CENTRAL UNIVERSITY

DEPARTMENT OF MANAGEMENT AND PUBLIC ADMINISTRATION

ANALYZING THE ROLE OF INFORMATION TECHNOLOGY IN THE INFORMATION FLOW OF THE SUPPLY CHAIN OPERATIONS OF MANUFACTURING FIRMS IN GHANA . A CASE STUDY ON FAN MILK LIMITED.

BY

SAMUEL BROWN DANSO AMANING
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A LONG ESSAY SUBMITTED TO THE DEPARTMENT OF MANAGEMENT AND PUBLIC ADMINISTRATION OF THE CENTRAL BUSINESS SCHOOL, CENTRAL UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHERLOR OF SCIENCE DEGREE IN MANAGEMENT STUDIES

OCTOBER 2021

DECLARATION

DECLARATION BY STUDENT

I the undersigned, declare that this Research Project is my original work and that it

has not been submitted for any Degree qualification in this or any other University or

Institution for academic credit.

DATE………………………..   SIGNATURE…………………..

SAMUEL BROWN DANSO AMANING

201802211

BSC. IN MANAGEMENT STUDIES

DECLARATION BY SUPERVISOR

This Research Project has been submitted for examination for the award of degree

with my approval as University Supervisor.

DATE………………………..   SIGNATURE…………………..

MRS. GLADYS NARKI KUMI-SOM

LECTURER
CENTRAL UNIVERISTY

DEDICATION

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This study was intended to analyse the role of information technology in the information flow of the supply chain operations of manufacturing firms in Ghana. The researcher used Fan Milk limited as the case study. The study was guided by the following objectives; to understand the flow of information in the supply chain, to determine how information shared is used by various partners of the supply chain, to recognize the role of emerging technology for improving supply chain information management, to what extent does information sharing improves supply chain coordination at Fan Milk Limited. The study adopted a descriptive research approach using a survey to collect quantitative data from the respondents. The data was analysed using Microsoft Excel after 32 respondents had filled the 50 questionnaires which were distributed. The data was then presented using tables, pie charts and histograms for better understanding. The findings revealed that indeed information technology was being employed in the various supply chains to assist the firms in the information flow of the supply chain. It was also established that if firms want to gain competitive advantage in their supply chain, information technology provides a more efficient way to achieve that goal. The study recommended that firms should consider investing into blockchain technology to also improve their supply chain performance. Future researchers are encouraged to take a look at a broader sample and also consider the problems stopping Ghanaian firms to share information with their partners in the supply chain.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

There has been a long standing interest in information technology and how it affects businesses. It has also been made clear that technology is rapidly changing and if firms do not adapt to new ways of doing things, they risk being less competitive and decreases their chances of survival. Firms have been forced to invest into new technology and procedures that aid in business operations. Investing into new technology ensures that firms are doing things more easily, faster and more efficiently than their competitors. It will translate into more profits for the investment they have made in new technology. Similarly, technology in supply chains have changed and new ways of operating has emerged. This means every firm ensures that they are using the best information technology to coordinate activities in their supply chain. This makes the firm stay relevant to other firms in the supply chain hence making them stay competitive in the market.

According to Lee (2000), the basics for coordination and collaboration in supply chain is information sharing among the members of the supply network. Sharing of information can help reduce or even curb a lot of supply chain problems like over stocking, high inventory costs, and poor customer satisfaction among others. Researchers, Baihaqi, Beaumont & Sohal, 2008, have made it clear that due to information technology, the question as to whether to share information is not the problem anymore but as to whom to share the information with, what information to share and what ways can you share information with your partners in the supply chain.

Firms therefore will have to find new ways to share information throughout the supply network (Varma, & Khan 2017).

Information flows in all directions of the supply chain so it is very important that the partners of a supply chain become fully aware of whatever processes and changes that have been made in the supply network.

Poor information flows can add a significant cost to the manufacturing process of a firm. Childerhouse et al.2003, established that, poor communication in a supply chain can add up to 10-20 percent of the manufacturing cost of a firm whereas as little as a 5 percent decrease in the supply chain costs can yield as much as a 50 percent increase in profits for a firm (Taylor, 2003).Therefore managing information flow and coordinating it with the other flows of the supply chain can positively affect how competitive a firm is and improve coordination in the supply chain.

1.2 STATEMENT OF THE PROBLEM

Manufacturing firms usually have a very interactive supply chain network. Most partners of these supply chains use information about demand to make strategic objectives and day-to-day decisions. Knowledge is very crucial to the success of every supply chain. Information, together with the other resources and materials must be readily available to all members of a firm's supply chain. All participants of the supply chain require adequate information that is relevant to their operations to enable successful integration in the supply chain. The information received will help make decisions which may influence forecasts and judgement on both future and present situations. Timely and accurate information regarding the demand for a particular product is needed by retailers, wholesalers and distributors to order more or less products, information is needed by the manufacturer to schedule production and also purchase needed raw materials to facilitate production and also needed by suppliers of

the raw materials to adjust the rate they produce those raw materials and make them ready to be supplied. Truck drivers will want accurate information about the exact location of retailers and wholesalers to make decisions on what routes to use to ensure quicker delivery of products or even what retailers to prioritise over others. Organizations need to be able to manage the flow of information in their supply chain effectively to ensure that errors are minimized drastically. There is a possibility that, for example, stores may tell the distributor that stocks are low on a particular product and want about 5 boxes, and will also inform the wholesalers that they need more of the good, and also inform the manufacturer that they need more of the product. This will result in the stores receiving over 15 boxes of the product simply because it fed irrelevant information to other participants of the supply chain who might not have necessarily needed that information. Manufactures may rely on this information and order more raw materials to produce those 15 boxes instead of the 5. This will transfer into additional costs to the manufacturer and even the store who would have to keep excess inventory. This is called the bullwhip effect, which Lee et al (1997) argued that proper information sharing in a supply chain could mitigate. In line with this, it is important to establish that information technology plays a crucial role in the gathering and dissemination of information across the supply chain. Unlike in paper-based communication where information flow would have been very time consuming and error prone, the application of information technology in this process can check these problems.

1.3 GENERAL AIM OF THE STUDY
The general objective of this paper is to assess the role of information technology in information sharing in the supply chain of Ghanaian manufacturing companies more specifically Fan Milk Limited.

1.4 OBJECTIVES OF THE STUDY

The following particular objectives are aimed to help achieve the main objective of the study.

    a. Understand the flow of information in the supply chain of Fan Milk Limited

    b. To determine how information shared is used by various partners of the supply chain

    c. To recognize the role of emerging technology for improving supply chain information management

    d. To what extent does information sharing improves supply chain coordination

1.5 RESEARCH QUESTIONS

1. What information is being shared in the supply chain Fan Milk Limited?

2. With whom are these information shared with?

3. Does information technology impact information sharing?

4. What new information technology has been implemented in the operations of Fan Milk Limited for the past decade?

1.6 JUSTIFICATION OF THE STUDY

This study will contribute to the body of knowledge to existing research on information flow in supply chains of manufacturing firms in Ghana. It will throw more light on how best information technology can be utilised and exploited to boost information sharing amongst partners of the supply network. This study will allow manufacturing firms in Ghana to appreciate the significance of information sharing in their supply chain. Fan Milk Limited can be set as a reference to smaller manufacturing firms in Ghana to engage in information technology in the information flow of their supply chain and for which they can imitate and better their performance.

1.7 SCOPE AND LIMITATIONS OF THE STUDY

The study focuses on mainly on Fan Milk Limited as a manufacturing firm in Ghana. As such employees and management of other partners in Fan Milk's supply chain may be reached and engaged to help facilitate achieving the aims of the research. This study will be carried out within the time frame of 3 months hence supporting the decision to narrow the research to one firm. A key challenge of this research is the lack of possibility for Fan Milk Limited to provide all information required to properly analyse information flow in its supply chain. Important statistics and data which may be crucial for the research may be restricted access by the various firms included in the research. It is essential to be aware that names of some partners of the supply chain may be made anonymous and so therefore it may be possible we use pseudonyms to hide the identity of some firms and individuals in the research. Quantitative data will be gathered through a survey and other secondary information may be obtained from other literatures.

1.8 DEFINITION OF TERMS

- Supply network: Also referred to as the supply chain. This refers to the network of all firms who come together to support each other in producing a particular good or service. Used to replace the term "supply chain" to reduce the number of times supply chain is mentioned.

- Knowledge: In this context, knowledge is information as a resource in the supply chain. It includes items such as bills of materials, product data, descriptions and pricing, inventory levels, customer and order information, delivery scheduling, supplier and distributor information, delivery status,

commercial documents, title of goods, current cash flow and financial information

- Information flow: This refers to how information is communicated within the supply chain.

1.9 ORGANISATION OF THE STUDY

The study is organised into five chapters. Chapter one covers the background of the study, statement of the problem, the general aim, the objectives of the study, research questions, the justification of the research, scope and limitations of the study as well as the definition of terms of the study. Chapter two contains the literature review which summarises other studies related to the topic by early researchers. The chapter three contains the methodology, which contains the research design, the study's population, the various sampling techniques and sample size, data collection and data analysis. The chapter four contains the analysis of the data collected in the previous chapter and a thorough interpretation of the findings. Chapter five of the study gives a summary of the research, the conclusion and recommendations for future researchers.

CHAPTER TWO

LITERATURE REVIEW

INTRODUCTION

This chapter gives an insight into several studies by other exceptional researchers, as well as clearly-defined terminologies with regards to the role of information technology in the information flow of supply chain operations. The chapter also provides a summary of the history and current status of the problems and gaps identified through a brief review of previous studies by the researchers.

2.1 CONCEPTUAL REVIEW

2.1.2 THE CONCEPT OF INFORMATION TECHNOLOGY

Information technology is the application of computer software and infrastructure to create, process, analyse, store, secure and exchange all forms of electronic data. Data is information, facts and statistics that is gathered together for use, analysis and storage.

COMPONENTS OF INFORMATION TECHNOLOGY

Information technology has various parts that work together to produce useful information to businesses. These components include the people who interact with the other components, the hardware, software, processes and the data that will be made meaningful to the end user.

PEOPLE

These are the personnel who are needed to run the systems and man the hardware devices that will be used to transform the data into meaning information. These are the most important components of information technology because in their absence the system cannot proceed.

HARDWARE

These are the physical components or devices that work with information. They are the devices that interact with the software to bring meaningful information to the organization.

SOFTWARE

The set of instructions that operate through the hardware and tells the hardware what to do. They are what make hardware operable. Software can be grouped into two: operating system software and application system software. The operating system software is the most important software of the information system. It performs all the basic functions like managing the hardware resources of the computer, providing the user-interface and providing a platform for software developers to write applications. Examples include Windows, Linux and VMS. The application software is the software that is designed to allow the user of the system to perform very specific tasks. These software is specific to the task it has been designed for and could be as simple as calculator application to something as complicated as a word-processing software.

PROCESSES

These are the various steps taken in the system to allow data to be transformed into meaning full information. It is where inputs into the system are converted into outputs.

DATA

Data is the raw and unprocessed facts like numbers, text, numbers, images and sound. These items are termed not meaningful and raw because by themselves they are not really useful and have not been properly arranged and brought together to create meaning to the user.

2.1.3 APPLICATION OF INFORMATION TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT

Here we discuss the various software and systems that are applied in a typical supply chain. It includes applications designed to ease communication and sharing of information between supply chain partners.

ELECTRONIC RECORDS MANAGEMENT

The ISO standard 15489: 2001 defines records management as the efficient and systematic control of the creation, receipt, maintenance, use, and disposition of records, including the processes for capturing and maintaining evidence of any information about business activities and transactions in the form of records. This is when records from transactions and other business processes are carefully managed electronically to reduce the risks associated with electronic communication in the supply chain

RADIO FREQUENCY IDENTIFICATION

This is technology based on using tags that release and receive signals through radio waves to identify an object and all information about that object. The information is transmitted wireless from the object to the users of the system which is then transformed into meaningful information for the business which can further be assessed and evaluated. The RFID system allows firms to easily capture information on good s in transit and instantly share such information with partners in the supply chain.

ORDER MANAGEMENT SYSTEM

This is a system that allows businesses to manage their orders. It allows all departments in the business who are involved in the fulfilling customer orders to easily share information amongst each other right from the customer service team

when the customer places the order, through payment reconciliation, fulfilment and shipment. This also allows the order information to be available to everyone including the accounting team, the warehouse team ad even the business owner. The system can even generate an automatic e-mail to follow up on customers after sales have been made.

ELECTRONIC DATA INTERCHANGE

This is a system which allows information to be instantly made available to all partners or selected partners in a supply chain. It based on a computer to computer data exchange where business documents are transferred to other businesses in the supply chain in a standard electronic format. Electronic Data Interchange allows the business to get rid of manual paper based communication which may be prone to errors. This system is fully automated in a sense that for example when a retailer updates its invoice or purchase order, that information is immediately made available to the distributor or manufacturer who would then make adjustments to fulfill that order.

