KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

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The essence of Information Technology (IT) in Supply Chain management. A case study of Manufacturing firms in Ghana

BY

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DECLARATION

I hereby declare that this submission is my own work towards the Master of Science, Logistics and Supply Chain Management and that to the best of my knowledge, it contains no material previously published by another person nor material that has been accepted for the award of any other degree of the University, except where due acknowledgment has been made in the text.

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DEDICATION

I dedicate this to myself, my entire family especially my parents, Mr. & Mrs. Asante, and to my wife, son and friends.

ACKNOWLEDGEMENT

I would like to convey my deepest gratitude to the following people for inspiring me to embark on this study. My foremost thanks to my Supervisor, Doctor Kwabena Obiri-Yeboah, who has guided me through all phases of the study. His rigorous oversight and motivation have helped me to work to my maximum ability. I must also thank my former boss, Mr.Joseph Darko Mantey, the Logistics manager of Olam Ghana Ltd without whose permission and goodwill, I would not have undertaken this study. I also appreciate the cooperation and support of my colleagues who have relentlessly provided and supported me during the whole time of my study. I would like to extend my appreciation to the Kwame Nkrumah University Science and Technology Graduate School of Business for availing such a flexible study program that could otherwise have been challenging for me to pursue my study. I wish to express my deepest gratitude to my instructors for their highly valuable knowledge transfer and deeply educational classroom. My parents, my wonderful and supportive wife, Linda Adu Gyamfi, my lovely son, Jedidiah Nana Yaw Ofori Asante and my mom are mentioned last only to emphasize the special nature of their extraordinary support during the course of my study and beyond.

ABSTRACT

The primary aim of this research is to evaluate the impact of information technology in supply chain management among manufacturing firms in Ghana. The research is quantitative. This study uses descriptive and explanatory research designs. Two hundred (200) individuals were selected using stratified random sampling. SPSS v26 performed the statistical analysis. Competitive pressure, staff knowledge, and relational advantage seem to impact supply chain IT adoption and use. Relational advantage and organisational preparation do not significantly affect supply chain IT implementation intentions. Transcranial Magnetic Stimulation (TMS) seems to negatively correlate with Artificial Intelligence (AI). Employee knowledge and competitive pressure strongly impact supply chain IT adoption intentions. The results show that integrating IT into supply chain (SC) management improves logistical efficiency. The research found that firms must be able to make educated judgements and adopt strategies to enhance logistics performance to gain a competitive advantage.

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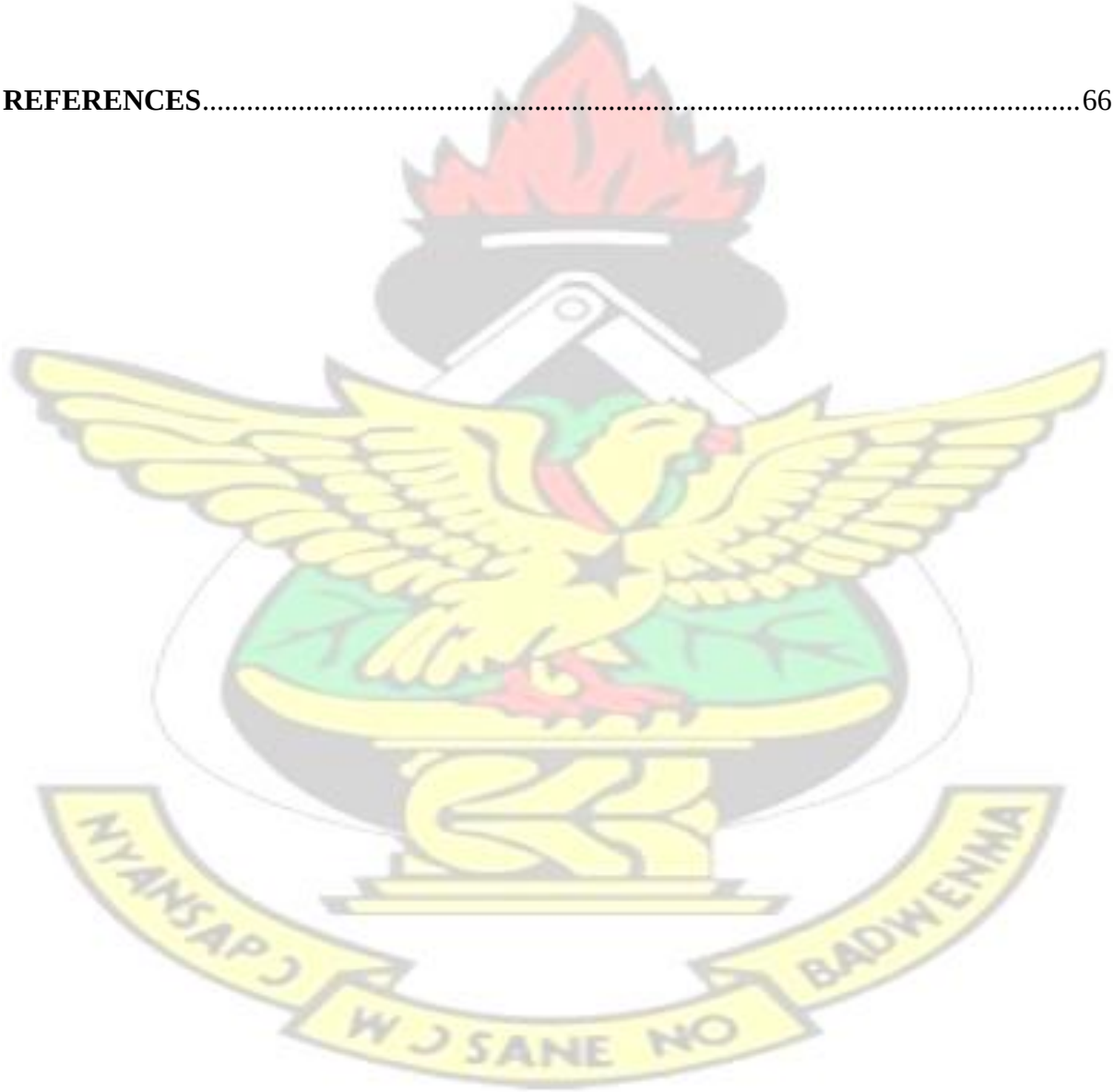

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

A number of issues with information flow, money transfer, data manipulation, tracking logistics, etc. plague the conventional supply chain management (SCM) process, which tend to augment increasing opportunity costs (Tasnim, et al., 2023). Therefore, a change from traditional SCM processes to more computerised ones is necessary. We have already observed a transition from linear supply chains to more integrated networks connecting different players due to the necessity for enhanced visibility across frequently hundreds or thousands of providers (Harapko, 2023). One of the technologies facilitating this tidal transformation is the Internet of Things (IoT) devices or sensors, which provide important information on where commodities are in the chain and their condition. A lot may be done to enhance supply chains in terms of end-to-end traceability, product delivery speed, coordination, and funding (Gaur & Gaiha, 2020). One solution that can offer a shared IT infrastructure to maintain efficient workflow and information flow among all SC partners is blockchain technology.

As a result of the fourth industrial revolution, businesses started utilising technology to streamline operations and cut expenses in an effort to become more competitive locally and globally (Beserra, 2020). In 2008, the blockchain technology originally emerged to support the emerging Bitcoin digital currency. However, it now has a wide range of uses and provides a new basis for a transaction in our increasingly digital culture (Rejeb, 2018). Blockchain, a decentralised digital ledger, stores data in blocks that are encrypted using cryptographic principles. The four main components of a block chain are the node (server), the transaction, the block (collection of transactions), the ledger (where the transactions are recorded) and the hash (algorithmic function) (Chang, et al., 2022).

In addition to providing traceability, boosting transparency, and establishing product provenance, as shown in the examples above, blockchain technology has further benefits. In fact, blockchain is a distributed ledger (database) that allows supply chain partners to communicate and exchange records such as information about products, certificates, localization data, transaction histories, and data from sensors and other connected devices while also securely creating, validating, and storing these records (Agi & Jha, 2022). A distributed or decentralised ledger, such as a blockchain, is a digital system for recording transactions between several parties in a verifiable and tamper-resistant manner. Transactions may also be automatically triggered by the ledger (Gaur & Gaiha, 2020). The adoption of the technology is expected to generate a value of USD 3 trillion per year by 2030. According to projections, this technology will be used by 10% of the world's economy by 2025 according the World Economic Forum (2018) and cited by (Bhardwaj, et al., 2021). The COVID-19 epidemic has significantly disrupted the world's supply chain management (Tasnim, et al., 2023).

Several commercial entities, including producers, retailers, distributors and suppliers, cooperation along the supply chain to find raw resources, transform them into finished goods or send goods to merchants (Ayan, et al., 2022). The impacts of the Covid-19 epidemic continue to have a substantial impact on worldwide supply chain networks. National lockdowns continue to impede manufacturing even in 2022 because they impede or even stop the flow of raw materials and completed commodities (Harapko, 2023). To deal with the constantly shifting consumer demands, environmental uncertainties, and the harsh market competition environment, businesses must work together to address the various client needs (Wang & Yang, 2022).

