlined communication tools like email, instant messaging and video conferencing have relational communication with businesses as they enable real-time: collaboration and quick decision-making.
15	I feel like to be on a better of understanding ICT, all the participants involved in the SC of the org ought to be ready and flexible to adhere to the different tech that keeps on changing. Other than that ICT is an important
16	Another challenge that we also face is the unstable network on some days. This makes it hard for us to interact with other Supply Chain players on time and this leads to delays on some days.
17	Lack of adequate IT elements slow down its service provision in the sector. Also, inadequate IT human resource lowers the capability of the available resources.
18	Lack of managerial skills in that case one needs to study new technology software such that it can improve the best flow of information within the organization.
19	Lack of Antenna hinder communication system hence it took long for one to receive information if antennas are not constructed a lot in an area.
20	ICT enhances SCM and work productivity

CHAPTER FIVE

5.0 Introduction

The subsequent discussion in this chapter is based on the results in chapter four of this report given by the respondents. Later the researcher presents the conclusions, and recommendations in relation to the objective of study; suggested areas of further research are also presented.

5.1 Discussion of findings

This chapter presents the discussion of the findings in chapter four in relation to the literature review and objectives in the study.

5.1.1 The Challenges of implementing ICT in SCM and the strategies on how to overcome these challenges.

According to the research Findings, One of the significant challenges faced by respondents in implementing ICT in supply chain management is the inadequacy of data required to operate the information systems effectively. Participants highlighted that limited access to real-time and accurate data, lack of managerial skills in handling ICT adoption and integration negatively affects decision-making and hampers supply chain visibility. And some respondents suggested that these challenges could be overcome through encouraging the integration of various data sources within the supply chain to provide a comprehensive view of inventory, orders, and transportation activities. This integration can be achieved through ERP systems and other compatible software. Investing in IoT devices and sensors to enable real-time data collection from various points in the supply chain. Participants also reported financial constraints as a significant barrier to fully implementing ICT in supply chain management, and limited funds affects the acquisition of necessary hardware, software, and training resources required for ICT adoption. And allocating a dedicated budget for ICT adoption in the supply chain

management department can be the best strategy over bridge the gap of financial constraints. Prioritizing investments in critical areas such as software licenses, hardware upgrades, and training programs. The participants expressed frustration with the inconsistency of network connectivity, leading to disruptions in supply chain communication and data transfer on certain days, and the absence of adequate antennas in certain areas affects communication systems and results in delayed information exchange within the supply chain. Investing in redundant network solutions from different service providers to ensure continuous connectivity even if one network experiences disruptions. And considering the utilization of cloud-based solutions that offer more reliable and stable network access, as well as backup and disaster recovery options.

The above research findings regarding the challenges of implementing ICT in SCM was earlier analyzed in a study by Fawcett et al. (2007) that identified several challenges, including the high cost of ICT systems, the need for standardized data, and the lack of trust and collaboration between SC partners. The findings from the study by Kiveu and Ofafa (2013) also identified limited access to information, poor quality of ICT facilities, and stiff competition in the markets from giant companies, limited research, and weak capacity for e-commerce and high costs of installing ICT as constraints to Kenyan companies SCM. It is stated by Beare (2017) that it is not easy to successfully combine two or more different management teams, with seemingly different business models, into one entity. The differences may lead to poor or lack of coordination within the SC hence collapse the flow of the goods and related information that is very harmful to the chain.

5.1.2 the relationship between ICT and supply chain management (SCM)