INVENTORY MANAGEMENT SYSTEM

This is the system that helps every business to have the right inventory at the right and in the right place. This is when goods are tracked throughout the supply chain enabling the firms to control and oversee purchases and regulate storage of stock, product sales and fulfilment of order. This process makes it less likely for errors to be encountered in the level of inventory that every firm in the supply chain must maintain.

ENTERPRISE RESOURCE PLANNING

This is a system that helps a business to integrate and manage all functions in the organization such finance, accounting, supply chain, marketing, operations and other

functions. It makes the organization centralize all information and make it available to all aspects of the organization in one single platform.

DISTRIBUTION REQUIREMENT PLANNING

This is the process of planning orders in a supply chain. The system ensures that all distributors of the supply chain are fully informed about orders that have come in the warehouse. The system enables gives vita information to the distribution channel when there's an anticipation of demand exceeding supply hence it generates a planned supply reorder and alerts the planner that replenishment is required if risk of stock-outs has to be avoided. It provides information that identifies need dates, replenishment dates, order dates for material requirements and this of information can be unified across the distribution network as one set of uniform numbers to be used by everyone.

ELECTRONIC PROCUREMENT (E-PROCUREMENT)

This is designed to streamline the regular procurement process and automates each process. Instead of having to manually exchange documents, or even send out tender documents and other contracts, the system handles all processes more efficiently.

CUSTOMER RELATIONSHIP MANAGEMENT SYSTEMS

This is a technology for managing firm's relationship and interaction between its customers and future customers. This system keeps records of customers like contacts, purchase history and their latest contact with the customer service to enable the staff to interact with the customers and predict future demands based on their purchase history and other related information the system gathers.

INTRANETS AND EXTRANETS

An intranet is network set up within an organization to share information and communicate to workers. It allows for easy collaboration between employees of the

organization. Intranet can be used to share information about vendors, the company's supply policies, list of suppliers, targets for manufacturing and other appropriate data that can be used by employees.

Extranet, just like the Intranet, is set up outside the organization to allow for easy communication and sharing of information between the firm and its partners in the supply chain. It authorizes users outside the company like suppliers and distributors to have access to information that is permitted by the company. In essence it makes communication a lot easier between the partners of the supply chain. These networks come with firewalls which is protective software which prevents unauthorized access to confidential records of an organization.

VENDOR MANAGEMENT AND VENDOR RELATIONSHIP MANAGEMENT SYSTEM

Vendor management is the process by which businesses control their relationship with their vendors to ensure low costs and reduce potential risks that may be associated with their vendors. The system, which is an online based tool, allows for managing all vendor related activities like sourcing vendors, acquiring of price information, managing multiple vendors, ensuring that payments are made on time to vendors and also matching standards through assessment of performance in relationships with vendors.

2.1.4 BENEFITS OF INFORMATION TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT

The impact technology has had on organizations and their supply chain has been remarkably convincing enabling more business to invest into new technological tools to stay competitive. The use of information technology to manage supply chain activities has caused many firms to get the right price for their products and services

to beat competitors. It has made it possible for firms to accurately decide what amount of inventory is needed at a particular time to prevent them from committing themselves from incurring huge costs. Since information sharing has been made extremely easy by use of information technology, firms in the supply chain are less reluctant to share information amongst their partners in the supply chain. Information they are looking for is always readily available to them in real-time. Integrated software allow for firms in the supply chain to get a broader view of the supply chain and helps them to seamlessly share information for other firms to make informed decisions. Firms will now be able to know which suppliers are available and their prices and this aids in deciding which suppliers to work with. Businesses can decide to increase or reduce the production of certain goods when they rely on sales data accompanied with some information on customers and their demand patterns. This has led to on-time deliveries which definitely lead more satisfied customers. Systems developed for customers to have interactions with the firm also lead to firms meeting customer demands hence better quality for the customer. Real time data from using information technology has allowed firms to get time to develop plan B for any issues that may arise. The use of information technology in supply chains has also led to overall better decision making by supply chain managers which in effect translates into higher revenues for the firm. With more accurate demand predictions, companies can reduce overhead costs associated with slow moving goods and inventory by stocking less of such goods and stocking more of revenue producing goods. Information technology has led to development of software that handle repetitive activities that the human being might find to be extremely boring. Regular entry of data which may seem boring has been handled by computers which are more accurate and efficient compared to human entry. Firms that have invested into information

technology in their supply chain activities have competitive advantage over other firms who have not. As discussed above, information technology makes a firm perform better than they were without using technology, meaning firms who are not using information technology will be perform poorly compared to others using technology. This therefore means, generally, every firm using information technology will have a competitive advantage over its competitors. This means lower costs compared to competitors, higher revenue compared to competitors, access to relevant and timely information compared to competitors, better customer and supplier relationships, improved information flow, and better decision making compared to competitors.

2.1.5 THE CONCEPT OF SUPPLY CHAIN MANAGEMENT (SCM) AND INFORMATION FLOW

The idea of "supply chain" is established in some literature as the alignment of firms who come together to bring a product or service to customers (Lambert, Stock and Ellram, 1998). The supply chain consists of the manufacturer, suppliers, transporters, warehouses, wholesalers, retailers, various intermediaries and customers themselves to some extent. In essence, any product on the market goes through a series of transactions and activities from its raw state through till it becomes a finished good and it reaches the customer.

Chopra and Meindl (2007, p.3) believe that "supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain includes not only the manufacturer and suppliers, but also transporters, warehouses, retailers, and even customers themselves. Within each organization, such as a manufacturer, the supply chain includes all functions involved in receiving and filling

a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance, and customer service".

While these definitions focus on the various players in delivering the finished good, others focus on the activities involved in bring the final good to the customer. For instance, Quinn(1997) says "the supply chain encompasses all of those activities associated with moving goods from the raw- materials stage through to the end user". This includes sourcing and procurement, production scheduling, order processing, inventory management, transportation, warehousing and customer service. Quinn also quotes Professor LaLonde who defines supply chain as "The delivery of enhanced customer and economic value through synchronized management of the flow of physical goods and associated information from sourcing to consumption".

Supply Chain management (SCM) allows for finished goods to reach the customer at the best quality possible. This is achieved by a network of firms who work together to ensure that their part of the mission is played to maximum best to ensure that the customer is adequately satisfied. The term management come in to properly supervise all players of the supply chain and maintain a healthy relationship between each other since they are all customers to each other and hence determined to make each firm satisfied. This satisfaction is achieved when information flow between all partners is well controlled as well.

Information flow in supply chain is the most important flow amongst other flows in the supply chain(Signh, 1996). It is the flow of information across the entire supply chain which enables firms to communicate and coordinate properly. If any item is mismanaged or inaccurate and therefore not corresponding to customer demands it leads to the dissatisfaction of the customer, for this matter information flow is considered the most important flow amongst product flow and money flow. Other

researchers suggest there are more than three flows however all of these researchers include information flow as part of the other flows and this further emphasizes its importance. Thus information, as part of managing other flows in supply chain management has an added significance. Information flow in a supply chain is bi-directional thus it flows in both directions of the supply chain. The supplier sends information to its customers and customers send information back to its suppliers.

2.1.6 COMMON TYPES OF INFORMATION SHARED IN THE SUPPLY CHAIN

INVENTORY LEVEL

Firms will want to share information about the level of inventory they currently hold with their partners to make sure they are not over stocking or under-stocking certain products.For instance a retailer may want to share their inventory data with the manufacturer to eliminate the chances of duplication of inventories if they both managed their inventory independently. Practically this can be done through Vendor management systems or continuous replenishment programs.

SALES DATA

Information on demand and sales records are important to partners in the supply chain, it serves as a source for future decisions. If such information is kept by each partner, firms tend to make assumptions about others and this gives a distorted view about the market place and future production plans may be affected.

ORDER STATUS FOR TRACKING

Firms in the chain provide information on the status of an order. This data helps customers to have a clear idea of where their item is in the chain. This makes it easier for customers to find out the status of their order.

Sales forecasts

Manufacturers and retailers collaborate together to exchange knowledge and jointly develop forecasts and replenishment plans. One way this is done is when downstream firms share information to the suppliers as they are closer to the customers thus better positioned to forecast market demands.

2.1.7 BENEFITS OF SHARING INFORMATION AMONGST PARTENRS IN THE SUPPLY CHAIN

A. Inventory reduction and efficient management of inventory

B. Reduction in cost

C. Reduced risks of uncertainties

D. Early problem detection

E. Healthy relationship between firms in the supply chain

F. Elimination of the bull-whip effect

G. Improved resource allocation

H. Improved lead times

I. Quick response

J. Expansion of supply network

K. Clearer understanding of the market

L. Greater customer satisfaction in the long run

2.1.8 BARRIERS TO INFORMATION SHARING

First of all, if the management of the organisation are not in full support of the firm sharing data with its partners, they will not invest in information sharing systems. This therefore is a major obstacle to information flow in a supply chain. The lack of managerial direction for information sharing makes the implementation of information sharing very difficult.

Another barrier to sharing of information is firms not wanting to share confidential information with other firms in the supply chain.

2.2 EMPIRICAL FRAMEWORK

Many researchers have stressed on the importance of information technology(IT) in the sharing of information in the supply chain. Varma (2017), asserts that information flow was time consuming and prone to error in the age of paper based communication and transactions and due to globalisation, organisations have started implementing technological processes into their communication and transactions in their supply chain networks. As such, it is believed that incorporating information technology in supply chain management facilitates the flow of information and finances and enable the sharing of information, coordination and the integration process (Malone et al. 1987).This view is further supported by Cachon and Fisher, (2000) that information technology(IT) in SCM enables the sharing of information seamlessly and inexpensively with partners which is an important aspect of modern supply chain management. When supply chain management activities are closely integrated using IT, firms tend to enjoy competitive advantage, reduced transactional costs and ensuring coordination between better cooperation and supply chain partners (Themistocleous et al 2004). A number of authors also recognise that an increased use of an integrated information systems and enabling technologies has become possible now to create seamless supply chains connecting suppliers to customers in order to

eliminate poor supplier performance, unpredictable customer demands, and an uncertain business environment (Bayraktar et al., 2009). Other studies have argued persuasively that enough evidence has been gathered

on the positive effects of information technology that the productivity paradox can be labelled a myth of the past (Mukhopadhyay et al., 1997).

However, (Brooks and Davenport, 2004; Lou et al., 2004) argued that technologies are characterised by high levels of uncertainty due to its essential characteristics of autonomy (Jenning and Wooldridge, 1995) and pre-activeness (Moyaux and Chaib-draa, 2006).

For example, research has provided evidence that IT helps manage the information flow and affect other dimensions of the supply chain like costs, quality,delivery, flexibility and ultimately the firm's profit (Brandyberry et al., 1999). If used properly and effectively, IT can help with better forecasting and improved resource planning leading to better operational efficiency (Lockhamy III and McCormack, 2004).

Also, Chae et al., insisted that before IT can bring the supply chain partners together, it must have first influenced inter-organisational collaboration. Therefore, the implementation of information technology in the supply chain requires a commitment to exchange information by the firms. Marinagi et al., (2014) stresses that firms must make sure that their methods of implementation must be compatible with other firms in the supply chain and that level of automation must be synchronized otherwise they face the risk of being isolated.

Information technology allows suppliers to be able to access the inventory information of their customers and prepare for stock delivery on time (Ngai et al., 2010).With the support of IT, organization can keep to track of market needs and to relocate resources in a responsive manner (Ngai et al., 2010). Technologies such as

RFID, global positioning system (GPS), wireless and mobile have been included in manufacturing (Lu et al., 2006), services (Wu et al., 2005), logistics and distributions (Giaglis et al., 2004), healthcare (Tzeng et al., 2008) and retailing (Prater et al., 2005). The Global logistics research team defines information sharing as "The willingness to exchange key technical, financial, operational and strategic data". Handfield & Nichols, (2002) also demonstrated that this information that will be shared must be useful to the partners if not, it adds nothing to supply chain processes. Seidmann & Sundararajan (1997) identify four levels of information shared to supply chain partners. The first level contains information on transactional data, for example orders and price. The second level consists operational information such as inventory levels. The next level includes the sharing of strategic information. The researchers claimed that this level of information may not be important to the holders of the information but will be of great use to the other parties receiving the information. An example of information that can be shared at this level is actual sales data. The fourth level of information shared is both strategic and competitive data. Also at this level the researchers claim it will yield more benefit to the party using the information compared to the owners of the information. Some authors have also suggested that information shared in a supply chain can be classified as strategic or tactical, logistical or pertaining to customers (Mentzer 2004). Lee and Whang, (2000) also identify types of information shared and their benefits. They concluded that sharing inventory information helps keep low levels of inventory hence low costs associated with high inventory and supply chain costs. Sharing production schedule data allows other firms to synchronize their production plan with both downstream and upstream partners. Overtime, there has been extensive studies emphasizing the importance of sharing information in the supply chain. Raghunatahan (2003) reported that sharing

demand information helps reduce inventory costs. This is supported by researchers Lee, So and Tang (2000) who found that sharing demand information, as far as they are auto-correlated overtime, will help reduce inventory and manufacturing costs.