1.2 Problem Statement

Ghana's most well-known industrial industries include the production of electronics, vehicles, electric cars, automobiles, light manufacturing, aluminium smelting, food processing, cement, and small commercial ships (Addo, 2017). GIPC (2023) further explains that the industry contribution to GDP was 32% in 2021, 29% manufacturing contribution to industry and manufacturing value added to GDP been GHC49 billion with the five major sub-sectors of the manufacturing sector including agro-processing, cocoa processing, textiles and footwear, engineering/ machine tools and electronics and household appliances. However, coordination across the supply chain network was difficult to maintain during the COVID-19 epidemic. As a result of the pandemic, tracking product flow and information flow were crucial because lockdown conditions prevailed almost everywhere in the world. As a result, the reliability of the source, the information, and the products was in doubt because nothing could be physically tracked (Tasnim, et al., 2023). The goal of utilising a supply chain is to coordinate and improve communication across all departments and procedures of the production stages, from raw material flow through end-user delivery (Mubarik, et al., 2021).

The manufacturing, assembly, transfer, and distribution of goods and services from suppliers to customers in accordance with their needs is the focus of a supply chain, which is often referred to as a system or network of interconnected components. The ability for Ghanaian businesses to anticipate the rise of new technologies in the future may result from studying the elements that affect the decision to embrace Blockchain technology. On the other hand, businesses in the Ghana risk losing a competitive advantage over rivals abroad if they do not use Blockchain technology. As a result, many businesses find it very difficult to maintain openness and traceability. The majority of businesses in developing nations carried out all supply chain-related tasks manually, whereas most businesses in affluent nations had already used digital technologies like BCT; this posed significant hurdles for emerging nations in

particular (Tasnim, et al., 2023). One of the disruptive technologies of the current day is blockchain; the majority of organisations, despite its growing importance, remain confused about what blockchain is. How does it function? what industries the technology is used in? and how deployment will benefit their business? There is a popular misunderstanding that Bitcoin and blockchain are the same, however this is untrue (Mubarik, et al., 2020).

The literature suggests that adopting blockchain would benefit a variety of industries and businesses, regardless of their size; however, businesses must overcome some obstacles, such as a lack of resources, industry regulations and knowledge, which continue to be practical issues during the early stages of blockchain development (Berg & Myllymaa, 2021). According to the literature, businesses should concentrate on various strategies to reap the full rewards of collaboration; however, many researchers stress that trust is a significant problem because this type of cooperation necessitates the sharing of sensitive information and openness between the various parties (Petersson & Baur, 2018). The use of Blockchain technology in the supply chain process can assist to increase trust while also lowering transaction costs for businesses and preventing fraud (Supranee & Rotchanakitumnuai, 2017). There is less data on how blockchain technology can be used in supply chains and what effects it has on SC in the manufacturing sector because the majority of study on the topic focuses on the financial industry and the use of the cryptocurrency Bitcoin. Additionally, studies from rich countries rather than impoverished countries are more prevalent (Ayan, et al., 2022). The majority of studies to far have focused on creating conceptual frameworks with less research has been done on empirical analysis, which is focused mostly on the unified theory of acceptance and usage of technology (UTAUT) and technology adoption model (TAM) (Bayramova, Edwards, & Roberts, 2021; Supranee & Rotchanakitumnuai, 2017; Petersson & Baur, 2018; Berg & Myllymaa, 2021). It is on this background that the study sought to explore the factors that are needed for determining the intention to adopt blockchain the manufacturing sector in Ghana.

1.3 Objectives Of The Study

The general objective of the study is to evaluate the impact of information technology in supply chain management among manufacturing firms in Ghana. The specific objectives of the study are:

1. To evaluate the level of adoption and usage of IT in supply chains in manufacturing firms in Ghana
2. To examine the impact of IT in supply chain processes among manufacturing firms in Ghana.
3. To explore the impact of IT on logistics performances among manufacturing firms in Ghana.

1.4 Research Questions

1. What is the level of adoption and usage of IT in supply chain in manufacturing firms in Ghana?
2. What is the impact of IT in supply chain processes among manufacturing firms in Ghana?
3. What is the impact of IT on logistics performances among manufacturing firms in Ghana?

1.5 Significance Of The Study

The study adds to the corpus of knowledge in this sector by illuminating the variables affecting Ghanaian manufacturing companies' aspirations to incorporate blockchain technology into their supply chains. The numerous stakeholders, such as SMEs, technology developers, vendors, and regulatory authorities, are consequently given the chance to think about the aspects that affect their decision to employ blockchain technology. Providing theoretical foundations to obstacles analysis of organisational innovation adoption, the use of block chain

technology for sustainable supply chain management is hampered, and this is better explained by theory. Recognising and evaluating the interrelationships of the barriers to blockchain adoption for sustainable supply chain management. The study will discuss how blockchain can alter the manner in which supply chain partners share information and enhance trust. This study will aid in understanding the supply chain applications of blockchain technology by examining the effects of this new technology on manufacturing companies in Ghana.

1.6 Brief Methodology

The study employed a questionnaire survey in Ghanaian manufacturing organisations and used self-administered to supply chain personnel to study the intention to use information technology in Ghana's manufacturing industry contexts. This study relied on primary data gathered from a survey of manufacturing enterprises in Ghana. Participating companies were selected from agro-processing, textiles and footwear, electronics and household appliances and engineering/ machine tools. These are the major sub-sectors of the manufacturing sector in Ghana (GIPC, 2023). The survey tools were adapted from earlier studies (Tasnim, et al., 2023) that used the same constructs and measurement scales. Regression was employed to assess the conceptual framework.

1.7 Scope of the study

Ghana's large and thriving consumer and industrial products and services sector serves both the Ghanaian economy and the wider West African region. Medium-sized local businesses and subsidiaries of global corporations dominate the market for consumer and industrial goods and services. This study focuses on evaluating the outcome relationship of IT adoption in supply chain and how its shapes logistics performance.

1.8 Limitations

The study only involves respondents from manufacturing firms which makes it difficult to generalize the findings for other sectors in the country. The study was also delimited to Accra because there is no funding to bear the cost involved in studying manufacturing firms in the entire country. This is also warranted by the limited time which is a restrictive factor for the study.

1.9 Organisation Of The Study

The research is divided into five sections. The relevance of the study, research questions, aims, and introduction are all laid forth in the introduction. The second chapter is devoted to a review of the relevant literature. In chapter three, the research approach is outlined. Methodology, design, data collection, and analysis are all aspects of scientific enquiry that are discussed here. The outcomes and conclusions of the research are presented and analysed in chapter four. In chapter five, we provide a brief overview of the study's results. Chapter five of this project contains the study's findings and suggestions.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Chapter two of this thesis is organized into four main sub-headings. The chapter provides information organized under conceptual review, theoretical review, empirical review, and finally the research model and hypotheses development. The Conceptual review section provides definitions, operationalizations, and how the constructs have been used in this study. The theoretical review section also provides the theoretical underpinnings of the study. The various prepositions proposed in this study were depicted using a conceptual framework and various relationships were well discussed. The Chapter ends with research gaps highlighted in the study.

2.2 Conceptual Review

Definitions, operationalizations, and an explanation of how the constructs were applied in this study are provided in this section. There are eight main constructions in the model (Digital Technologies, Organizational readiness, Relative advantage, Top management support, Employee knowledge, Competitive pressure, Supply Chain Management). The following sections made these constructions operational (see **2.2.1-2.2.3**).

2.2.1 Information Technology

Digital tools, methods, and resources that support data creation, storage, and management are referred to as digital technology (Arumugam et al., 2022). Digital technologies include hardware like smartphones and tablets, programs like software and applications, hardware like cameras, calculators, and digital toys, as well as less physical types of high speed internet (Trendov et al., 2019). Technological advancement, sometimes known as IT, is a crucial

component of digital technology and refers to the use of machines to handle information and documents. To oversee procedures and processes and to enable the user experience, the majority of firms increasingly employ digital technology. The way that consumers behave is shifting from information-seeking and -sharing to real product purchasing (Pagoropoulos et al., 2017). Businesses must adapt by implementing digital technologies to help clients during the purchase process. Digital technology is also used by businesses to current growth (Ardolino et al., 2018). Due to technology's capacity for endless connectivity, businesses may contact millions of people globally and expand their clientele across national borders. Given that the majority of organizations nowadays automate their activities, digital transformation is essential to any corporate industry. Businesses that fail to adapt will become obsolete and lose their competitiveness (Whitelaw et al., 2020). On the other extreme, businesses may digitize thanks to a number of incentives. For instance, as machines are taking the place of people in monotonous activities, manufacturing will move more quickly. Therefore, everyone may collaborate more easily thanks to the synchronization of business data in a single mechanism (Ting et al., 2020). For the purpose of this study, the definition of digital technology by Arumugam et al., 2022) will be adopted by the study. It states that Digital tools, methods, and resources that support data creation, storage, and management are referred to as digital technology.

2.2.2.1 Organizational readiness

The level of different stakeholders' mental and behavioural preparedness to undertake transformational culture is referred to as organizational readiness (Miake-Lye et al., 2020). Individuals are more inclined to enact change, put out more energy, be more persistent, and act cooperatively when institutional preparedness is high, all of which contribute to a more successful execution of the government can regulate (Weiner, 2020). When institutional

preparedness is poor, on the other hand, individuals are more likely to perceive the adjustment as undesired and avoid, or even reject, engaging in designing the effort and the systems approach. An essential managerial principle that aids businesses and associations in successfully achieving their objectives is institutional preparedness for development (Lokuge et al., 2019). It is crucial to evaluate the organization's project preparedness in order to guarantee the change's introduction goes smoothly. Project stated objectives, assumptions and worries, leadership support, flexibility, and other crucial project demands are all elements that affect how adaptable a business is to change (Kampstra et al., 2018).