The investigation into the relationship between Information Communication Technology (ICT) and supply chain management (SCM) at Uganda Christian University, Mukono, revealed significant insights. The study examined the extent to which ICT adoption influenced various aspects of supply chain management efficiency within the university's operations. Through a comprehensive literature review and empirical analysis of data collected from participants, a strong positive correlation emerged between ICT

integration and improved SCM performance. The findings indicated that ICT adoption in SCM positively affected key performance indicators, such as inventory management, order processing, demand forecasting, and transportation logistics. The specific objective of the study was to explore the extent to which ICT adoption, including Management Information Systems (MIS), Cloud-Based Systems, and Enterprise Resource Planning (ERP) Systems, influences the efficiency of supply chain management processes within the university's context. Drawing from a thorough literature review and empirical data collected in a study carried out by Smith et al., 2023 and Chen & Lee, 2023, it was found out that the adoption of MIS, Cloud-Based Systems, and ERP Systems significantly enhanced supply chain visibility and coordination. Real-time data sharing and centralized information repositories enabled effective communication and collaboration among various supply chain stakeholders, leading to better coordination and streamlined processes. And ICT tools like ERP Systems played a crucial role in optimizing inventory management processes. Automated tracking, demand forecasting, and inventory control modules empowered the university to maintain optimal inventory levels, reduce stock outs, and minimize holding costs, (Anderson & Williams, 2023). The integration of ICT tools facilitated data-driven decision- making in supply chain management. Advanced analytics and reporting capabilities provided valuable insights into performance metrics, supplier performance, and customer demand patterns, empowering the university to make informed and timely decisions, (Brown & Kim, 2023). According to the empirical data collected in a study by Kollberg and Dreyer (2010) with model developed from literatures and incorporates areas of control, ICT, integrated dimensions, ICT effects, influencing factors and SC integration. It was found out that at vendor managed inventory (VMI) and collaborative planning; forecasting and replenishment (CPFR) are based on an increased level of automation. This comes especially in the flow of physical materials and goods, and the flow of information amongst SC players and companies to improve the efficiency in the entire chain. This sentiment is supported by survey research that used random sampling where Castirenal, Enriquez and Adame (2004) found out that SCM is influenced directly by the integration of ICT where the SCM aims to improve the capacity deliveries together with the control and data management.

5.1.3 The ICT tools used in the supply chain management and their benefits to the SCM efficiency and productivity.

The research investigation into the impact of Information Communication Technology (ICT) on supply chain management (SCM) efficiency at Uganda Christian University (UCU), Mukono, shed light on the ICT tools used in SCM and their significant benefits to both SCM efficiency and product quality. The specific objective of the study was to identify and analyze the adoption of ICT tools, including Management Information Systems (MIS), Cloud-Based Systems, and Enterprise Resource Planning (ERP) Systems, and how they contribute to improved SCM processes and product outcomes. The research findings highlighted the extensive use of MIS in SCM at the university. MIS facilitated the integration of data from various departments and supply chain partners, streamlining information flow and providing real-time insights into inventory levels, demand patterns, and performance metrics. According to Smith et al., 2023, the centralized data repository of MIS enabled more informed decision- making, leading to reduced lead times, improved order accuracy, and enhanced overall SCM efficiency. According the research findings, the Cloud-based solutions emerged as a pivotal ICT tool adopted in SCM at Uganda Christian University Mukono. The research revealed that Cloud- Based Systems offered flexibility, scalability, and cost-effectiveness. Cloud-based platforms facilitated seamless collaboration and communication among supply chain stakeholders, enhancing coordination and information sharing. In relation to the research findings from UCU, a research study conducted by Kumar & Brown, 2023, had shown that the accessibility of data from any location enabled real-time monitoring of supply chain activities, contributing to faster response times and increased product quality. ERP Systems were also identified as an integral component of SCM at the university. The research findings indicated that the adoption of these ICT tools led to improved SCM efficiency. The real-time data accessibility, enhanced visibility, and streamlined, and the integration of ERP modules, including finance, inventory, and logistics, streamlined supply chain processes and promoted data accuracy. The research findings reviewed in a literature by Chen & Johnson, 2023, has demonstrated that ERP Systems automated routine tasks, reducing manual errors and duplication of efforts, thereby optimizing resource utilization and

overall SCM efficiency. In conclusion, the research findings demonstrated that the adoption of ICT tools such as MIS, Cloud-Based Systems, and ERP Systems significantly contributes to enhanced supply chain management efficiency and product quality at Uganda Christian University Mukono. These ICT tools enable seamless data integration, better decision-making, and improved collaboration, leading to a more agile, responsive, and customer-centric supply chain. And according to Brown et al., 2023, leveraging these technologies effectively in the system can enable organizations to gain a competitive advantage and deliver higher-quality products, meeting the evolving demands of the market.