Other studies also argue that there is a misconception about information sharing and collaboration in supply chain management. They believe that investing in information technology can meaningfully bring people and companies together (Fawcett et al., 2007). this perception leads to a reliance on technology to drive collaboration hence a reliance on technology also to solve information sharing problems. For this reason many organisations with this perception never have their information sharing strategies materialize (Fawcett and Magnan, 2001). Firms must therefore embed information sharing and collaboration into their organisational cultures. If firms are willing and able to share vital information, then can trust be established and collaboration promoted (Fawcett et al., 2007). A company's willingness to be open to share information is determined by the extent of sharing that take place (Mendelson, 2000).

2.3 THORETICAL REVIEW

2.3.1THE BULLWHIP EFFECT

The Chartered Institute of Procurement and Supply(CIPS) define the bullwhip effect as " the demand distortion that travels upstream in the supply chain from the retailer through to the wholesaler and manufacturer due to the variance of orders which may be larger than that of sales." The term 'bullwhip' was coined to describe the effect by which slow moving consumer demand creates large swings in production for the suppliers at the other end of the supply chain (Wang and Disney, 2016). The Bullwhip effect can also be referred to as 'demand amplification'(Wormack and Jones, 2002), 'variance amplification' or the 'Forrester effect'.

2.3.2 HISTORY AND BACKGROUND OF THE BULLWHIP EFFECT

The term was first coined by Procter & Gamble (P&G) in the 1990s to describe the order variance amplification phenomenon between the company P&G and its suppliers. Forrester (1961) first made the term "variance amplification" in his book "Industrial Dynamics". He supported this by generating the "Beer Game", mimicking a simulation to experiment the decision making bahaviour in supply chains. Sterman, (1989) also published 20 years of data from the game attributing the amplification to be as a result of firms disregarding information on orders placed but not yet received. This beahviour from the various firms was believed to be "irrational".

Lee, Padmanabhan, and Whang(1997) however engaged the academic bodies on the term bullwhip effect and also proposed four major causes to the problem in cases where the players in the supply chain are assumed to act "rationally". The causes include situations where:

I. Past demands are not used for forecasting

II. Resupply is infinite with a fixed lead time

III. There is no fixed order cost

IV. Purchase cost of the product is stationery over time

INFORMATION SHARING AND THE BULLWHIP EFFECT

Lee et al., (1997), describe the bull whip effect as the result of information distortion in a supply chain, where companies upstream do not have information on actual consumer demand. It is however clear that the underlying cause of the bullwhip effect is little or no data on the desired information other supply chain partners require. One of the most important mechanisms for coordinating supply chain partners is information, and in its absence or distortion, there comes a major obstacle to a smooth

supply chain. It is however natural that bull whip effect can be decreased if companies can keep down the level of uncertainty by sharing desired information along the entire supply chain. Wang et al., (2011) affirm that the causes of certain predictable factors are distortions in demand information. Baljko (1999) writes that the bullwhip effect can be eliminated if there is shared knowledge with suppliers and customers to better gauge demand and cooperation with supply chain partners to help determine what records and data are being undermined that cause poor coordination and costs associated with information.

CHAPTER THREE

RESEARCH METHODOLOGY AND DESIGN

3.0 INTRODUCTION

This chapter discusses the research methodology used to analyse the role of information technology in the information flow of supply chain operations of manufacturing firms in Ghana. It talks about the research approach, research design, population, sample and sampling technique, research instruments, validity of response, data analysis method and ethical considerations for the research. This chapter in essence seeks to describe how the whole research was conducted.

3.1 RESEARCH APPROACH

There are two main types of research approaches, and they can either be a quantitative or qualitative approach. The two approaches are sometimes combined by some researchers to for a mixed-method approach. The quantitative research deals with numbers and graphs. In the opinion of Matthews & Ross (2010), quantitative research methods are basically applied to the collection of data that is structured and which could be represented numerically. Qualitative research is concerned with collecting an analysing no-numerical data. The qualitative approach can be used to understand how an individual subjectively perceives and gives meaning to their social reality, (Mcleod, 2019). This research will adopt the quantitative approach.

3.2 RESEARCH DESIGN

A survey research approach was adopted to help gather the information that was required. Survey research is defined as "the collection of information from a sample of individuals through their responses to questions" (Check & Schutt, 2012, p. 160). A survey was used because it allows for the collection of data from a large population

and permits the use of quantitative research strategies. Using the survey makes it possible to collect data from a smaller part of the population which can be used to make generalisation of the population (Nworgu, 1991). Surveys can also be used to evaluate needs, assess demand, and analyse impact (Salant & Dillman, 1994, p. 2). The respondents were given a brief description of the research problem along with some explanation of some constructs they might have found to be confusing. The questioning consisted of both open and close ended questions, majority being close ended. To compliment the primary data collected, secondary data was obtained from the website of the company as well as the review of various articles and journals of information technology, information sharing, operations and supply chain management in relation to manufacturing firms in Ghana.

3.3 POPULATION

The survey was directed towards all management and staff of Fan Milk Limited located at the North Industrial Area in Accra, Ghana.

3.4 SAMPLE AND SAMPLING TECHNIQUE

The sample consists of 50 respondents from the target population. A non-probability sampling method was used to select the respondents from the population for the study. This was adopted because it was the most convenient and cheapest option to recruit the respondents.Time constraints also influenced the choice of this sampling method. Staff and management who were on the premises at the time of data collection were used as the respondents as far as they fell within the following departments of the firm

- Purchasing & Procurement

- Logistics

- Operations

- Information Technology

3.5 RESEARCH INSTRUMENTS

The research instruments used for the collection of data were researcher-administered questionnaires and structured questionnaires. These instruments were used to gather primary data from the respondents. According to Bougie and Roger (2009), a questionnaire is a pre-formulated written set of questions to which respondents record their answers, usually within rather closely defined alternatives.When the researcher knows exactly what is needed and how to measure the variable of interest, the questionnaire is an effective data collection mechanism. It is, therefore, essential to properly design a data collection instruments to reach reliable and valid conclusions. Questionnaires were preferred because they are expedient as respondents could fill them during their free time and it is quicker to administer.

3.6 DATA COLLECTION

The questionnaires were delivered physically and filled out on the spot.The section A of the questionnaire was used to gather demographic information of the respondent including the age, sex, educational qualification,department in which they are in the organisation and for how long they have been in the organisation. For the rest of the sections, a 5-point likert scale was used to measure respondents views on the extent of the technology being practised in supply chain operations of the organisation. The scale ranged from "not at all" to "a great extent". On the other hand, the scale used to measure the effectiveness of information sharing between the supply chain partners ranged from "highly disagree" to strongly agree".

3.7 VALIDITY OF RESPONSE

Validity refers to how accurately the method measures or captures the intended area of information to be covered in the investigation (Ghauri & Gronhaug, 2005).The questionnaires contained few open and close-ended questions and this was used because it gets respondents to easily engage in the survey exercise and would not have to write much.The questionnaire was directed to some staff and supply chain managers, purchasing managers, procurement officers, operations officers and personnel in the IT department of the organisation. These respondents were chosen because they were deemed more likely to be heavily engaged in the supply chain operations and therefore likely to be aware of the technology adopted to share information among partners. It is believed that this would maximise the validity of the research content.

3.8 DATA ANALYSIS

Both descriptive and content analysis was used to analyse the data, as the information collected was both quantitative and qualitative in nature. Microsoft Excel 2016 was used to analyse the responses that were collected during data collection. The research results were presented with graphs, tables and tables to facilitate interpretation.The final report was later compiled and presented using Microsoft Word after a thorough analysis of the data.

3.9 ETHICAL CONSIDERATIONS

All participants of the survey were adequately informed prior to the administration of the questionnaires and their consents were sought for before they could be included in the survey. Emails were sent followed by a phone call to the organisation for their feedback to go ahead with the administration of the questionnaire on an agreed date. The respondents were promised confidentiality and anonymity on their response to the questionnaire.

DATA ANALYSIS AND DISCUSSION OF FINDINGS

4.1 INTRODUCTION

In this chapter, the captured data from the survey will be systematically presented, analysed, described and interpreted as the next step in the research process. The response from the survey were analysed and presented in tables, pie charts and graphs for easy understanding. Out of the 50 questionnaires that were distributed, only 32 returned answered giving a response rate of 64%.

DESCRIPTIVE STATISTICS

4.2 SECTION A: DEMOGRAPHY OF RESPONDENTS

Table 1: Gender of Respondents

	FREQUENCY	PERCENTAGE(%)
MALE	21	65.625
FEMALE	11	34.375
OTHER	0	0
TOTAL	32	100

Source: Field data, 2021

Table 1 above shows the percentage of males and females in the Manufacturing sector of Ghana according to the sampled population. Per the data, the dominating gender in the manufacturing sector is the male gender with a percentage of 65.63% as against 34.38% females. It is therefore evident that males are dominating in the manufacturing sector by some significant margin.

Table 2: Age of Respondents

	FREQUENCY	PERCENTAGE(%)
20-29	3	9.375
30-39	11	34.375
40-49	13	40.625
50-59	4	12.5
60 and above	1	3.125
Total	32	100

Source: Field data, 2021

Table 2 depicts the distribution of the ages of the respondents. According to the survey taken, majority of the respondents are between the ages of 40 and 49 with a percentage of roughly 41 of the respondents. Those within the ages of 30 to 39 follow closely with a percentage of 34 as the second most concentrated age group in the manufacturing sector. This is to say that most of the employees of the firm fall within the active employment zone whilst minority are close to the retirement zone noticeable with a sum of just 15 percent of the entire respondents with ages in the range of 50 and above.

Table 3: Highest Level of Education

	FREQUENCY	PERCENTAGE(%)
Elementary	0	0

Secondary	5	15.625
Tertiary	21	65.625
Other	6	18.75
Total	32	100

Source: Field data, 2021

Out of the 32 respondents, majority of them have their highest education level to be at the tertiary level with a percentage high of 65 and none ended their education just at the elementary level. This indicates that most of the respondents are highly educated which corresponds to nature of qualification and experience required for an occupation in the manufacturing sector.

Figure 1. DEPARTMENT OF RESPONDENTS
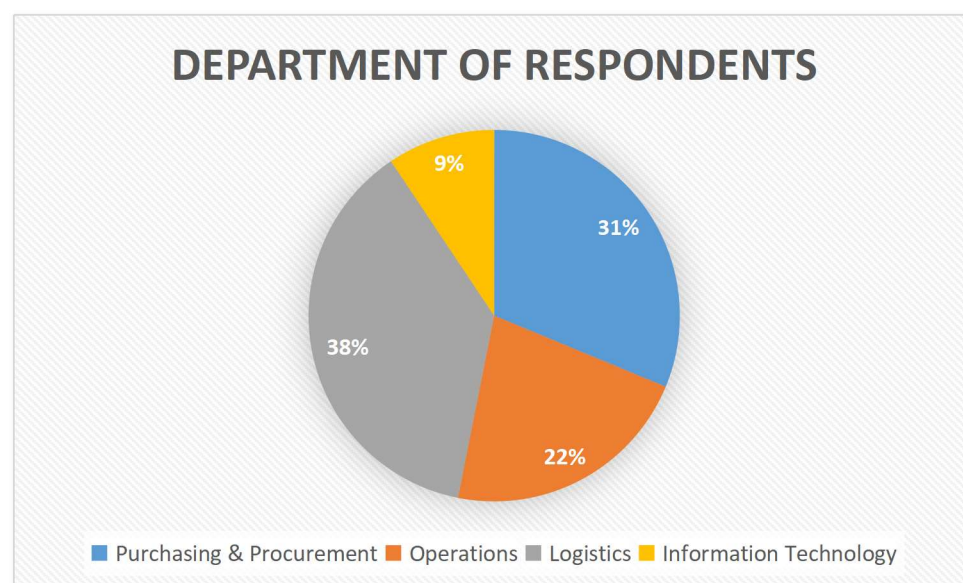
Source: Field Data, 2021

Figure 1 shows the departmental representation of the respondents for the survey. The various departments were represented quite fairly in the survey with only the information technology department recording just 3 respondents with a significantly lower percentage relative to the other departments. The purchasing and procurement

department registered 10, the operations department registered 7 while the logistics registered the highest number with 12 respondents.