2.2.2.2 Relative advantage

The degree to which an invention is seen as superior to the concept it replaces is known as relative advantage (Adugna et al., 2022). According to Rogers' idea, improvements that offer a distinct, unmistakable benefit over the prior strategy will be more readily accepted and put into practice (Kosnina et al., 2019). The "scope to which buyers consider a new item or service as improved above its alternative," according to Eagly et al. (2020) definition of relative advantage. Leckie et al. (2018), stating that it was "the extent to which an invention is viewed as being superior to the notion it overpowers." The word "relative advantage" describes how much a certain product appears to be preferable to another currently existing model, and is typically used with new services or goods.

2.2.2.3 Top management support

Top management assistance is described as: allocating time to the program proportionate to its expense and prospective; evaluating plans; monitoring outcomes; and supporting the management issues associated with the integration ICT with the organization' strategic plan (Hsu et al., 2019). Effective management assistance may take many various forms, such as

including employees in strategic planning, providing them with honest criticism on their achievement, and assisting them with complicated problems (Dubey et al., 2019). The ability and responsibility of executives to identify the need for creativity, build the necessary resources and competencies, and create a climate that is conducive to its execution are the main drivers of top management support (Singh et al., 2021).

2.2.2.4 Employees' knowledge

Employee knowledge refers to the combined expertise, understanding, and intelligence of certain individuals inside a company (Abualoush et al., 2018). The HR equivalent of client understanding is employee knowledge. Employee knowledge would make it feasible to maximize what a firm knows and comprehends about its workers in order to give them individualized support in an era of shared attention (Bavik et al., 2018). Therefore, supporting the distribution of such knowledge (while preventing silos) guarantees that firms workforce has equitable access to the understanding they need to accomplish their tasks. Organizational knowledge is crucial because it helps workers to execute their duties successfully (Naim and Lenka, 2018).

2.2.2.5 Competitive pressure

The definition of competitive pressure is on how it affects an agency's intentions to implement product and procedure improvements. A new model to be released onto the marketplace is the end result of innovative products (Cruz-Jesus et al., 2019). Therefore, the profit margin linked with this particular model determines the motivation for product development (Cai and Li, 2018). A corporation is under "competitive pressure" when it frequently experiences pressure from its rivals. With the exception of dominant businesses, it is frequently observed in all types of economies. A lot relies on the supply and demand dynamics for a certain product or sector.

The two main competitive forces facing firms today are the expansion of world commerce and the technological advancements (Wong et al., 2020).

2.2.2 Supply Chain Management

Supply chain management (SCM) is the process of streamlining a new product manufacturing, distribution, and transportation to the end user from the procurement of raw materials through to the end (Hugos, 2018). Supply chain management is the interconnected preparation and execution of mechanisms needed to control the flow of goods, details, and capital investments in actions that expansively include order processing, merchandise sourcing, manufacturing, stockpile storage and distribution, freight or supply chain and exchanging overstock or defective goods (Copacino, 2019). Collaboration, specialist software, and corporate strategy are all necessary for supply chain administration to function. Each participant, from vendors to manufacturers and beyond, must continue to collaborate since it is such a large-scale, complicated enterprise in order to increase efficiency, mitigate risk, and respond swiftly to development (Zekhnini et al., 2021). Additional considerations of serious concern for today's businesses include sustainability performance, which addresses ecological, social, and legal complications, process selection, and the strongly linked idea of corporate citizenship, which assesses a company's environmental footprint and social well-being (Ben-Daya et al., 2019). For the purpose of this study, the definition of Supply chain management by Hugos (2018) will be adopted by the study. It states that Supply chain management (SCM) is the process of streamlining a new product manufacturing, distribution, and transportation to the end user from the procurement of raw materials through to the end.

2.3 Theoretical Literature Review

2.3.1UTAUT Model

An integration of eight technological models with high variance, robust in nature and parsimonious developed by Venkatesh, Morris, Davis & Davis (2003). It was first used in the banking sector in the western world, specifically in the US. Since its implementation it has been used by many scholars in many diverse fields of study and in many countries. The results have been the same all over the world and in all diverse sectors namely high variance, parsimonious and robustness in nature. UTAUT is one model that has high usage and adoption by many scholars, in view of this the model has gone through a lot of development. The development is seen as UTAUT 1, 2 and 3. UTAUT 1 consists of four independent variables namely; performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC), two dependent variables namely behavioural intention (BI) and use behavior (UB) with four moderators namely; gender, age, experience and voluntariness. UTAUT 2 contains all the above mentioned with three additional independent variables namely habit (HT), hedonic motivation (HM) and price value (PV). UTAUT 3 includes all the factors mentioned in UTAUT 1 with one additional independent variable known as personal innovativeness. For the purpose of this study the concentration will be on UTAUT 1 with some modifications.

2.3.2 Technology-organizational-environmental (TOE) framework

TOE framework was developed by Tornatzky and Fleischer (1990) to examine firm-level adoption of various IS/IT products and services. It has emerged as a widespread theoretical perspective on IT adoption (Zhu et al., 2004). Inclusion of technological, organizational and environmental variables has made TOE advantageous over other adoption models in studying technology adoption, technology use and value creation from technology innovation (Hossain

and Quaddus, 2011; Oliveira and Martins, 2010; 110 JEIM 28,1 Ramdani et al., 2009; Zhu and Kraemer, 2005). Also, it is free from industry and firm-size restrictions (Wen and Chen, 2010). Hence, it provides a holistic picture for user adoption of technology, its implementation, foreseeing challenges, its impact on value chain activities, the post-adoption diffusion among firms, factors influencing business innovation-adoption decisions and to develop better organizational capabilities using the technology (Wang et al., 2010; Salwani et al., 2009; Lin and Lin, 2008; Zhu et al., 2004). Katebi et al. (2022) made a significant contribution to technology adoption by developing what is recognized as the technology adoption model (TAM). It developed a model using user satisfaction and relative advantage of use, two essential characteristics. Later, the unified theory of acceptability and application of technology was proposed by Na et al. (2022) by mapping TAM and other deployment models (UTAUT). Four key elements make up this theory: accomplishment anticipation, user satisfaction, social pressure, and enabling circumstances. Four moderating factors make up this model: gender, age, knowledge, and perceived behavior control of usage (Kimiagari and Baei, 2022). Numerous studies have been conducted using the unified theory of acquiescence and use of diffusion of innovation, which has been expanded as the unified theory of acceptance and utilization of technology 2 prototype and consists of three concepts: routine, effort expectancy, and price fairness (Sugandini et al., 2019).

2.4 Empirical Literature Review

This section assessed the research on prior studies that addressed the study's objective. These include an empirical study on factors impacting the adoption of digital technologies in supply chain management and what blockchain technology could do for the manufacturing sector in Ghana. Literature related to the study's goal of an empirical study on factors impacting the adoption of digital technologies in supply chain management and what blockchain technology

could do for the manufacturing sector in Ghana in previous and ongoing research projects was evaluated.

Liu et al. (2016) examined the impact of supply chain technology linking adoption utilization, adoption and performance. The study found that efficiency motivation for SCT adoption more significantly and positively relates to SCT utilization in firms than does legitimacy motivation for adoption, the study also found that there is a positive relationship between SCT utilization and firm performance and this increases when the level of information sharing between supply chain partner's increases.

Kamble et al. (2019) examined the block chain technology adoption in supply Chains-Indian context. The study used a survey data from 181 supply chain practitioners in India the proposed model was tested using structural equation modelling. The study found that perceived usefulness, attitude, and perceived behavioural control affect the behavioural to adopt block chain technology intention.

Wamba and Queiroz (2022) investigated the multi-stage model of adoption (intention, adoption, and routinisation stages), for a better understanding of blockchain. The researchers validated their models using PLS-SEM, which was applied on data collected in India and the U.S. The study found that there are essential differences in the variables that determine block chain innovation and in the stage of diffusion.

Agi and Jha (2022) developed a comprehensive framework for blockchain adoption in the supply chain by identifying the enablers and empirically evaluating their interdependencies and impact on adoption. 20 enablers of blockchain adoption in the supply chain are identified using an extensive literature review. The study found the relative advantage of the technology and the external pressure are the most prominent categories of enablers that impact blockchain adoption in the supply chain.

Dora et al. (2022) examined the critical success factors influencing artificial intelligence adoption in food supply and found that technology readiness, security, privacy, customer satisfaction, perceived benefits, demand volatility, regulatory compliance, competitor pressure and information sharing among partners are the most significant critical success factors for adopting artificial Intelligence in food supply chains.

Mukherjee and Chittipaka (2022) identified and analyse the factors that impact the adoption of intelligent agent technology (IAT) in the food supply chain (FSC). The research was conducted based on 329 respondents from various hotels and the theoretical framework adopted in this study, that is, technological, organizational and environmental (TOE) framework. The proposed TOE framework has identified several factors like relative advantage, reliability, complexity, cost innovation adoption, top management support, skilled employees, IT awareness, environmental uncertainty, competitive pressure, information intensity and supplier's pressure, which helps in the adoption process of IAT in the FSC.

Shamout et al. (2022) examines the influence of implementing autonomous robots in supply chains. The main variable effect considered in this study is relative advantage, complexity, and cost. Also a survey research approach was used to collect data using questionnaires, with, a sample size of 314 respondents made up senior managers. Furthermore, the study employed structural equation modelling technique to test the relationships that existed among the variables. Findings indicate that perceived relative advantage have no influence on supply chains. Further studies should consider case study research on autonomous robots in the supply chain and logistics sector.