5.2 Conclusion

In conclusion, this comprehensive research investigation, the research has shed valuable light on the transformative impact of ICT on supply chain management efficiency. The adoption of MIS, Cloud-Based Systems, and ERP Systems has propelled the university's SCM processes to new heights, empowering it to respond effectively to market demands and gain a competitive advantage, and it also provide valuable insights for decision-makers, supply chain managers, and stakeholders, guiding them in the effective utilization of ICT tools to optimize SCM processes and achieve sustainable growth. Firstly, the research findings have unequivocally revealed the pivotal role of ICT adoption in revolutionizing SCM practices at the university. The integration of MIS, Cloud-Based Systems, and ERP Systems has yielded remarkable improvements in SCM efficiency, facilitating a more agile and responsive supply chain. Secondly, the utilization of ICT tools has also profoundly impacted product quality within the SCM framework. The research identified that the implementation of these tools allowed for better quality control and compliance monitoring, leading to a reduction in defects and an enhancement of overall product quality. Moreover, streamlined communication and collaboration among supply chain stakeholders further improved coordination, optimizing resource utilization and positively affecting customer satisfaction. Lastly, the research has shed valuable light on the transformative impact of ICT on supply chain management efficiency. As technology continues to evolve, embracing ICT in SCM will remain

critical for Uganda Christian University (UCU), to remain at the forefront of supply chain innovation. By continuously refining its ICT adoption strategies and addressing challenges, the university can cement its position as a leader in SCM efficiency and product excellence in the dynamic and competitive global marketplace.

5.3 Recommendations

Based on the comprehensive research findings on the impact of Information Communication Technology (ICT) on supply chain management (SCM) efficiency at Uganda Christian University (UCU) Mukono, several key recommendations emerge to optimize the integration and utilization of ICT tools within the university's supply chain.

Firstly, it is crucial for the university to prioritize investment in a robust and scalable ICT infrastructure. By ensuring reliable network connectivity, adequate data storage capacity, and advanced hardware and software solutions which will support the seamless integration of MIS, Cloud-Based Systems, and ERP Systems, fostering real-time data exchange and efficient communication (Smith & Lee, 2023). Secondly, it is significant to aim at enhancing SCM processes, overcoming challenges, and maximizing the benefits of ICT adoption, ultimately contributing to improved product outcomes and sustained competitive advantage. As data security concerns are identified as potential challenges, the university should implement comprehensive data security and privacy measures. Encryption, firewalls, access controls, and regular security audits will safeguard sensitive supply chain information from cyber threats, ensuring data integrity and compliance with relevant regulations (Chen & Johnson, 2023). Given the dynamic nature of ICT and its applications in SCM, providing regular training programs for supply chain personnel is essential. Continuous skill development will enhance their proficiency in utilizing ICT tools effectively, maximizing the benefits and potential of MIS, Cloud-Based Systems, and ERP Systems (Brown et al., 2023). Embracing Artificial Intelligence (AI) and advanced analytics in SCM can further enhance decision-making processes. The university should explore AI-powered tools for demand forecasting, predictive analytics, and anomaly detection to gain deeper insights into supply chain performance and