Table 4: WORK EXPERIENCE OF RESPONDENTS

	FREQUENCY	PERCENTAGE(%)
2-5years	4	12.5
5-10years	10	31.25
10-15years	15	46.875
15-25years	3	9.375
more than 25 years	0	0
Total	32	100

Source: Field Data, 2021

Table4 above shows the work experience of the respondents to the survey. Most of them have been working between 10 to 15 years registering 15 respondents. 10 of the respondents have worked between 5 to 10 years whereas 4 of the respondents have worked between 2 to 5 years. 3 of the workers have been working for over 15 years with none of the respondents exceeding 25 yeas of work experience.

PROFILE OF FAN MILK LIMITED

Fan Milk Limited was established in Ghana by a Danish entrepreneur (Erik Emborg). The company has been in existence since 1962. Fan Milk was converted to a public limited liability company in 1969, and is currently engaged in the production and distribution of quality refreshing milk-based and fruit-based products.

The milk-based products consist of a range of frozen ice creams, frozen flavoured milk drinks and yoghurt drinks. Their brands in this segement include FanYogo, FanChoco, FanIce,FanMaxx, SuperYogo and FanVille.

The fruit-based products include fruit drinks and fruit lolly. Brands associated with these products are FanDango and FanJoy.

FanMilk has a strong commitment to product quality,health and nutritious products for consumers.

MISSION OF FAN MILK LIMITED

To touch and transform people's lives bringing health through food to as many people as possible in the West African region by turning these challenges into opportunities to have a positive impact on society and thrive as a business.

VISSION OF FAN MILK LIMITED

Long-term commitment to create and share sustainable value for all, in line with our dual economic and social agenda, is expressed in our ambition to become a Certified B Corp in West Africa.

4.3 SECTON B: RESPONSE ON INFORMATON TECHNOLOY PRACTICES USED BY THE ORGANISATION

4.31 Figure 2 RESPONSES ON USE OF SOFTWARE
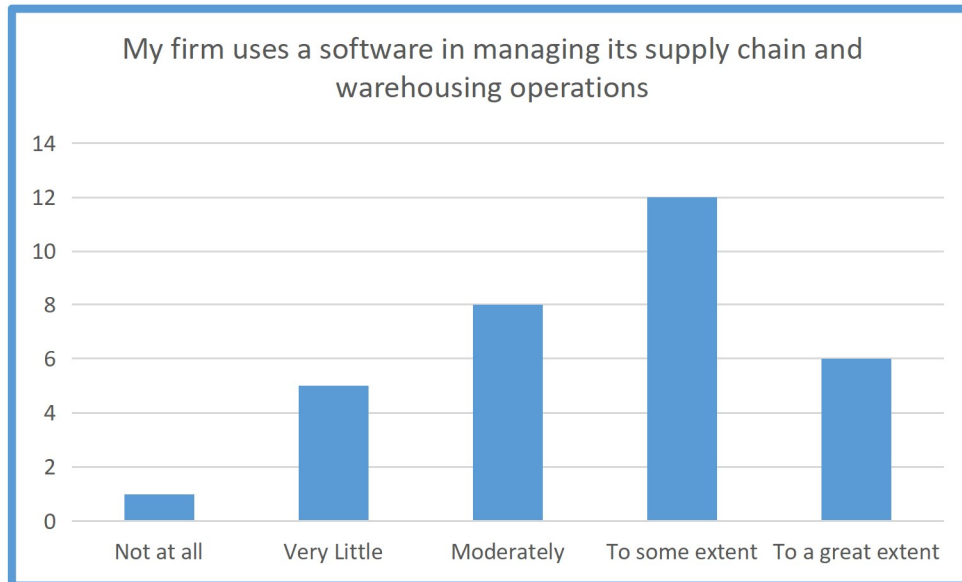
Source: Field Data, 2021

The bar chart above shows the data from the response to the question whether the firm uses any form of software in dealings with its supply chain. The distribution shows that 12 of the 32 respondents can confirm that the firm uses some form of software in its supply chain activities and just 1 respondent believes that there is no form of software used by the firm in their operations. Judging by the other responses, 6 think that the firm uses some software to a great extent, 8 of them are not entirely sure about the use of any software while 5 think the firm's use of software is very little.

4.32 Figure 3. RESPONSES ON USE OF ADVANCED IT

The company uses the most advanced IT for the Supply Chain
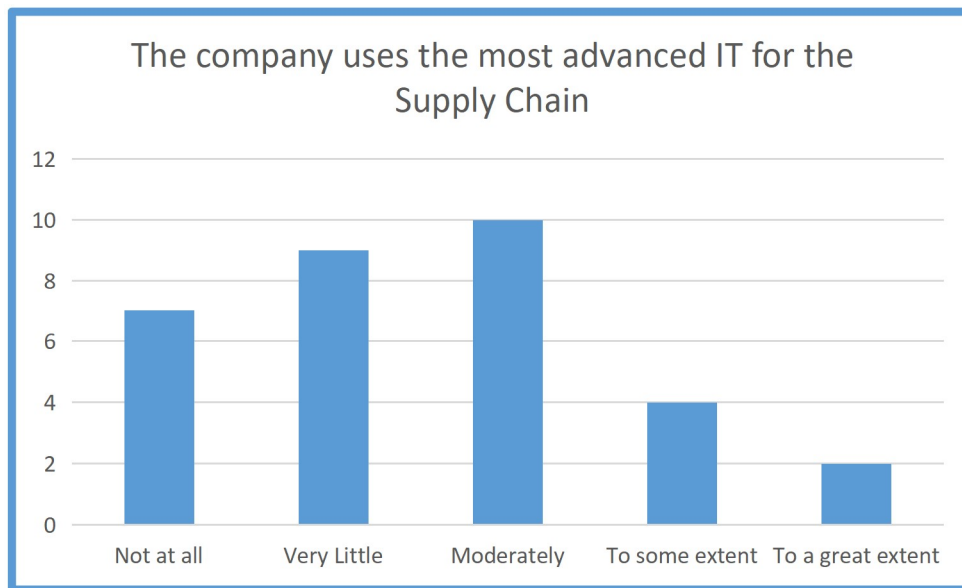
Source: Field Data, 2021

Figure 3 above shows the distribution of responses to the question whether the company uses the most advanced information technology for its supply chain. Most of the respondents do not believe that their firm uses the most advanced IT in the supply chain. A combined 6 out of the 32 respondents believe that the firm uses the most advanced information technology to some extent (4) or to a great extent (2), majority believe that the firm somewhat uses the most advanced IT.

4.33 Figure 4 RESPONSES ON IT INVESTEMENT

The company invests in IT to align its technology with that of its partners
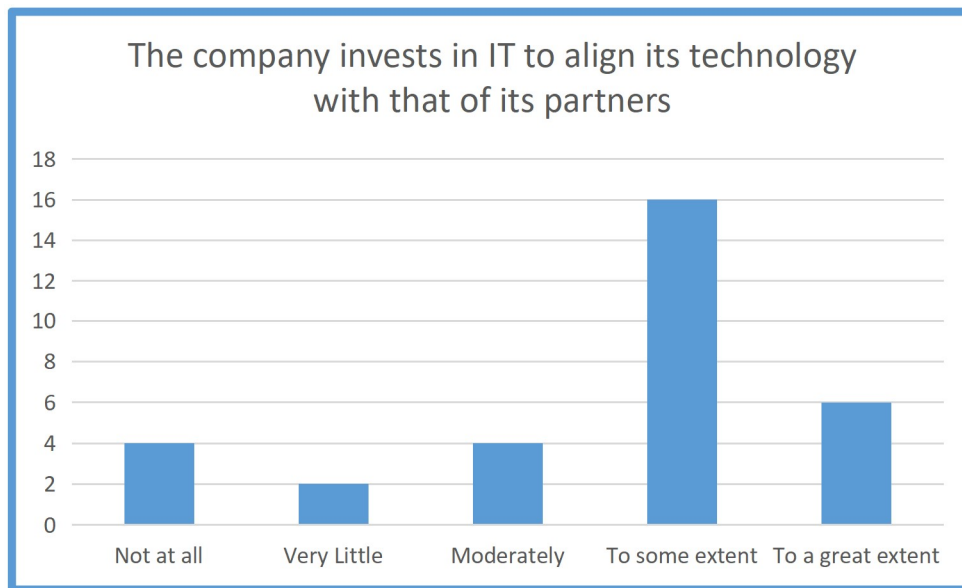
Source: Field Data, 2021

This question was to find out if the firm invests in information technology to align their technology to what other partners are offering and also to ease cooperation between them in the supply chain. 50% the respondents believe that the firm makes the effort to allocate resources to better the technology used in the supply chain. 18%, the second highest number believe to a great extent that the firm invests into IT for its supply chain. This shows that the firm has made the effort to always commit to investing into their IT for the supply chain and to make it easier for the partners to cooperate with them.

4.34 Figure 5 RESPONSES ON FIRMS POSSESION OF THE MOST ADVANCED
TECHNOLOGIES IN THE SUPPLY CHAIN COMPARED TO OTHER FIRMS
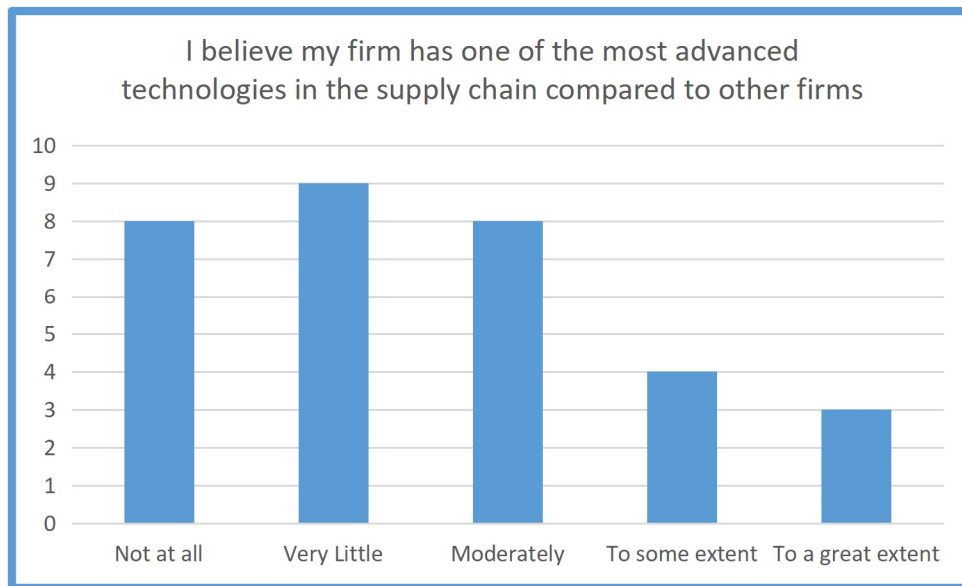
Source: Field Data, 2021

This question was to test the view of the respondents if they were of the opinion that
their firm uses on of the most advanced technologies in the supply chain compared to
other firms in the industry. Clearly from the chart above, most of the respondents to
do not believe that compared to their competitors, they use one of the leading
technologies in the supply chain. A combined 25 of the 32 respondents which make
up about 78% of the responses believe the firm does not use the most advanced
technology compared to their competitors.

4.35 Figure 6RESPONSE ON DEVICE USED FOR RECORDING PRODUCT INFORMATION
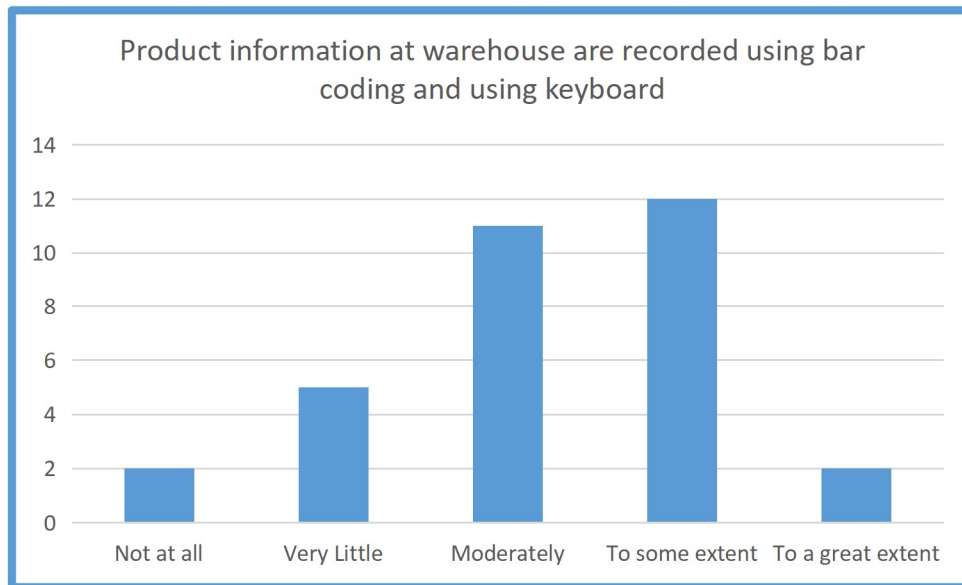
Source: Field Data, 2021

The bar chart above shows the responses to the question if product information at warehouse are recorded using bar codes and using keyboards. 12 of the respondents agree to some extent that bar codes and keyboards are used to input product information in the warehouse whereas 11 of them are unsure about such practices. 2 of the participants agree to a great extent that in fact bar codes are in the warehouse and 7 of the others have the view that none or very little of the bar codes are used in the warehouse. With majority of the responses indicating that as a matter of fact some product information is recorded by bar codes or keyboards moderately, to some extent and to a great extent it can be confirmed that the firm uses such devices.