Manzoor et al. (2022) examines blockchain technology (BT) in supply chain management. The study employs systematic literature review and collects data from 292 articles obtained from SCOPUS databases. Descriptive and content analysis was used to analyze data. It was found

that features of BT and trust positively affects supply chains. The study recommends that the self-developed guiding framework provides an in-depth understanding of the growth t and use of current technology in any industry.

Yang et al (2021) examines the role of digital technologies and its effects on supply chains. The study employs a qualitative research design to collect secondary data from 55 articles obtained from EBSCOhost, Scopus, Emerald, ScienceDirect, and Web of Science. Also, the study used descriptive statistics and content analysis to analyze data. Results gathered shows that digital intelligence and supply chain cooperation directly affects operations. Further studies may consider the role of service providers and their digitalization effects on supply chains.

Kouhizadeh et al. (2021) investigates the adoption of BT in sustainable supply chain management. The study employed an exploratory research design to collect data using DEMATEL survey. Sample size of 47 informants was obtained using convenience sample technique. Also, the study implemented the TOE and force-field theories to identify the relationships and barriers to block chain adoption. Results gathered shows that technological barriers specifically security, negative perception and immaturity affect supply chains.

Cagliano et al. (2021), conducts a study on the effects of social and economic factors on digital supply chain technologies (DSC). The study employs both qualitative and quantitative research methods to gather data obtained from online sources. Also, the study focused on socio-economic variables such as GDP per capita, foreign investments etc. as the dependent variables whereas IOT, block chain, Big data etc. were considered as the independent variable. Furthermore, data was analysed using ANNOVA and time factor analysis. Findings show that big data have a significantly higher economic effort than other technologies. Further research

may examine how recent economic funding influence the implementation of DSC technologies.

Wong et al. (2020) explored the influence of blockchain technology in supply chain management. A survey approach was employed to collect data using questionnaires. A sample size of 194 SMEs in Malaysia was selected using the random sampling technique. Also, the study used the Technology, Organization and Environment theory focusing on competitive pressure, complexity, cost and relative advantage market dynamics, regulatory and upper management support. Furthermore, the study employed the PLS-SEM analysis to analyze data. Findings show that competitive pressure, complexity, cost and relative advantage positively influence operations whiles market dynamics, regulatory and upper management support have no influence on supply chain operations. Future research may examine the effects of information sharing and resources on supply chain management.

Wamba et al. (2020b) investigates the link between BT and SC performance. The study adopts a survey research method to gather data using questionnaires. Also a sample size of 344 informants which comprises SC experts from various industries was considered for the study.

Furthermore, data was analyzed using structural equation modeling (SEM) technique. Results indicate that BT significantly affects trading partner pressure and knowledge sharing, whereas BT adoption significantly improves transparency and SC performance. Future studies may consider the effects of BT supply chain security and performance.

Köhler and Pizzol (2020) conducts a study on how BT is implemented in the food SC. The study adopts an explorative research design using six cases studies targeting the tuna, coffee, and egg food products Secondary and primary data was collected through web search, newsletters, and interviews. Also, the study employs qualitative analysis to analyze data.

Results gathered shows that BT positively influence transparency, visibility traceability in SC. Future studies may examine the long-term effects of BT in food SC

Attaran (2020) conducts a study on digital technology and its effects on performance. The study implements a systematic literature review to collect secondary data obtained from EBSCO ResearchGate, Google Scholar etc. Also, the study employs content analysis to analyze data. Results gathered reveals that digital technologies positively influence supply chain performance. The study recommends that firms need to establish and readjust preferences and operate with a sense of purpose and urgency in adopting DSC.

Ivanov et al. (2019) conduct a study on the influence of technology on SC practices. The study implements a qualitative research method to collect data. Also, content analysis was employed to analyze data. Results demonstrate that BT positively influence SC visibility of events which lead to a decrease in disruption risk and hence, reduced chances of ripple effect.

Research by Al-Wattar et al. (2019) examined the possibility that integrating accounting information systems might increase hotel revenues. The research also looked at how environmental, social, and economic reporting in the Iraqi hotel industry relates to profits. The financial stability of the Iraqi hotel sector was analyzed using data from a panel of 10 hotels listed on The Iraq Stock Exchange (ISX) between 2013 and 2018. The Disclosure Index was used to conduct a content analysis of sustainability reports in accordance with the Global Reporting Initiative's (GRI) reporting guidelines, with its focus on the environmental, social, and economic components of such reports (GR 3.1.) After reviewing the numbers, we concluded that the hotel's financial information system benefitted from being integrated with sustainability reporting. These results show that current accounting practices in the hotel business do not provide reports with the necessary degree of social, economic, and environmental sustainability. Data loss was also noted in yearly reports.

According to Putra's research, a large percentage of SMEs (small and medium-sized businesses) utilize some kind of accounting software (2019). We used inference and deduction to conduct this research. Findings from the study do not rule out the possibility that customers also consider factors such as price, performance, stability, adaptability, simplicity of use, speed of deployment, customization, and vendor support when making accounting software purchases. It is suggested that accountants be included in future studies and that researchers employ more thorough statistical methodologies.

Tjahjadi et al. (2019) examined the mediating impacts of intellectual capital (IC), management accounting information systems (MAIS), internal process performance (CP), and customer performance (CP) on the relationship between strategies and financial performance (FP). Only big and moderate Java companies were included in the study. An innovation strategy that incorporates product innovation, process innovation, and technology may help businesses with solid CP, reliable management accounting information systems, and excellent internal process performance. No significant improvements in CP or internal process performance were found, showing that the IC did not have a role in bringing about such changes via the management accounting information system.

2.5 Conceptual Model/ Framework

The two major pillars of the theoretical model are the Technology organization, And Environment (TOE) Theory (see Figure 2.1). Independent (Digital Technologies, Organizational readiness, Relative advantage, Top management support, Employee knowledge, Competitive pressure), and variables are all included in the overall idea dependent (Adoption of Supply Chain Management and Blockchain Technology). In this study, six types of variables were employed. It is anticipated that an empirical study on factors impacting the adoption of IT in supply chain.