proactively address potential issues (Kumar & Brown, 2023). Foster collaboration and information sharing with supply chain partners to achieve end-to-end visibility and optimize overall supply chain performance. Encouraging suppliers and other stakeholders to adopt compatible ICT tools and platforms will streamline processes, reduce lead times, and improve customer satisfaction (Green & White, 2023). Establish key performance indicators (KPIs) to assess the impact of ICT adoption on SCM efficiency and product quality. Regularly monitor and evaluate these metrics to identify areas for improvement and measure the return on investment in ICT tools (Jones et al., 2023). Develop a sustainable ICT adoption strategy that aligns with the university's long-term objectives and business goals. A well-defined roadmap will guide the systematic implementation of ICT tools, ensuring their continuous relevance and value within the SCM framework (Johnson & Lee, 2023). As technology evolves, the university should remain flexible and open to adopting emerging ICT solutions that align with its SCM requirements. Embracing innovative technologies that offer enhanced capabilities and cost-effectiveness will help maintain a competitive edge (Smith et al., 2023). In conclusion, by implementing these recommendations, Uganda Christian University (UCU), Mukono, can optimize the impact of ICT on supply chain management efficiency. The strategic adoption and utilization of MIS, Cloud-Based Systems, and ERP Systems, along with a commitment to overcoming challenges and continuous improvement, will empower the university to achieve higher levels of SCM performance, deliver exceptional product quality, and sustain its position as a leader in the dynamic and competitive market.

5.4 Areas of further Research

While the current research has provided valuable insights into the impact of Information Communication Technology (ICT) on supply chain management (SCM) efficiency, there are several areas that warrant further investigation to expand knowledge and address emerging challenges. The following areas of further research are proposed to delve deeper into specific aspects of ICT adoption and its influence on SCM: Investigate the potential of block chain technology in enhancing transparency, traceability, and security within the university's supply chain. Analyze the applicability of block chain in

streamlining supplier relationships, reducing counterfeit risks, and improving product provenance. Examine the role of ICT tools in fostering sustainable supply chain practices, such as reducing carbon footprint, optimizing transportation routes, and enhancing resource efficiency. Assess how ICT-driven Green SCM initiatives can contribute to the university's environmental stewardship efforts. Explore the relationship between ICT adoption and supply chain resilience at Uganda Christian University (UCU). Investigate how MIS, Cloud-Based Systems, and ERP Systems can enhance the university's ability to respond and recover from disruptions, such as natural disasters or supply chain disruptions. Assess the potential of Artificial Intelligence (AI) and advanced analytics in optimizing demand forecasting, inventory management, and supply chain decision-making. Investigate how AI-driven insights can lead to enhanced efficiency and improved customer satisfaction. Analyse the impact of ICT tools on fostering collaboration and information sharing among supply chain partners. Investigate the factors that influence the willingness of suppliers and other stakeholders to adopt compatible ICT platforms for improved coordination. Conduct a cost-benefit analysis of ICT adoption in SCM. Evaluate the return on investment (ROI) and the economic implications of integrating MIS, Cloud-Based Systems, and ERP Systems into supply chain operations. Explore the challenges and opportunities of implementing ICT tools in supply chain management in emerging markets, particularly in the context of Uganda's specific socio-economic and technological landscape. Investigate the ethical and legal implications of data privacy and security concerning ICT adoption in SCM. Assess compliance with relevant data protection regulations and identify strategies to address potential risks. Examine the impact of ICT adoption on supply chain education and training programs. Evaluate how integrating ICT tools into SCM curricula can better prepare students for future industry demands. Conduct a comparative study to assess how other educational institutions or organizations in the region or globally are leveraging ICT tools in SCM. Identify best practices and lessons that can be adapted for the university's supply chain management practices. By exploring these areas of further research, Uganda Christian University (UCU), can deepen its understanding of the relationship between ICT adoption and SCM efficiency, laying the foundation for continuous improvement and innovation in supply chain management practices. The

insights gained from these investigations will help the university make informed decisions to optimize its supply chain processes and maintain a competitive edge in the dynamic and evolving business landscape.

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July 10th 2023

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To whom it may concern

Name: Beatrice Ijang John Reg. No. 1S19B00/011

A bachelor's student who is seeking permission from your office to collect data for his/her dissertation titled

"IMPACT OF ICT ON SUPPLY CHAIN MANAGEMENT (SCM) & EFFICIENCY"

We shall be grateful if you could render assistance to him/her in collecting the necessary data for his/her dissertation.

The Uganda Christian University School of Business thanks you in advance

Mukisa Simon Peter
Research coordinator