4. 36 Figure 7 RESPONSE ON USE OF RFID AT IN SUPPLY CHAIN
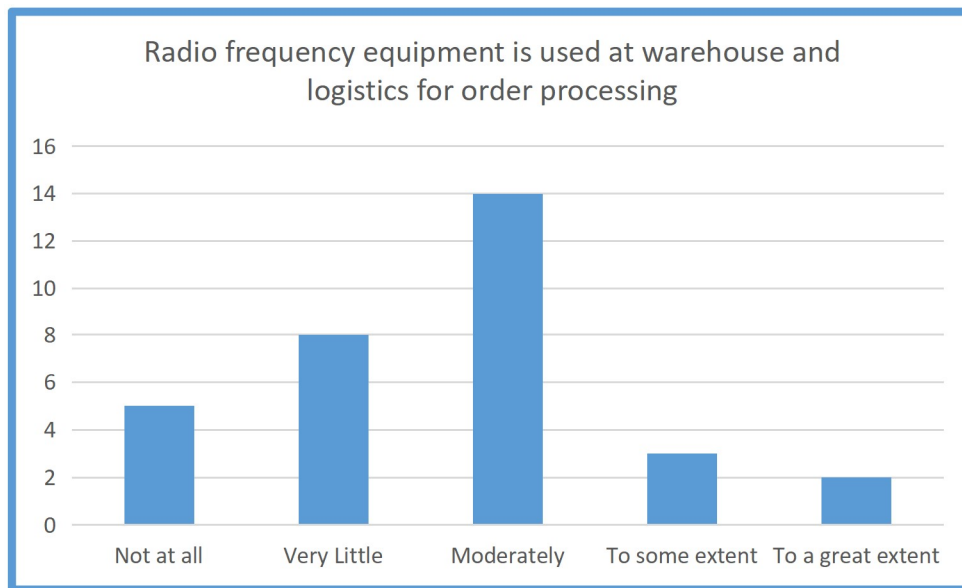
Source: Field Data, 2021

The figure above shows the responses to the question whether radio frequency equipment is used at warehouse and logistics for order processing. Here 14 (43%) of the respondents selected moderately to the question showing that they are not entirely sure about the existence of such equipment while 8 said very little of such an equipment was used in the warehouse and logistics of the firm, 5 said not at all and the other 5 said such an equipment was used to some extent or to a great extent. The data therefore concludes that majority of the respondents could not confirm if such an equipment was being used in the warehouse or logistics for order processing.

4.37 Figure 8 RESPONSE ON MANAGEMENTS COMMITMENT TO IT

Top management believe that we can achieve greater supply chain performance (cost,quality,reliability,flexibility and speed) through the use of IT infrastructure
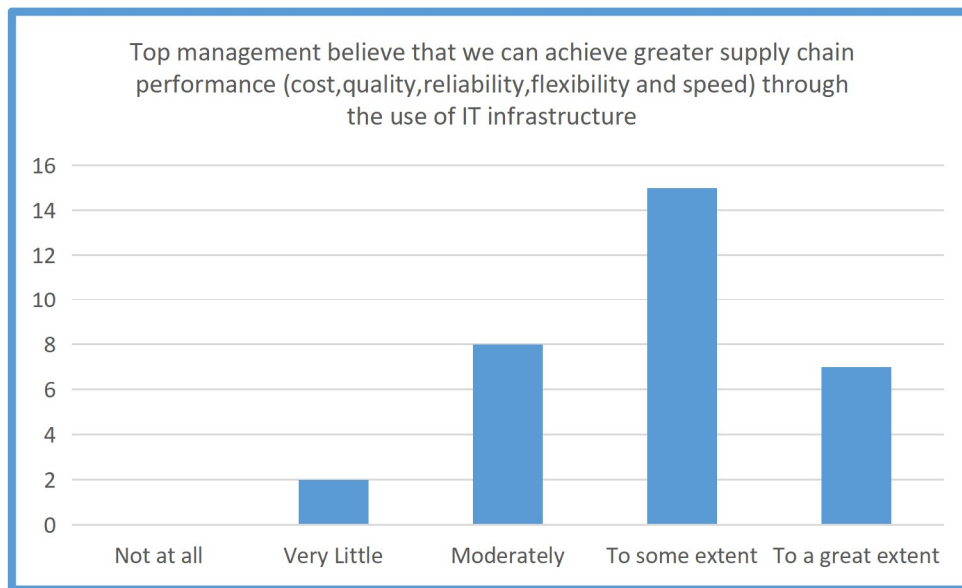
Source: Field Data, 2021

Figure 8 above shows the distribution of responses whether the respondents have the view that the top management believe that they can achieve greater supply chain performance if they engage in IT infrastructure. About 15 of them making the majority with a percentage of 46 maintain that management believe that they can achieve a substantial advantage in their supply chain performance if they use IT infrastructure. No one registered a response for not at all whilst 2, 8 and 7 people responded "very little", "moderately" and "to a great extent" respectively. It is absolutely certain that if the top management of any organisation support the achievement of a particular goal, the execution of that goal becomes almost certain by the entire organisation.

4.38 Figure 9 RESPONSE ON COST REDUCTION BY IT INVESTMENT
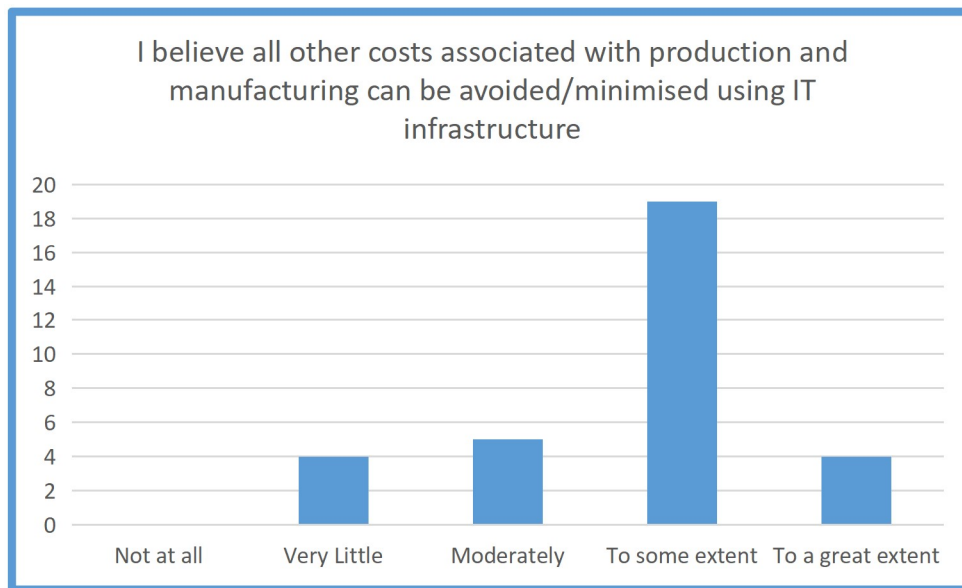
Source: Field Data, 2021

The bar chart above shows the responses to the question if the respondents believe that through the use of IT infrastructure production and manufacturing costs can be completely avoided or reduced. Over 59% of the respondents believe that these costs can be avoided if the firm makes use of IT infrastructure, again no one registered a response for "not at all" whiles there were 4 registered responses each for "very little" and to a "great extent". Response for moderately were 5 making about 16% of the entire votes. This is to show that the entire organisation are ready to embrace the use of IT infrastructure if they want to curb some of the costs associated with manufacturing and production.

4.4 SECTION C: INFORMATION SHARING WITH SUPPLY CHAIN PARTNERS

4.41 Figure 10 RESPONSE ON COLLABORATION BETWEEN PARTNERS
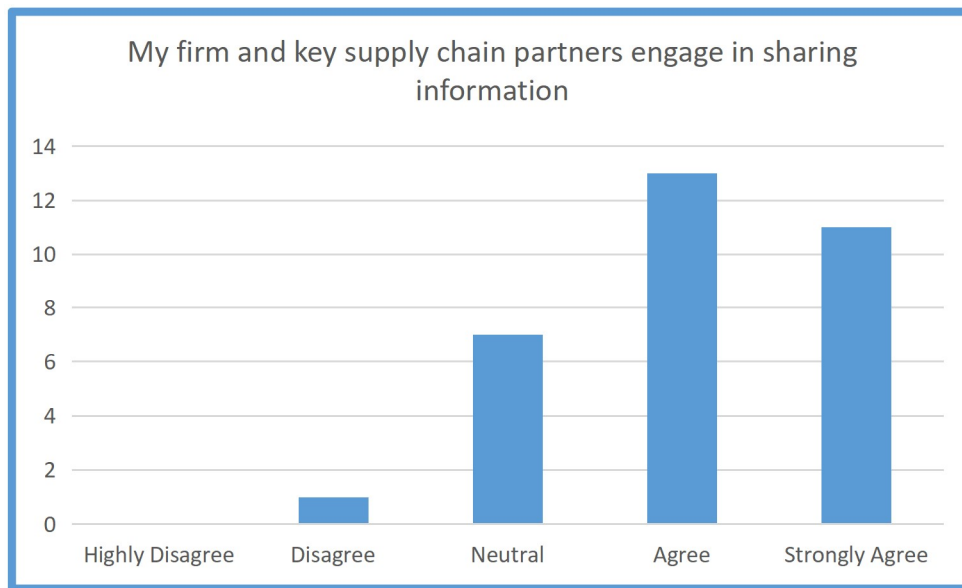
Source: Field Data, 2021

Figure 10 above shows the results to the question if the the firm shares information with its supply chain partners. There was one registered response that disagreed with this statement, 7 of them were neutral and 13 of the respondents agreed to the statement, with 11 of them agreeing strongly to the fact that the firm and its key partners engage in sharing information in the supply chain. No respondent highly disagreed to this statement.

4.42 Figure 11 RESPONSE ON SHARING STRATEGIC PLANS WITH PARTNERS

Source: Field Data, 2021

The chart above illustrates respondents level of agreement to the statement that the firm collaborates with its supply chain partners to make strategic decisions and forecasts. 4 of the respondents highly disagree with this statement, 6 of the respondents disagree and 11 of the responses registered "neutral". 9 of the respondents agree and just 2 of the responses registered "strongly agree"

4.43 Figure 12 RESPONSE ON SHARING OTHER TYPES OF INFORMATION
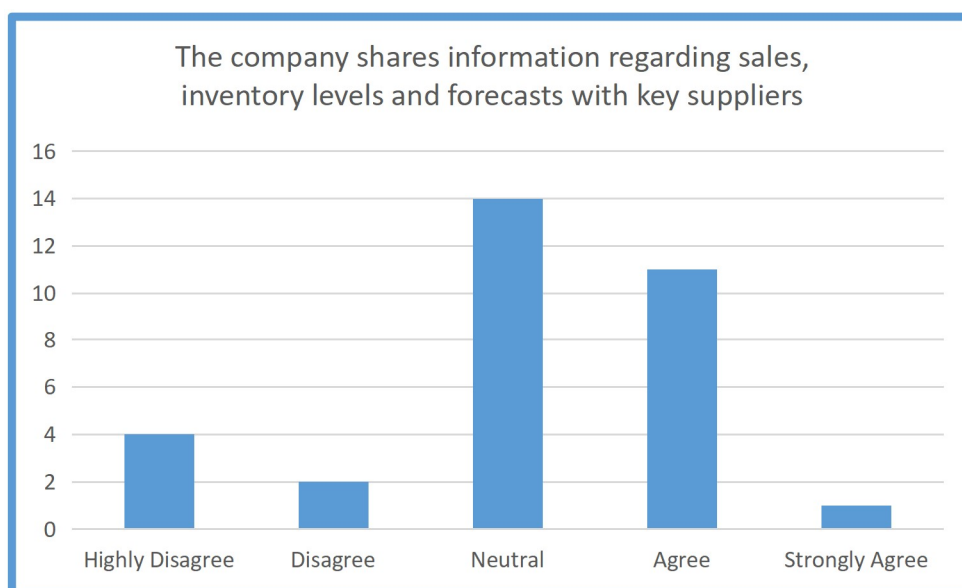
Source: Field Data, 2021

The above chart was used to assess the respondents level of agreement to the type of information that may be shared by the firm to its suppliers. 14 of the respondents registered a neutral response while 11 of them agreed to the fact that the company shares sales and inventory data with its suppliers. The least response was one respondent who strongly agreed to the statement. 2 respondents disagreed to the statement and 4 respondents highly disagreed.