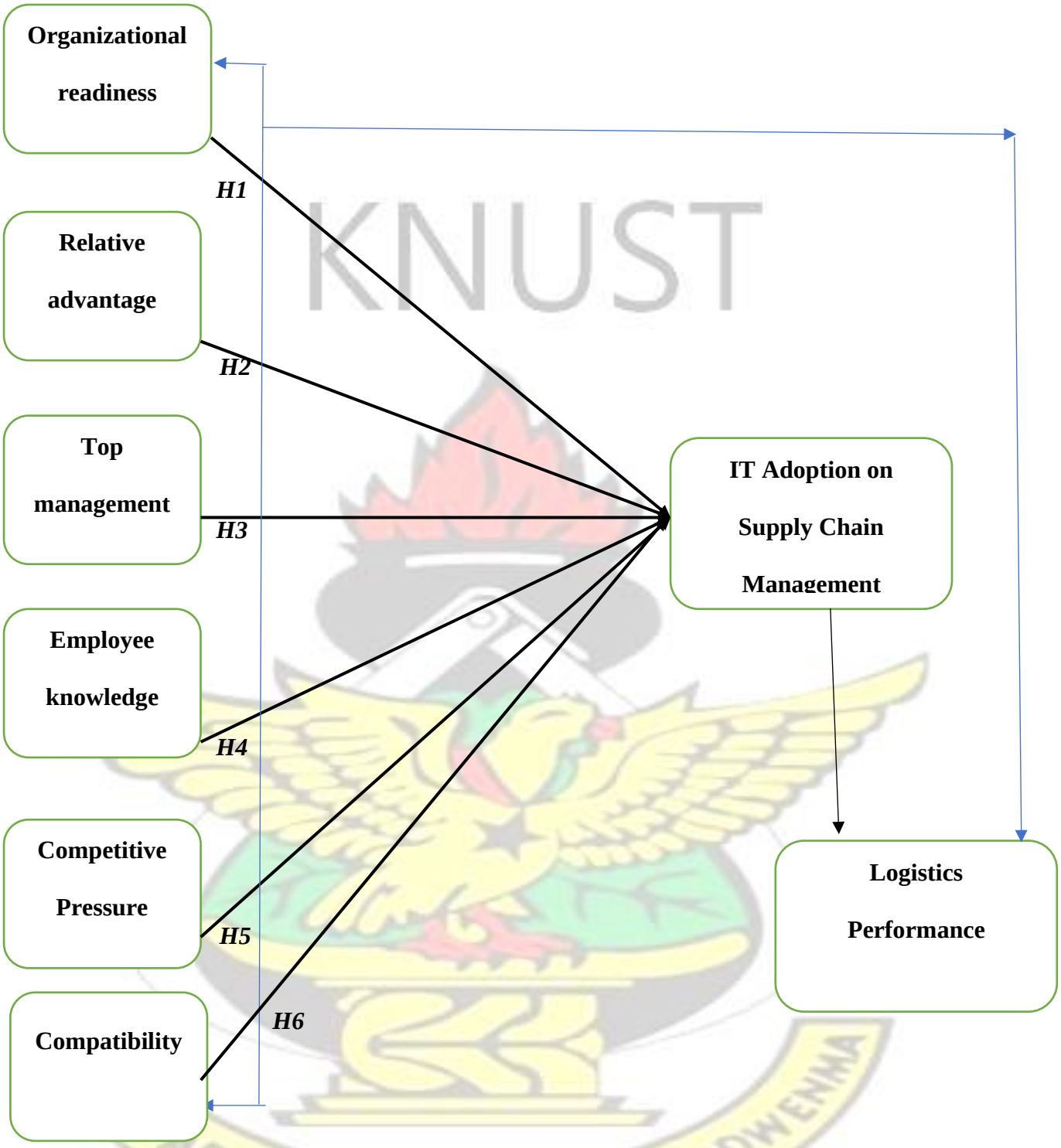

Figure 2.1 Conceptual framework

2.6.1 Hypothesis 1: Organizational readiness on Adoption Supply Chain Management Technology

Organizational readiness is defined as the extent to which financial, technological and skilled human resources are accessible to an organization wishing to embrace a technology (Maroufkhani et al., 2020). Chen et al. (2015, p. 18) defined organizational readiness as "the availability of the necessary organizational resources for using technologies." Previous studies have shown that organizational readiness plays a significant role in the adoption of technologies such as social commerce (Abed, 2020), intelligent agent technology (Alsetoohy et al., 2019), e-commerce (Hajli et al., 2014), mobile commerce (Chau et al., 2020), blockchain (Wang et al., 2016b) and big data (Hajiheydari et al., 2021). Besides, monetary funds, IT infrastructure, analytics capabilities and skilled capital are critical for successful technology adoption (Raut et al., 2021; Zailani et al., 2014). Consistently, organizational readiness in the present work refers to the firms' overall access to financial resources/capital, skilled employees, knowledge resources, analytical competencies and necessary infrastructure that enable them to exploit SC technologies fully. If a firm cannot reap the benefits of technology due to insufficient resources and capabilities, investment in that technology is meaningless despite its tremendous advantages (Alsetoohy et al., 2019). Previous researchers have shown the influence of organizational resources on technology adoption (Gangwar, 2018; Maroufkhani et al., 2020; Ramanathan et al., 2017). Hence, the following hypothesis was developed.

H_1. *Organizational readiness has a positive and significant effect on adoption of SCM Technologies*

2.6.2 Hypothesis 2: Relative advantage on Adoption of Supply Chain Management Technology

The perceived advantage of innovation to the value of a specific organization may significantly affect the intention of the organization to adopt it. Basically, the relative advantage refers to the level to which technology adoption is perceived as dominant to other existing technology types used in businesses, and the benefits that the company can obtain from it (Abdalwali et al., 2022). According to Lutfi et al. (2018), SMEs are inclined towards technology adoption if they are convinced that its advantages are more than that of any other existing technology; thus, the current work proposes the following hypothesis for testing: The magnitude to which an invention is viewed as being superior to the concept it replaces is known as relative advantage (Kamble et al., 2020). The considerable advantage measures the gap among the advantages a company may obtain and the work required to implement an innovation (Wong et al., 2020). In the SCM, relative advantage is crucial for the adoption of new technologies (Bhattacharya & Wamba, 2018). Adopting systems like blockchain may help the SCM process in many ways, such as responsibility, openness, visibility, confidentiality, trustworthiness, fraud prevention, reliability, and cost-effectiveness (Helo & Shamsuzzoha, 2020; Reyna et al., 2018; C. L. Chen, 2019; Roeck et al., 2020). A system's openness boosts output and enhanced client service and assistance (Werner et al., 2021). Hence, it is anticipated that a positive influence of Relative advantage on *ASMT*:

H_2. *Relative advantage has a positive and significant effect on Supply Chain Management Technology*

2.6.3 Hypothesis 3: Top management support on Supply Chain Management Technology

Top management support is "the degree to which managers comprehend and embrace the technological capabilities of a new technology system" (Maroufkhani et al., 2020, p. 4) hence a critical factor for the successful adoption of a technology (El-Haddadeh et al., 2021; Maroufkhani et al., 2020). On the other hand, it can be a considerable obstacle to business analytics adoption (LaValle et al., 2011). The influence of top management support on the adoption of various technologies such as cloud (Khayer et al., 2020), CRM system (Cruz-Jesus et al., 2019), SaaS (Oliveira et al., 2019) and big data (Talwar et al., 2021) has been supported. Top managers play a critical role in creating a suitable environment for adopting SCT, where sufficient resources are available for technology adoption (El-Haddadeh et al., 2021). The support of top managers is essential during the technology adoption process; thus, they would have a positive effect on technologies adoption (Wang et al., 2016a; Youssef et al., 2022). Given this, top management support works as an agent for accelerating the process of business transformation and, consequently, adopting new technologies (Chen et al., 2015; Lai, 2018; Verma and Bhattacharyya, 2017). Accordingly, the following hypothesis was proposed:

H_3. *Top management support has a positive and significant effect on adoption of Supply Chain Management Technology*

2.6.4 Hypothesis 4: Competitive Pressure on Supply Chain Management Technology

Moving on to government regulations, which is the second environmental element that influences technology adoption, such regulations may prohibit firms from or encourage them towards adopting new technologies (Oliveira et al. 2017; Abdalwali et al., 2022). Firms' adoption of supply chain technologies may increase if government rules and policies encourage them towards it and if technological standards and legislation are in favor of it (Muafi et al., 2021). Organizations facing high level of government pressure and regulations have the

likelihood to adopt cloud technology based on prior studies (Lokuge et al., 2019; Hasan et al., 2021). Thus, based on the above literature review of technology adoption studies, government regulations in the form of assistance and incentives stimulate the adoption/acceptance of supply chain technologies. More specifically, competitive pressure was defined as the external environment's effects on the firm that urges it to use technologies (Hasan et al., 2021). In essence, competitive pressure is felt by the firm from its suppliers, customers and competitors. Prior studies focused on SMEs stated that the pressure for firms to compete turn them to adopting new technology. In a related study, several studies indicated that competition has a significant effect on technology adoption among SMEs (Khayer et al., 2020; Cruz-Jesus et al., 2019). In addition, environmental pressure stemming from media, rivals and customers had a significant effect on their sustainable manufacturing practices. Other studies, such as those by Chen et al. (2018) and Lautenbach et al. (2020), found that increasing technology usage among competitors could work to pressurize the owners and managers to capture business analytics and intelligence to obtain and maintain a competitive market status. Hence, this study proposes the following hypothesis for testing

H_4. *Competitive Pressure has a positive and significant effect on adoption of Supply Chain Management Technology*

2.6.5 Hypothesis 5: Compatibility on Supply Chain Management Technology

Compatibility examines "the degree to which a new system is consistent with the current system within the company" (Maroufkhani et al., 2020, p. 3). Compatibility has been a frequently cited driver of technology adoption (Bian et al., 2020). Alsetoohy et al. (2019) argued that firms select and adopt technologies that conform to their internal culture and values and consequently need minimal changes and adjustments. The influence of compatibility on the adoption of various technologies such as mobile reservation systems (Wang et al., 2016c), intelligent agent technology (Alsetoohy et al., 2019) and cloud computing (Oliveira et al.,

2014) has been supported in the previous studies. In the context of BDA, the association between compatibility and BDA adoption has been confirmed (Chen et al., 2015; Verma and Bhattacharyya, 2017). Thus, the following hypothesis was developed:

H_6. *Employee knowledge has a positive and significant effect on Supply Chain Management Technology*

2.7 Adoption of Supply chain technologies and Logistics Performance

Logistics is a backbone to economic growth throughout the globe. When the economy expands dramatically, more efficient logistics is needed to accommodate its expansion (Zainal & Rasi, 2022). However, according to Muango et al (2021); Cerasis (2018), in the age of globalisation, the logistics industry is up against a formidable foe. This is because demand is growing faster than anyone could have predicted. As a result, new technologies are causing market disruption (Rey et al., 2021; Macaulay et al., 2015). The industry's infrastructure of transportation, customs, and services is complex. Aside from the local authorities' regulation of these sub-sectors, each country's logistics industries will face a variety of challenges. (Wang et al., 2022; Arase, 2015).

More recently, studies by Ainomugisha (2022); Mlimbila and Mbamba (2018) discovered a link between information system usage and perceived decreases in shipping and trucking costs, timely delivery of goods and services, perceived increase in trade volume, and enhanced organisational logistics capability. Zainal and Rasi (2021) claimed that investment in logistics information technologies are crucial in a company in order to keep relevant in the market and better managing customer relations. The use of information technology in supply chain and logistics management has piqued the interest of the business and academic communities. Rey et al (2021); Lee and Wang (2011) investigated the potential for Internet-based collaboration to reduce the bullwhip effect in supply chains. Similarly, Capgemini (2008) discovered that

collaboration among supply chain. members via Internet tools would significantly improve supply chain performance. Technology application in the supply chain context may provide benefits in the following areas: improved supply chain agility, reduced cycle time, increased efficiency, and timely delivery of products to customers (Lee & Wang, 2011).Ainomugisha (2022); Dubey & Singhal (2021) suggested that a sound logistics information technology and information system provide benefits that extend across the entire logistics information system, including inventory, transportation, and delivery system with better efficiency, security, and safety. Most researchers agree that IT has a direct impact on the operations of most logistics companies in some way, and that they have a positive impact on the infrastructure and assets of a company management system. Thus, the following hypothesis was developed:

H_7. *Adoption of Supply chain technologies has a positive and significant effect on logistics performance*

Table 2.1 Summary of Literature Review

Author/ Year	Country	Purpose	Theory	Method	Findings	Future studies
Yang et al (2021)	UK	To examines the role of digital technologies and its effects on supply chains	Not clearly stated	Systematic Lit. review	Results gathered shows that digital intelligence and supply chain cooperation directly affects operations	Further studies may consider the role of service providers and their digitalization effects on supply chains
Shamout et al. (2022)	United Arab Emirates	To examines the influence of implementing autonomous robots in supply chains.	Not stated	Quantitative	Findings indicate that perceived relative advantage have no influence on supply chains	Further studies should consider case study research on autonomous robots in the supply chain and logistics sector
Cagliano et al. (2021)	Italy	To conducts a study on digital supply chain technologies (DSC).	Not stated	Sytemmatic Lit. review.	Findings show that big data have a significantly higher economic effort than other technologies	Further research may examine how recent economic funding influence the implementation of DSC technologies
Attaran (2020)	USA	To conducts a study on digital technology and its effect performance	Not stated	Sytemmatic Lit. review.	Results gathered reveals that digital technologies positively influence supply chain performance	The study recommends that firms need to establish and readjust preferences and operate with a sense of purpose and urgency in adopting DSC.

Wong et al. (2020)	Malaysia	To explored the influence of blockchain technology in supply chain management	Technology-Organisation-Environment (TOE)	quantitative	Findings show that competitive pressure, complexity, cost and relative advantage positively influence operations	Future research may examine the effects of information sharing and resources on supply chain management
Manzoor et al. (2022)	India	To examines blockchain technology(BT) in supply chain management	Self-developed guiding framework	systematic literature review	It was found that features of BT and trust positively affects supply chains.	The study recommends that the self-developed guiding framework provides an in-depth understanding of the growth t and use of current technology in any industry
Kouhizadeh et al. (2021)		To investigates the adoption of BT in sustainable supply chain management	TOE & Force Field Theory	DEMATEL	Results gathered shows that tangible and intangible assets influence the use of block chain in supply chains	
Wamba et al. (2020b)	France	To investigates the factors of blockchain adoption and its impacts on supply	Technology Adoption Models	Quantitative	Results indicate that BT significantly affects trading partner pressure and knowledge sharing, whereas BT adoption significantly	Future studies may consider the effects of BT supply chain security and performance.

		chain performance.			improves transparency and SC performance	
Ivanov et al. (2019)	Hong Kong	To conduct a study on the influence of technology on SC practices	Game theory	Qualitative	Results demonstrate that BT positively influence SC visibility	Not clearly stated
Köhler and Pizzol (2020)	Denmark	To conducts a study on how BT is implemented in the food SC.	technology assessment framework	Qualitative	Results gathered shows that BT positively influence transparency, visibility traceability in SC	Future studies may examine the long-term effects of BT in food SC

CHAPTER THREE

RESEARCH METHODOLOGY AND ORGANIZATIONAL PROFILE

3.1 Introduction

This chapter objectively presents the methodology of the research. The methods projected in this chapter, purpose to accomplish the study objectives and answer the research questions. The methodology chapter commenced by clearly explaining the research design, secondly, research sampling procedures, and then the research instrument. The final stage in this section addresses the explanation of the proposed data analysis.

3.2 Research Design

Research design represents the structure of the research. It serves as a glue that binds all the elements in the study, in order words, it is the plan of the proposed research work (Inaam, 2016). Though there are different forms of research designs, this study employs both descriptive and explanatory research designs. While the descriptive study only observes, explanatory research makes the fan fort to explain the phenomenon. The forces behind the occurrence of the phenomenon are represented by theories or hypotheses. Explanatory research is concerned with cause and effect (Saunders et al., 2007). The main purpose is to explain how one variable affects another variable. Explanatory research holds the assumption that the change in the dependent variable is caused by an external factor. It is usually grounded in theory which helps to answer the how and why questions. In the opinion of Engel and Schutt (2014), explanatory research is the eventual destination of science and on the knowledge continuum, they place it at the apex. Usually, explanatory research is experimental and it allows for the testing of hypotheses (Strydom, 2013). The focus of explanatory research is how or why things occur. Collis and Hussey (2003) believe that explanatory research extends a descriptive study. In this context, the phenomenon observed by descriptive research is explained and analyzed by

the researcher to find reasons beyond the description of the characteristics (Blumberg et al., 2005, Collis and Hussey, 2003). In this study, an explanatory approach will be utilized in chapter 4 to test the stated hypothesis. The explanatory approach will be used to investigate the effect of stakeholder orientation on sustainable procurement in the context of manufacturing firms. Because this study is predominantly quantitative it employed both descriptive and explanatory approaches. The beginning of the findings presented a description of individual responses. In a nutshell, the basic features of the data gathered will be described to bring out the summaries of the selected sample and measures adopted. The research domain is clarified and the relationships between the variables are established in Chapter four. This approach was found suitable to help test the generated hypotheses for the study. The approach helped to discover the reality and explain what the reality was. It helped to set the conceptual and theoretical framework as well as an evaluation of the factors impacting the adoption of digital technologies and the impact of technology in supply chain management in the manufacturing sector of Ghana. Asking the opinion of the respondents in a structured way and analyzing the data using mathematical methods in explaining the phenomena is known as the quantitative approach (Muijs, 2010). This approach provides a detailed explanation for studies that concentrate on examining the relationship between variables (Muijs, 2010).

The survey is one of the methods used in collecting data from a quantitative approach. This method is seen as efficient and very economical in addition, it can capture a great number of respondents (Zikmund et al., 2000). This study used the survey strategy to get the needed information from the target respondents.

3.3 Population of the study

The relevance of a research population has a great reflection on the quality of the study. Thus, the outcome of the study will be hugely negated if wrong, unqualified, and unsuitable

respondents are targeted. Hence, it is all time important to clarify the population and the target population before data is collected. To understand the research population, it is important to differentiate between the target population and the accessible population. While the target population represents the broad group that is of interest to the researcher, the accessible population represents the actual participants that the researcher can include in the study. This is also determined by the unit of analysis, thus if the researcher intends to conduct the study at the organizational level, then it is advisable to use a single response, however, if the study is an individual level. Then the focus could be on multiple respondents from a case study. This study is conducted at the organizational level; hence the target populations include all manufacturing SMEs in Ghana. According to the Registrar's Department of Ghana database, there are about 777 registered manufacturing firms in Ghana (as cited in Agyaben-Mensah et al.,2020). Hence the target population of this study is made up of 777 manufacturing companies in Ghana. Data is gathered from procurement, logistics, and top executives or managers of all the manufacturing companies in Ghana.

3.4 Sample Size and Sampling Technique

In any social science research, the issue of how many respondents should be included in a study or what sample size is adequate remains a puzzle that has received varied opinions. In such regard, varied views have been expressed by different researchers. While a school of thought believes that smaller sample size is well suited for larger populations, other schools believe that it should be representative (Krejcie and Morgan, 1970), relatively homogeneous, or heterogeneous of the population. In the view of Gorsuch (1983) and Kline (1979), the sample size should be at least 100. Others advise that researchers should get the maximum sample size possible (Rummell, 1970; Humphreys et al., 1969; Guertin and Bailey, 1970; Press, 1972).

To avoid all these confusions, Yamane (1967:886) provides a simplified formula to calculate sample sizes. This formula was used to calculate the sample size.

The formula is given us;

$$n=\frac{N}{1:+N(e^2)}$$

Where n is the sample size, N is the population size, and e is the level of precision. When this formula is applied to the above example, we get

$$n=\frac{777}{1:+777(0.05^2)}$$

n=264 firms

Having established the required sample, the method to select these firms is also another issue of concern. The sampling technique can also be used to designate the process of selecting a section from the entire population (Bryman, 2012). Sampling is largely about choosing persons or entities as a subset of a defined population to assess the characteristics of the entire population (Collis & Hussey, 2009). It is very appropriate in a situation where it is not feasible for the researcher to reach the entire population due to challenges such as cost and time constraints (Saunders et al., 2007). Knowing the type of sampling method to apply is important, for it helps the researcher to select the right respondents for the study. It is very suitable in situations where the researcher cannot reach the whole sample or population due to challenges such as time constraints and cost (Saunders et al., 2007). There are two main techniques used in sampling: probability (random) and non-probability. With probability or random sampling, every participant in the population has an equal chance of selection. However, in the instance of non-probability sampling not all the subjects in the population have the chance of being selected (Bhattacherjee, 2012; Kothari, 2004). “Simple random sampling, stratified sampling, systematic sampling, and cluster/area sampling are examples of probability (random) sampling while judgment sampling, quota sampling, and convenience sampling techniques fall under

non-probability sampling" (Kothari, 2004, p.15). Considering the possible heterogeneity in the characteristics of the samples that will be drawn from each stratum (Belt/Zone) and to increase precision and to minimize sampling bias, a sample frame will be collected from Ghana Statistical Service to identify the firms in each of the strata and reach out to them through a survey with an online and self-administered questionnaire. Proportionate and adequate sample size will be collected from each category to constitute a total sample size of 200 respondents. The study used stratified random sampling techniques to select target respondents with deep knowledge in lean management and green issues from the target population.