4.44 Figure 13 RESPONSE ON PARTNER COLLABORATION IN OPERATIONAL PROCESS
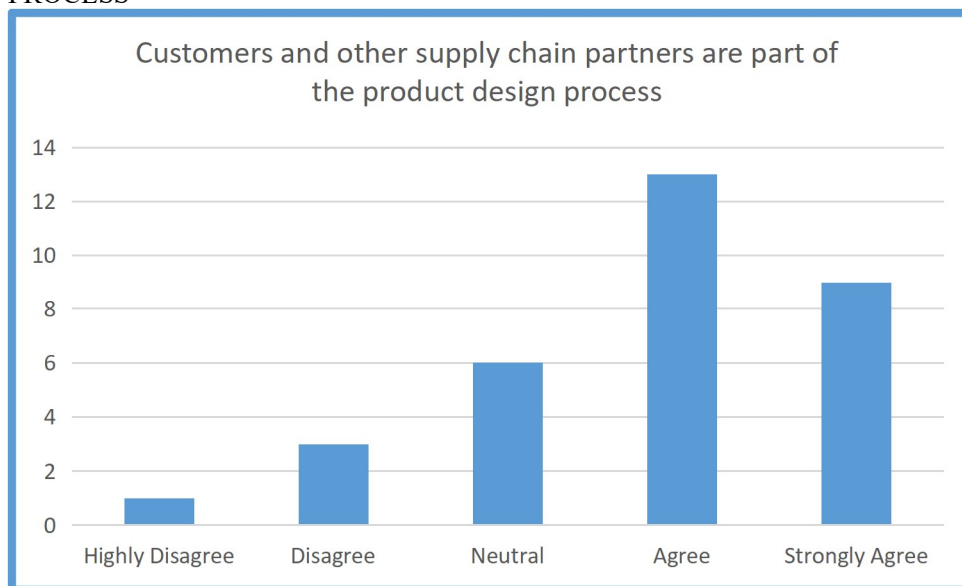
Source: Field Data, 2021

From the chart above it can be established that the firm includes its customers and other partners of the supply chain in its product design process. Majority of the responses registered "agree" to the statement followed by the second highest of 9 who strongly agree to the statement. The lowest response registered 1 to highly disagree

followed by second lowest response of 3 for disagree. 6 of the responses registered "neutral".

4.45 Figure 14 RESPONSE ON ADEQUACY AND QUALITY OF INFORMATION SHARED
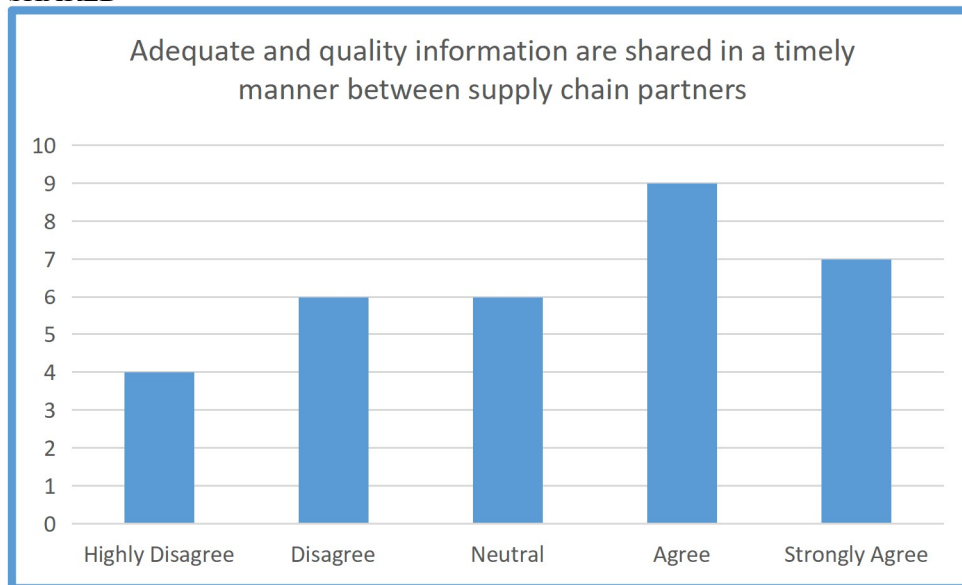
Source: Field Data, 2021

Figure 14 above shows the results to the question if the firm and its supply chain partners share quality and adequate information in a timely manner. 9 of the respondents agree to this statement, 7 strongly agree, 12 responses were shared amongst "neutral" and "disagree" evenly. 4 respondents highly disagree with this statement. The responses were quite fairly distributed here but the stand out response agreed to the statement.

4.46 Figure 15 RESPONSE OF TIMELINESS OF INFORMATION SHARED

My firm gets timely information from supply chain partners to make necessary supply chain decisions
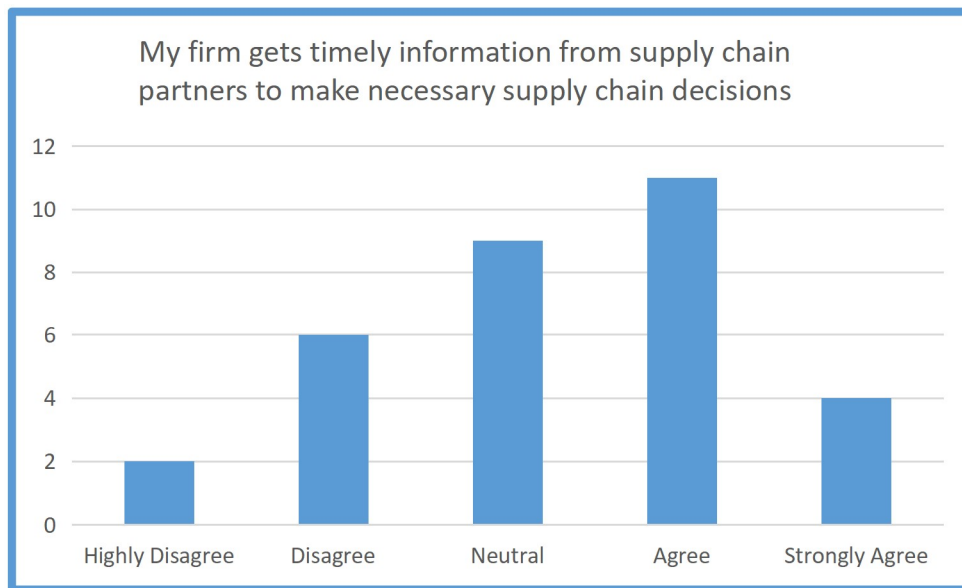
Source: Field Data, 2021

The figure above shows the response for the question if the firm tends to get information at the right time to make necessary supply chain decisions. 11 of the respondents agreed to the statement while just 4 of the respondents strongly agree to the statement. 9 of them chose "neutral", 6 disagreed and only 2 of the respondents highly disagreed to the statement.

4.47 Figure 16 RESPONSE ON EFFECT TIMELY INFORMATION

Timely information affects our production schedule and fulfilment of orders
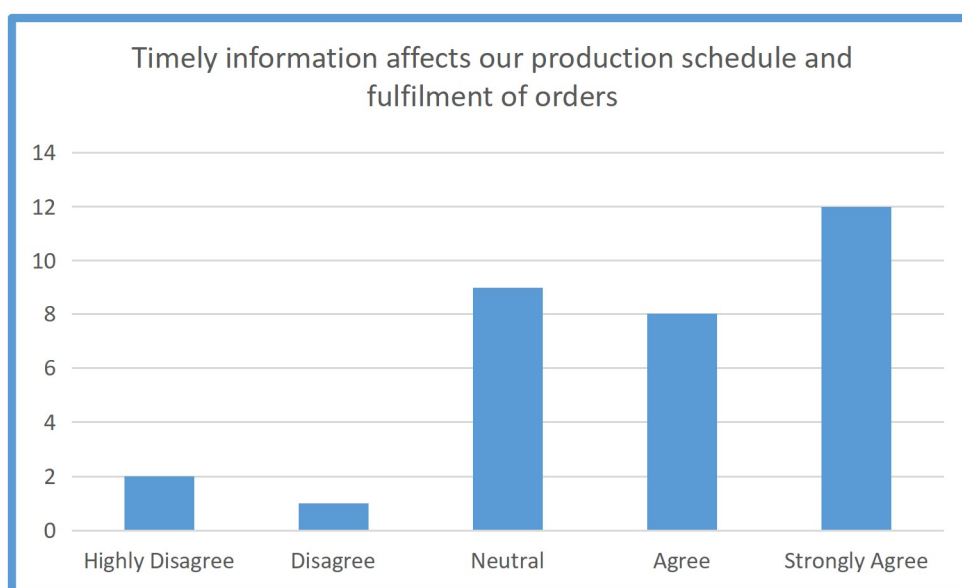
Source: Field Data, 2021

The figure above illustrates the respondents view on the question if timely information affects the schedule and fulfilment of orders. Here most of the responses were fairly shared amongst "neutral" , "agree" and "strongly agree" representing about 90% of the responses, 9 registered "neutral", 8 registered "agree" and 12 registered "strongly agree". the other 10% was shared amongst those who disagreed and highly disagreed to the statement. This results is to say that in fact if information is shared in a timely manner it can go a long way to better the performance of firms in a supply chain since it affects some decisions.

4.48 Figure 17 COMMUNICATION OF ORDER FULFILMENT
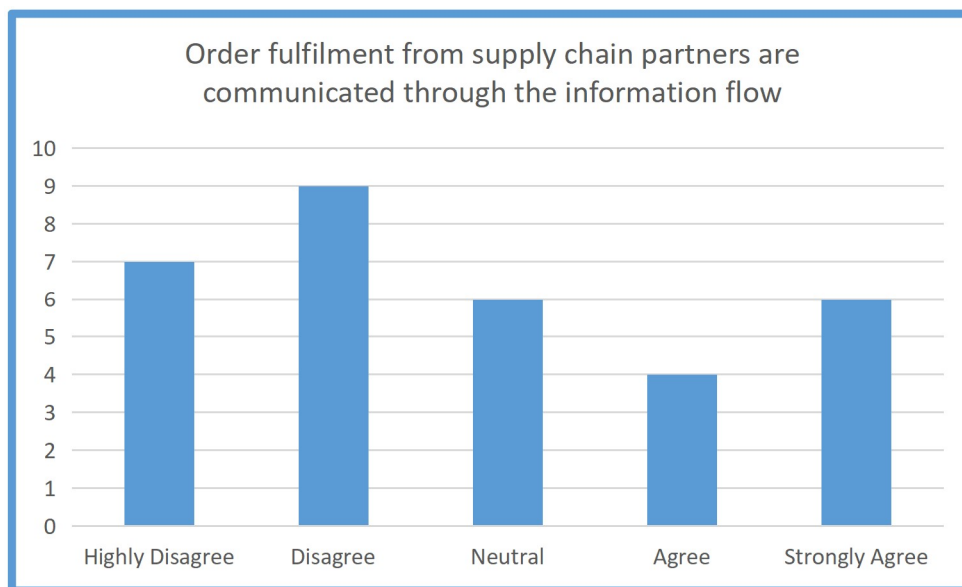
Source: Field Data, 2021

The bar chart above shows data from the response to the question if the firm communicates with its partners about order fulfilment in the information flow of the supply chain. Here 9 of the respondents registered a response to disagree with the statement representing the majority. The lowest number of respondents agreed to the statement representing just 4 of the respondents. 7 highly disagreed, 6 strongly agreed whereas another 6 of the responses were neutral. It can be said that not much

collaboration goes into sharing information about order fulfilment amongst the partners of the firm's supply chain.