3.5 Data Collection

The two key sources of data for most research is primary and secondary. While primary data consists of first-hand materials that the researcher has gathered himself or herself mainly using questionnaires (Dubey et al., 2016), secondary data in contrast is the information that has been collected by other individual (s) for other purposes (Bryman and Bell, 2007). In this study the main source of data collection is primary. To support or reject the findings from this study, data from secondary sources were reviewed. The primary source of data includes information gathered through questionnaires that were administered to the respondents sampled from pharmaceutical firms in Ghana. In gathering the primary data required in this study, a cross-sectional survey design is utilized. A structured questionnaire with a mainly close-ended format was self-administered to the respondents. A team comprising the researcher and research assistants will visit the metropolitan and municipalities to administer the questionnaires in addition to the online survey. Before the questionnaires are administered, an introductory letter was obtained from Kwame Nkrumah University of Science and Technology, Department of Supply Chain and Information Systems, and presented to the selected establishment Human Resources Managers (HR)/ Chief Executive Officer (CEO). The CEO or HR manager after

being satisfied with the demands of the research then issued a letter introducing the team to the workers. After obtaining the approval, the researcher will seek the consent of the respondents before administering the questionnaire. To achieve this purpose, the researcher will explain in detail the aim and importance of the study to the respondents before they decided to participate in the study. Also, part of the questionnaire preamble will reiterate the promise of confidentiality of the data. The team will distribute three hundred (300) questionnaires to compensate for non-response. For each randomly selected organization, we identified a key informant, who typically had a title such as supply chain managers who were in charge of the company's internal and external processes. The study targeted these executives and other top and middle-level managers as they are most knowledgeable about organizational issues and their application in other business functions. The questionnaire was the main instrument used to collect primary data.

A well-structured questionnaire containing measurement items validated in previous studies will be employed in the study. Each of the variables was measured based on a five (5) point Likert which ranged from 1 (strongly disagree) to 5 (strongly agree). The questionnaire will be structured to reflect the relevant objectives of the research. The questionnaire helped to solicit responses to test all the key variables in the conceptual framework of the study. Using a Five-point Likert scale point (1= "Strongly Disagree" to 5= "Strongly Agree"), each item was measured. The preliminary part consisted of demographic measures which included gender, educational background, work experience, and position within the firm of the participants, of the categorization questions included in the survey, captured the kind of company. The constructs and their respective measures are shown in the appendix.

3.5.1 Pre-testing and Pilot Study

One of the important steps in developing a questionnaire is to pre-test. It is to confirm that the questionnaire has been designed effectively for the proposed study before actual data is collected. In research, a pre-test is done to validate the content and the question wording, format, and how relevant the questions are to the objectives. Although the proposed items to be used in this research are adopted from previous research, yet, a pre-test is very important to confirm that the questions are suited to the respondents (Kumar et al., 2013). The pre-test in this research was done through discussions with people in academics who are authority in the related study area, this included academic Professors and also experts from the industry. The pre-test process focused on reviewing the proposed questionnaire with its content validity, clarity, and the timing for the respondents to answer the questionnaire. Respondents were engaged to answer the questionnaire and the feedback from the respondents within the pre-test period was used to improve the questionnaire. The experts in the field of the supply chain from Ghana were asked to point out items that are unclear to understand for rewording or elimination.

3.6 Method of Data Analysis

Data analysis is the process of using a systematic procedure to draw inferences from data gathered from the field as well as considering the various procedures that can be used to analyze the data (Churchill and Iacobucci, 2009). The researchers further suggest that the research design, kind of data and assumptions made in the research, and concerns associated with the study will influence the suitability of a given technique. Data analysis may follow the quantitative or qualitative procedures in scrutinizing the large volume of information obtained from the field. In the quantitative context, the procedure includes the use of statistical techniques to describe and examine variation in the quantitative measures. The quantitative

approach emphasizes the use of either inferential or descriptive statistics (statistical techniques), to understand and establish relationships between constructs.

In this study Statistical Package for Social Sciences (SPSS) version 23 and SmartPLS 3 software will be utilized to conduct descriptive statistics and inferential statistics respectively. The data collected will be coded, cleaned, and prepared for analysis. The data will first be coded in Microsoft excel. In excel the data will be thoroughly checked to avoid possible data entry errors. After cleaning the data will then be exported to SPSS. The data checks in SPSS include missing values, reliability, descriptive statistics, and test of assumptions for multivariate analysis. Subsequently, SmartPLS version 3 (Ringle et al., 2015) will be employed to conduct inferential statistics through multivariate data analysis.

3.7 Reliability and Validity

Evaluating the measurement model is very important in quantitative research, it confirms the validation and the result of the research. It is however important for researchers to concentrate on improving the quality of their work (Heale and Twycross, 2015). Again, there are two vital features to deal with in assessing the measurement model, they include the reliability and validity of the study instrument to be used (Saunders, Lewis, & Thornhill, 2016). Khalid et al. (2012), defined reliability measurement as the degree to which the measurement is free from random error by giving a consistent result. Concurrently, it is known as internal consistency of measurement which mirrors the same underlying construct (Cooper and Schindler, 2003). To test for how reliable an instrument is, Hair et al. (2012), came up with two tests of reliability and they are internal consistency and indicator of reliability. For internal consistency reliability, the researcher used Cronbach Alpha. According to Hair, Sarstedt, Ringle, & Mena (2012), the indicator reliability is used to measure the indicator's variance to explain the latent construct where every indicator's absolute standardized loading should be more than 0.7 (Hair, Ringle,

& Sarstedt, 2011). The researchers claim that the indicator loading, between 0.4 to 0.7 should be removed from the scale if deleting the said indicator will increase the composite reliability above the accepted threshold value. However, if the indicator loading is equal to or less than 0.7, it should be removed at all times from the reflective scale. Zikmund (2000), defined validity to be the accuracy of the measurement device and denotes the ability of a scale to measure what is proposed to measure. For quantitative research, the researcher has to certify that the three traditional forms of validity exist in the measurement device and they include face validity, content validity, and construct validity (Heale & Twycross, 2015).

Content Validity: The common method among others is content validity however, it is very needful to be conducted. It tests whether the items would measure all the content which is made to measure in the study (Creswell, 2009; Heale & Twycross, 2015). The content validity is mostly done through reviewing related literature, in this research, the instruments used were validated from past studies. Yet to make sure that it captures all the content of the research, the researcher explored face validity by involving experts to evaluate to ensure that the instruments are suitable in terms of their relevance, appearance, and properly representing the elements (Richard G. Netemeyer, William O. Bearden, 2003).

3.8 Ethical Issues

Ethics are the moral principles that a person must follow, irrespective of the place or time (Akaranga & Makau, 2016). Research ethics focus on the moral principles that researchers must follow in their respective fields of research (Fouka & Mantzorou, 2011). A consent form was presented to the authorities of all selected firms to inform them of all benefits and risks involved in the participation and further sought their consent for their inclusion in the study. Selected firms had the right to decline their participation in the study. The researcher indicated in the consent form that all forms of anonymity and confidentiality would be observed. Privacy

of firms in terms of freedom to define the time, extent and the conditions of sharing information were also observed. The researcher avoided any form of actions in their relation with participants that amounts to deception. All forms of plagiarism and falsification of data were also avoided by the researcher.

3.9 Profile of Organization

Given that developed as well as developing nations manufacturing sector accounts for the largest share of the industrial sector (Haraguchi, Cheng, & Smeets, 2017). The manufacturing industries refer to those industries which involve the manufacture and processing of articles and indulge in either creating new commodities or adding value (Pfeiffer, 2017). Dangelico & Vocalelli (2017) describe the term as a manufacturing and marketing segment focused on the manufacture, processing, or preparation of raw material and commodity products, the finished products could be used both as a finished good of production or for sale to customers (Xu, Serrano, & Lin, 2017). Whereas, as per Hitomi (2017), a manufacturing sector could be seen as an economic activity wherein, on a large scale, the material is converted into finished products (Kayanula & Quartey 2000). Added to that, the National Manufacturing Association (USA) proposed the term as the firms engaged in manufacturing and processing of products.

In its industry report, the Ghana Statistical Service (GSS) proposed the term as a collection of activities associated with with goods and services. The Ghana Enterprise Development Commission (GEDC) has described the manufacturing sector in aspects of their machinery and plants. However, Kayanula and Quartey (2000) brought up the underlying potential risk of prioritizing a fixed asset and the potential impact of inflation on valuation, in specific by adopting criteria for fixed assets. The indigenous manufacturing industry supports local businesses and employs a major section of the increasing workforce. Manufacturing, food processing, construction, a small glass industry, textiles and clothing, chemicals and

pharmaceuticals, metal processing, furniture and wood products, and leather and footwear are among Ghana's most important manufacturing industries (Addo, 2017).

Among the issues that have plagued this industry is that most manufacturers have not kept up with technological advancements and have failed to invest in new and modernized equipment, resulting in higher electricity usage (Abor & Quartey, 2010). Inadequacies in terms of innovation, knowledge inadequacies, financial constraints and the quality of locally produced items, as well as operational inefficiencies, and insufficient knowledge are just a few of the identified constraints faced by small and medium scale enterprises (Abor, 2015; Oppong et al., 2014; Quartey et al., 2017; Sitharam & Hoque, 2016)

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND DISCUSSION

4.0 Introduction

An overview of the information gathered to answer the study's questions is provided here. This research provides a detailed analysis of the demographic characteristics, together with descriptive statistics, regression modelling, and a discussion of the findings.