4.49 Figure 18 PARTNERS ROLE IN DEMAND FORECASTS
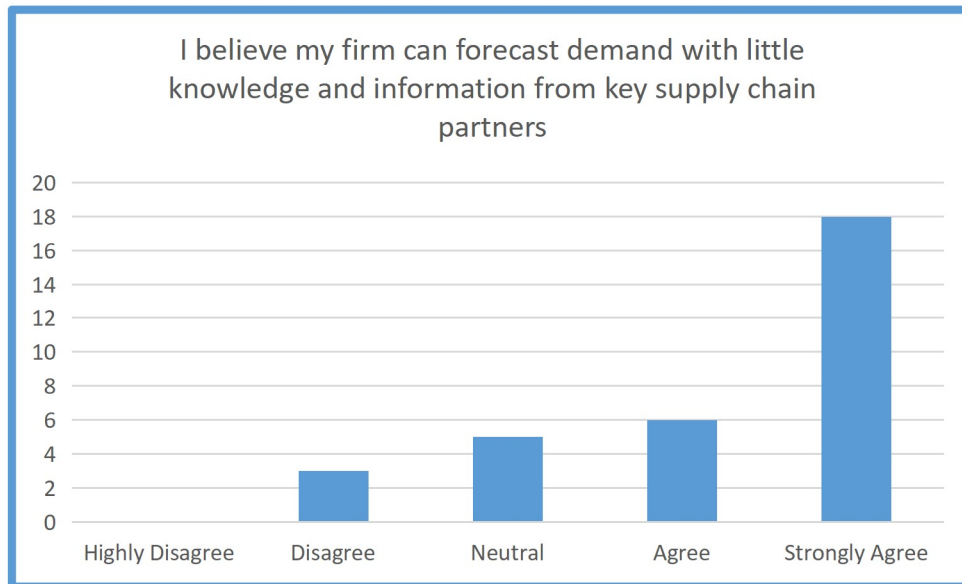
Source: Field Data, 2021

In Figure 18 above, out of the 32 responses, no one highly disagreed to the belief that the firm can make forecasts with some knowledge and information from their supply chain partners. Majority of them represented by 18 responses strongly agree that the firm needs some information from its partners to be able to make demand forecasts while only 3 disagreed, 5 were neutral and 6 agreed. This to show that in fact firms rely on information from others in the supply chain to able to make accurate demand forecasts.

4.50 Figure 19 DO PARTNERS USE INFORMATION SHARED?
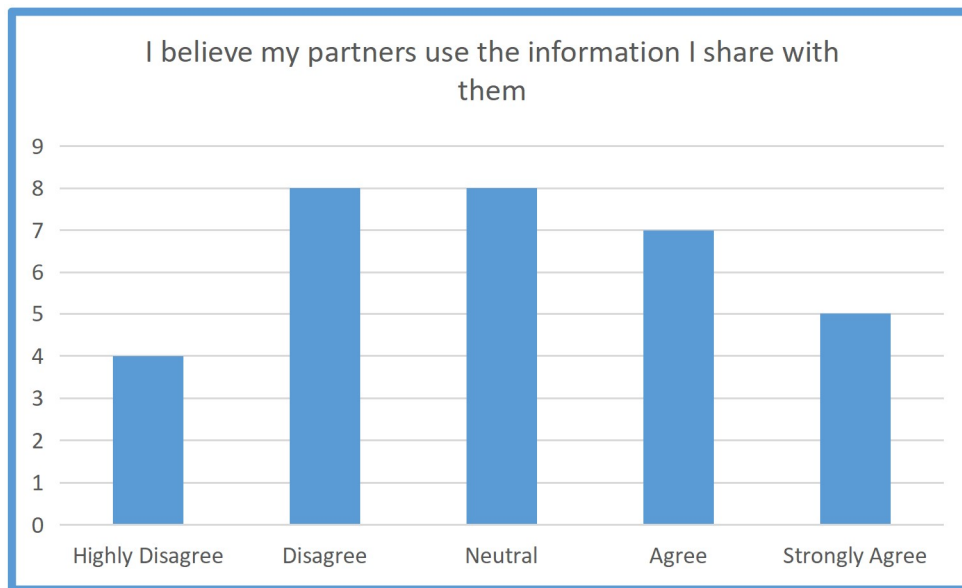
Source: Field Data, 2021

The figure above shows that 16 of the respondents either disagreed or were neutral to knowing whether their partner make use of information shared with them by their firm. 7 of the respondents agreed that their partners make use of the shared information, 5 strongly agreed and 4 highly disagreed. This information can be used to draw a conclusion that the employees of the firm believe that most of the partners tend not to act on shared information that their firm makes available to their partners.

4.51 Figure 20 RELIANCE ON INFORMATION SHARED BY PARTNERS

I am sceptical about the information I get from my supply chain partners
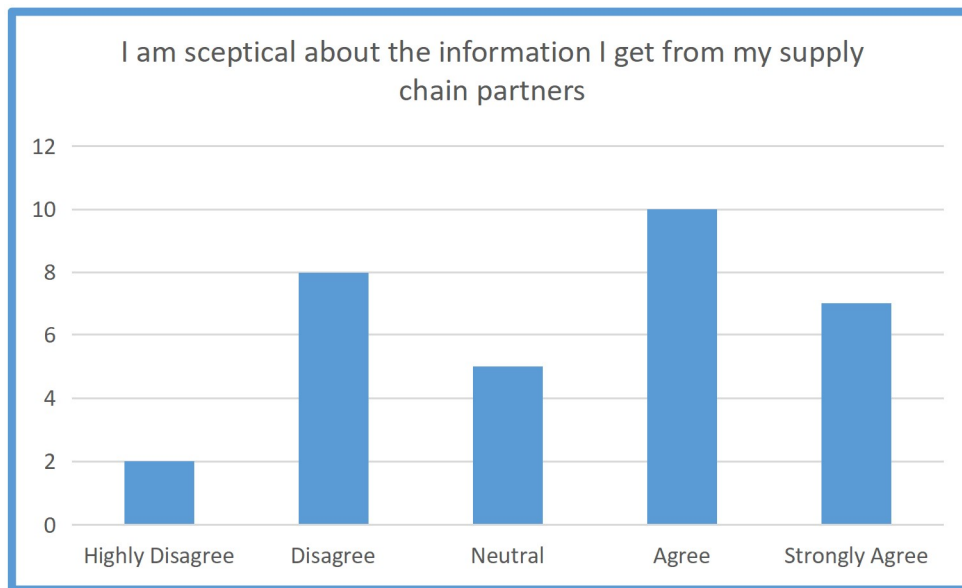
Source: Field Data, 2021

The figure above shows data about assessing how trustworthy the information shared by other supply chain partners are. 10 of the 32 respondents agree to be sceptical about the information they get from their supply chain partners, 8 disagree, 7 strongly agree, 5 were neutral and 2 highly disagreed. This is to say that majority of the respondents and for that matter majority of the employees do not trust information shared by their supply chain partners.

4.52 Figure 21 PARTNERS CONCERN ABOUT SUPPLY CHAIN SUCCESS
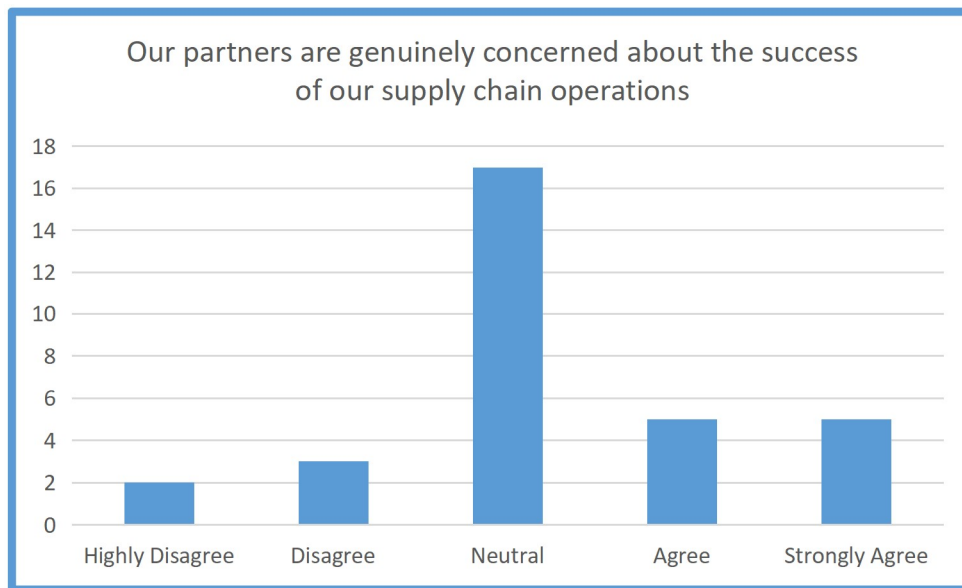
Source: Field Data, 2021

The figure above shows the results to the question if the other partners in the supply chain are genuinely concerned about the success of the firm's supply chain operations. 17 out of the 32 responses registered "neutral" making up about 53% of the total responses. 5 people strongly agreed and 5 others also agreed to the statement. 3 responders disagreed and 2 highly disagreed.

4.54 Figure 22 VALUE FROM INFORMATION SHARED

My firm does not gain value out of information shared between my customers and suppliers

Response	Value
Highly Disagree	15
Disagree	8
Neutral	7
Agree	2
Strongly Agree	0
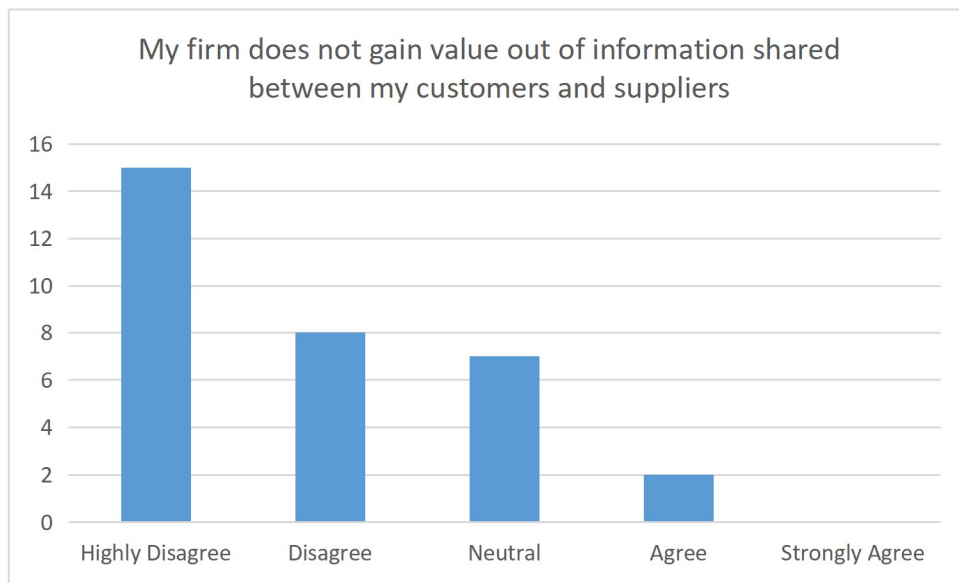
Source: Field Data, 2021

The figure above shows the data on the respondents view if the firm does not gain some value from shared information between its customers and suppliers. No one strongly agreed that the firm does not gain any value from the information shared between its customers and suppliers. In fact majority of the responders highly disagreed to the statement while 8 disagreed and 7 were neutral leaving just 2 respondents to agree to the statement.

4.55 Figure 23 PARTNERS INCLUSION OF FIRM IN THEIR DECISIONS

Our supply chain partners keep our organisation fully informed about issues that affect its business

Response	Value
Highly Disagree	13
Disagree	5
Neutral	6
Agree	6
Strongly Agree	2
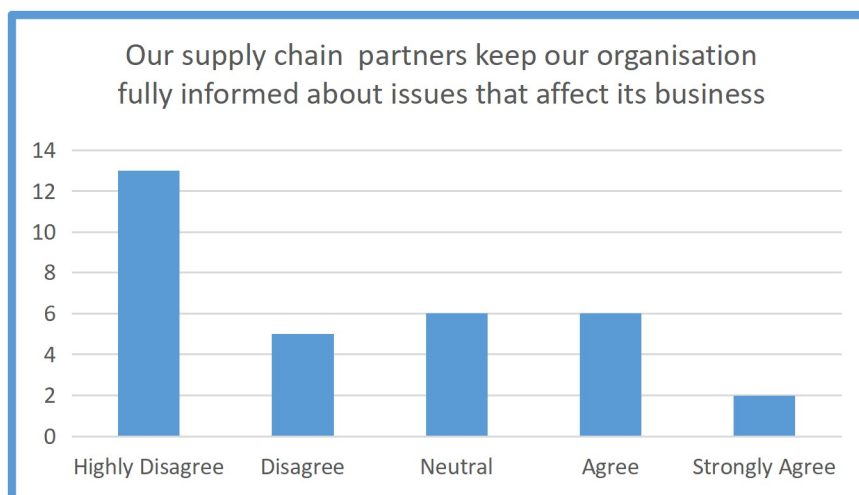
Source: Field Data, 2021

Out of the 32 respondents,13 of them highly disagree that their supply chain partners keep the organisation fully informed about issues that affect their business. 12 responses were shared evenly for those who were neutral about the statement and those ho agreed to the statement. 5 of the respondents disagree and 2 of the respondents strongly agree to the statement. This means that the respondents believe that not all information that affects their partners' business is shared with the firm.

4.55 Figure 24 INFORMATION SHARING BETWEEN THE PARTNERS
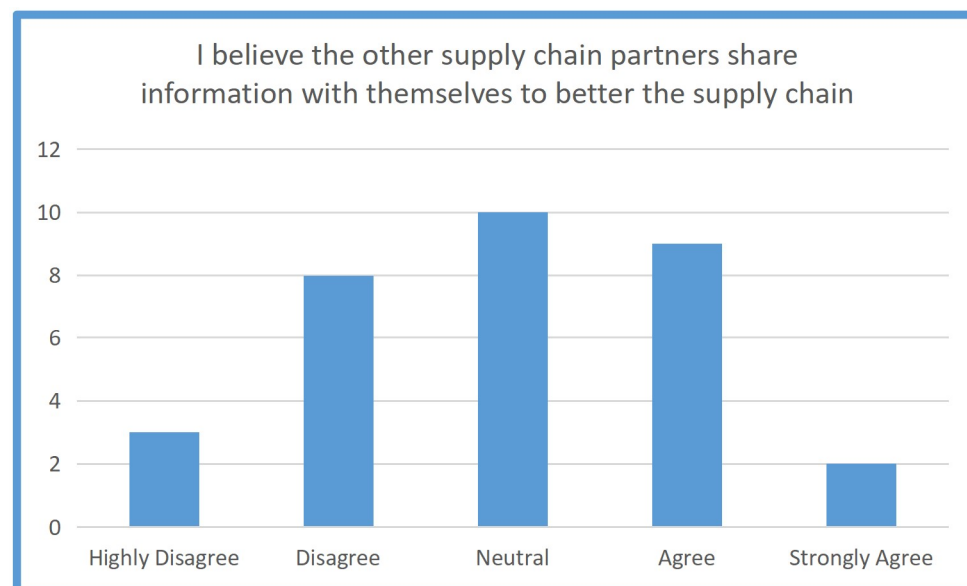
Source: Field Data, 2021

Figure 24 above shows the response to the question if the respondents believe that the other supply chain parters share some information among themselves. 10 of the respondents could not tell as they registered a neutral response while 9 of the respondents agreed that the other partners share information with the other partners in the supply chain. 8 of the respondents disagree ad 3 of them highly disagree that the other supply chain partners share information with the other partners.

SECTION D

This part of the questionnaire was answered by just 13 of the respondents while the rest left them blank. The common answer for the first part of the section which asked for the new ways that they suggest to help improve the collaboration in the supply chain was that if all the firms in the supply chain strive to make every situation a win-win opportunity with the right benefit sharing model. They suggest that if for example the manufacturer and retailers could collaborate where the result will be an increase in sales for both parties. Another issue for which they suggested could be improved upon was for each party to trust one another to make it possible for them to share some valuable information that can benefit both parties. They also suggest that all parties in the supply chain should make an effort to invest in some IT infrastructure that can be used to share information amongst themselves. Other suggestions included the various firms in the supply chain making an effort to "train" their employees to be able to understand the essence of supply chain collaboration.

The part B of this section asked the respondents new technologies that they would want their firm to invest in to improve supply chain coordination with partners. Some suggested that the security of their data should be improved if they want to move to the next level of having to share information with their partners. Some suggestions included the creation of mobile software and application for the firm to enable interaction between the suppliers, customers, other partners in the supply chain. It is understood that this will make it possible for them to place orders for new supplies from their suppliers and for customers to place orders for products through the application. There was another respondent who suggested that the firm can invest in drone technology for transporting deliveries to customers and retailers.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION, RECOMMENDATIONS AND SUGGESTIONS FOR FUTURE STUDIES

5.1 INTRODUCTION

This chapter captures summary of the main findings of the study presented in chapter four, the conclusion, recommendations and suggestions for future studies.

5.2 SUMMARY OF FINDINGS

The study initially examined the demographic characteristics in relation to the gender, age, level of education, department and years of experience of the employees of Fan Milk Limited. The gender representation of the respondents revealed that males dominated the entire workforce. For that matter it can be concluded that the findings were more skewed towards the ideas of men. Most of the respondents were between the ages 40 and 49, showing that most of the workers are physically active and are within the mid years of their work life. Most of the workers have their highest level of education at the tertiary level or beyond. Again this means we could rely on the responses provided by the respondents since majority could read and understand the questions provided. The most represented department in the firm for the survey were from the logistics department and most of the respondents have been working between 10 to 15 years. This gives enough confidence as to the competence of the respondents for answering the questions.

The section B of the questionnaire aimed to gather responses on the various information technologies adopted by the firm and how it impacts their supply chain. This was to achieve the research objective of recognizing the role of emerging technology for improving supply chain information management. It can be established to some extent that as a matter of fact some form of technologies are employed in the

supply chain of the firm. Examples include the traditional telephones, emails and some quite modern ones such as RFIDs and Bar code scanners. Most of the respondents also believe management and the employees both believe that information technology can be the answer to most of their challenges in the supply chain.

The section C of the questionnaire aimed to assess the information sharing and collaboration between the supply chain partners.This section of the questionnaire was to achieve the objectives of:

i. Understanding the flow of information in the supply chain

ii. Determining how information shared is used by various partners of the supply chain

iii. To what extent does information sharing improve supply chain coordination

Most of the responses established that there is some noticeable collaboration between the supply chain partners, however the issue was regarding trust between the partners. The study also established that not all information that may be relevant to other partners are shared.

5.3 CONCLUSION AND RECOMMENDATIONS

The findings in this study have shed lights on the various aspects of information sharing and the role information technology plays in supply chain operations in manufacturing firms. Based on the study, it is clear that sharing information in a supply chain can go a long way to make supply chain collaboration better. It was established that the most common type of information shared amongst the partners are inventory data and demand information.Despite the benefits of information sharing discussed in the literature review, the study found that firms do not intensively share some operational and strategic information. To some extent demand forecasts were

shared but they must be complimented by other information like order status, delivery schedules, customer information, and production schedules as there is a risk of the other partners overstating their demand and inventory requirements. Investing in advanced technology can take this collaboration to another level as far as all firms in the supply chain are ready to embrace it. To successfully adapt the new technology, managers must first pay attention to what kind of technology is needed and what aspect of the supply chain or even production status that technology will be required. The employees or better still human resource must be taken into consideration when choosing these systems because their skills will play a part in the execution of such systems. It is important to note that competitors of FanMilk in the food manufacturing and processing industry are ready to duplicate any systems that make FanMilk look more competitive in its supply chain, this will move the industry to anther level since most firms will be applying some of the most advanced technologies in their supply chain. Information technology investment decisions should also be focused on how they can reduce current problems in the supply chain. They must make decisions that will reduce order response and fulfilment time, reduce inventory related costs, and even be able to meet customer demands at the right time.

Firms are also encouraged to increase collaboration between supply chain partners both downstream and upstream. These collaborations can be made possible through various information technologies. Electronic data interchange software will make it easier to share some business documents amongst partners whiles maintain maximum security. Systems like inventory management, order management, enterprise resource planning and vendor management systems can be used to improve data exchange and sharing within the supply chain. Also blockchain technology has been a recent inclusion to the list of new technology to be adopted by firms. This new technology is

an automated digital system for recording transactions of multiple supply chain partners so that they can not be tempered with by an unauthorised party. The system is believed to improve the supply chain by enabling faster and a more cost-efficient delivery of products, enhancing the traceability of products and improving collaboration between supply chain partners.

As discussed, manufacturing firms require the best use of advanced technology to improve information sharing and collaboration in their supply chain to increase their competitive advantage and also survive in today's emerging economy.

5.4 SUGGESTIONS FOR FUTURE STUDIES

a. Future researchers are encouraged to include other partners of the supply chain for the firm or firms to be studied as it will give a perspective of what the partners in the supply chain may be experiencing.

b. Future studies should also pay attention to post-sales service information and how it is dealt with by firms in the supply chain

c. Researchers should also conduct in-depth studies on the various draw backs to firms sharing information with each other.

d. Future researchers are encouraged to include more manufacturing firms in the country since this study was focused on just FanMilk Limited located in Accra. Other studies can be conducted in other parts of the country to bring a more representative data about manufacturing firms in the country.

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APPENDIX

QUESTIONNAIRE

CENTRAL BUSINESS SCHOOL

DEPARTMENT OF MANAGEMENT AND PUBLIC
ADMINISTRATION

A QUESTIONNAIRE ON ANALYSING THE ROLE OF
INFORMATION TECHNOLOGY IN THE INFORMATION FLOW OF
THE SUPPLY CHAIN OPERATIONS OF MANUFACTURING FIRMS
IN GHANA.

Dear Respondent,

I am a final year student from Central University conducting a research**.**
This research work is part of the requirements for the completion and
award of my Bsc. in Management Studies degree. The research is for
academic purposes only and for that we will not require your name or
identity. You are guaranteed maximum anonymity and confidentiality on
your response to this survey. Please take a few minutes of your time to
fill out the questionnaire as frankly as possible. Thank you for helping us
make this survey a possibility with your response.

SECTION A: DEMOGRAPHIC DETAILS OF RESPONDENT
Please state or tick(v) where appropriate
1. Gender   (a)Male[ ]   (b)Female[ ]

2. Age   (a)20-29years[ ]   (b)30-39years[ ]   (c)40-49years[ ]
(d)50-59years[ ]   (e)60 and above[ ]

3. Highest Level of Education
(a) Elementary[ ]   (b) Secondary[ ]   (c) Tertiary[ ]

(d) Any other, please specify ……………………………………

4. Department
(a) Purchasing & Procurement[ ]   (b)Operations[ ]   (c) Logistics[ ]
(d)Information Technology[ ]

5. I have been employed in this organisation for…………..
(a)2-5years[ ]   (b)5-10years[ ]   (c)10-15years[ ]   (d)15-25years[ ]
 (e) more than 25 years[ ]

SECTION B
INFORMATION TECHNOLOGY PRACTICES USED BY THE ORGANISATION

The following questions are about how your organisation has been using information technology in its supply chain. In general kindly identify your agreement on the following practices.

Please indicate your level of agreement on the following statements based on your experience
working in this company. The rating is from 1= very little to 5= a great extent

No		Very little 1	2	3	4	A great extent 5
6	My firm uses a software in managing its supply chain and warehousing operations					
7	The company uses the most advanced IT for the Supply Chain					
8	The company invests in IT to align its technology with that of its partners					
9	I believe my firm has one of the most advanced technologies in the supply chain compared to other firms					
10	Product information at warehouse are recorded using bar coding and using keyboard					
11	Radio frequency equipment is used at warehouse and logistics for order processing					
12	Top management believe that we can achieve greater supply chain performance (cost,quality,reliability,flexibility and speed) through the use of IT infrastructure					
13	I believe all other costs associated with production and manufacturing can be avoided/minimised using IT infrastructure					

SECTION C
INFORMATION SHARING WITH SUPPLY CHAIN PARTNERS

The following questions are about how well your organisation shares information with its supply chain partners. In general kindly identify your agreement on the following practices.

Please indicate your level of agreement on the following statements based on your experience
working in this company. The rating is from 1= highly disagree 5= strongly disagree

		Highly disagree			Strongly disagree

No		1	2	3	4	5
14	My firm and key supply chain partners engage in sharing information					
15	The company develops strategic plans and forecasts in collaboration with key suppliers					
16	The company shares information regarding sales, inventory levels and forecasts with key suppliers					
17	Customers and other supply chain partners are part of the product design process					
18	Adequate and quality information are shared in a timely manner between supply chain partners					
19	My firm gets timely information from supply chain partners to make necessary supply chain decisions					
20	Timely information affects our production schedule and fulfilment of orders					
21	Order fulfilment from supply chain partners are communicated through the information flow					
22	I believe my firm can forecast demand with little knowledge and information from key supply chain partners					
23	I believe my partners use the information I share with them					
24	I am sceptical about the information I get from my supply chain partners					
25	Our partners are genuinely concerned about the success of our supply chain operations					
26	My firm does not gain value out of information shared between my customers and suppliers					
27	Our supply chain partners keep our organisation fully informed about issues that affect its business					
28	I believe the other supply chain partners share information with themselves to better the supply chain					

SECTION D

29. What new way do you suggest to your company to improve their interaction and sharing of information with their supply chain partners?

....
....
....
....

30. What new technology do you think can be included in your firm's supply chain to improve coordination with other partners?

....
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