4.1 Exploratory Data Analysis

The nature of the first investigation of the data was exploratory. Early on, the data quality was evaluated using exploratory factor analysis. The most important tool was SPSS. Response rate, non-response bias, and typical method bias or variance are the subsections that are included in this section. Detailed explanations of the early data quality assessment tests and interpretation may be found in the sections that follow.

4.1.1 Response Rate

Response rates to surveys are often provided in the form of a percentage. To arrive at this figure, just divide the total number of questionnaires that were sent in by the final count of respondents who filled them out. Response rates in surveys that are higher than 50 percent are unusual. The dates were from April 5th to May 22nd, 2022 for the data collection. The research therefore surveyed 264 participants. After determining whether or not each questionnaire is valid, an acceptable response rate for analysis is determined to be 75.8%, as seen in the table below. This results in 200 questionnaires that may be used.

Table 4.1: Data Response Rate

Distributed	Collected	Percentage of Usable
Response	200	75.8
Non-Response	64	24.2
Total	**264**	**100.0**

Source: Field Survey (2023)

4.1.2 Test for Common Method Bias and Sampling Adequacy

To assure the accuracy of dependent variable-predictor relationships in survey research, common method bias (CMB) testing is essential. Dependence on one responder risks dissolving this link (Podsakoff and Organ, 1986; Bahrami et al., 2022), which might lead to incorrect judgements. Podsakoff et al. (2003) found a social desirability or consistency-based common method bias (CMB). This suggests using different approaches to reduce CMB's influence on data. Exploratory Factor Analysis showed that one factor explained less than half of the variation, supporting Harman's single component technique. Principal component analysis found that 23.201% of data variance is due to a single source.

Table 4.2: Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	4.408	23.201	23.201	4.408	23.201	23.201
2	1.840	9.684	32.885	1.840	9.684	32.885
3	1.323	6.965	39.850	1.323	6.965	39.850
4	1.222	6.431	46.281	1.222	6.431	46.281
5	1.160	6.107	52.388	1.160	6.107	52.388
6	1.101	5.797	58.186	1.101	5.797	58.186
7	1.008	5.304	63.489	1.008	5.304	63.489
8	.946	4.979	68.468			
9	.901	4.740	73.208			
10	.796	4.189	77.397			
11	.730	3.842	81.239			
12	.629	3.311	84.550			
13	.584	3.075	87.626			
14	.489	2.571	90.197			
15	.470	2.471	92.668			
16	.414	2.177	94.845			
17	.367	1.931	96.777			
18	.321	1.688	98.465			
19	.292	1.535	100.000			

Extraction Method: Principal Component Analysis.

Source: Field Survey (2023)

The samples' accuracy was assessed using the KMO and Bartlett sphericity tests. According to Table 4.3, the Kaiser-Meyer-Olkin Examining Sufficiency score was 75.2%, and Bartlett's test was significant ($\mathcal{X}^2$= 878.572, df: 171, p = 0.000). This demonstrates that the sampling was carried out appropriately.

Table 4.3: Bartlett's Test of Sphericity and KMO Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.752
Bartlett's Test of Sphericity	Approx. Chi-Square	878.572
	df	171
	Sig.	.000

Source: Field Survey (2023)

4.1.3 Non-Response Bias

The study looked at the possibility of bias in the participants' answers. Non-response bias occurs when a less percentage of the population responds to a survey than would be expected based on the population as a whole. When a survey invites a group of people but only a subset of them responds, this is known as non-response bias. This lowers the validity of the findings and the reliability of the data acquired. In order to reduce the impact of this bias, this study compared the responses of early and late respondents. Oppenheim (2000) states that there should be no differences in the dependent or independent variables between the two groups. This proves there was no issue with non-response bias and that the samples are indeed representative of the target population. The first 100 answers were considered early responses, while the subsequent 100 were considered late responses. After that, the study used T-tests to look for signs of non-response bias. Results are shown in Table 4.4. T-test results showed no statistically significant differences. In conclusion, the research demonstrates there is consistency between the first- and last-month responses.

Table 4.4: Results of Independent-Samples t-Test for Non-Response Bias

			Levene's Test for Equality of Variances		
Variables	**Group**	**Mean**	**F**	**Sig.**	**T**
Relational Advantage	1	16.75	2.120	0.162	1.231
	2	16.43			
Organizational Readiness	1	37.25	0.722	0.201	1.018
	2	38.16			
Top Management Support	1	29.12	0.426	0.080	0.933
	2	28.94			
Employee Knowledge	1	15.83	0.523	0.632	0.896
	2	15.11			
Competitive Pressure	1	20.63	1. 001	0.730	1.716
	2	21.74			
Logistics Performance	1	40.45	0.051	0.822	0.982
	2	39.83			

Source: Field Survey (2023)

4.2 Respondent's Profile

This section provides demographic data about survey respondents to contextualise the research. Key information collected from respondents includes gender, age, educational level, position, years working in the firm, number of employees, number of products produce, and years of operating the firm.

Table 4.5: Respondent's Profile

Variables	Categories	Frequency	Percent
Gender	Female	83	41.5
	Male	117	58.5
Age	18-30 years	20	10.0
	31-40 years	105	52.5
	41-50 years	60	30.0
	Above 50 years	15	7.5
Level of Education	Bachelor Degree	88	44.0
	Diploma	22	11.0
	Graduate Studies (Master / Ph.D.)	90	45.0
Your Position in the Firm	Business Manager	26	13.0
	Human Resource Manager	11	5.5
	Operation Manager	107	53.5
	Production Manager	56	28.0
How many years have you been working in your firm?	1-5 Years	52	26.0
	11-15 Years	45	22.5
	16 Years and Above	36	18.0
	6-10 Years	67	33.5
How many employees are in the firm?	30 – 99 employees	61	30.5
	5 – 29 employees	30	15.0
	More than 100	109	54.5
How many products does the firm produce?	1-2 products	61	30.5
	3-5 products	30	15.0
	More than 5 products	109	54.5
How many years have your firm been in operation?	1 - 5 years	31	15.5
	11 – 15 years	59	29.5
	16 years and above	12	6.0
	6 - 10 years	98	49.0
	Total	**200**	**100.0**

Source: Field Survey (2023)

The gender distribution of the sample was 58.5% male and 41.5% female. The age range of 31-40 years had the highest percentage of respondents, with 52.5% falling within this category. The age range of 41-50 years was represented by 30.0% of the respondents. The percentage of individuals falling within the age bracket of 18-30 years was 10.0%. 7.5% of the population falls into the age group of 50 years and above. The data shows that 44.0% of the respondents held a Bachelor's degree. Nearly half of the population surveyed had completed graduate studies, specifically a Master's or Ph.D. programme. 11.0% of the population holds a Diploma.

Over half of the respondents (53.5%) identified themselves as Operation Managers, indicating that this group was the largest among the survey participants. Production Managers accounted for 28.0% of the total population. Business Managers accounted for 13.0% of the total population. Human Resource Managers accounted for 5.5% of the total population being analysed. Approximately one-third of the participants (33.5%) reported having worked in their organisation for a period of 6-10 years, making it the most common range of work experience among the respondents. Approximately 26.0% of the individuals surveyed had between one to five years of experience. Approximately one-fifth of the group, specifically 22.5%, possessed between 11 to 15 years of experience. 18.0% of the group surveyed had 16 years or more of experience. Over half of the firms, specifically 54.5%, had a workforce of more than 100 employees. The data shows that 30.5% of the sample had companies with 30-99 employees. The percentage of businesses with 5-29 employees was 15.0%. According to the data, 54.5% of firms had a production output of more than 5 products. Approximately 30.5% of the total production resulted in the creation of 1-2 products. The data shows that 15.0% of the sample produced a range of 3-5 products. The majority of firms, comprising 49.0% of the total, had been operating for a period of 6-10 years. Approximately 29.5% of the sample had been engaged in the activity for a duration of 11-15 years. A total of 15.5% of the observed entities had been in operation for a period of 1 to 5 years. Out of the total population, 6.0% have been operating for 16 years or more.

4.3 Factors affecting Technology adoption

The initial goal of this study evaluate the level of adoption and usage of IT in supply chains in manufacturing firms in Ghana. This segment of the investigation utilized descriptive methodology (mean and standard deviations) to depict the perspectives on respondents on the level of adoption and usage of IT in supply chains. Despite the fact that the conclusion

presented in Table 4.6 stated that all of the items evaluated the level of adoption and usage of IT in supply chains. However, competitive pressure score the highest overall mean of 4.15, followed by employee knowledge with an overall mean score of 3.80. Also, the overall mean score on relational advantage is 3.79. Organizational readiness scored an overall mean of 3.69. Top management support scored an overall mean of 3.13. As a result, indicators measuring the level of adoption and usage of IT in supply chains were identified with an overall mean above the aggregate mean 3.71. This implies that competitive pressure, employee knowledge, and relational advantage are the level/factors of adoption and usage of IT in supply chains.

Table 4.6: Factors affecting Technology adoption

Factors	Min	Max	Mean	Std. Dev.
Relational Advantage				
Technology will improve remote data access anytime, everywhere.	1	5	4.01	0.913
Technology reduces IT infrastructure upkeep.	1	5	4.04	0.831
Technology improves operations.	1	5	3.31	1.175
Overall Mean			***3.79***	***0.973***
Organizational Readiness				
Your company has IT implementation expertise.	1	5	4.3	0.716
Your company may deploy IT over the internet.	1	5	3.14	1.179
Your company has IT money.	1	5	3.64	1.157
Overall Mean			***3.69***	***1.017***
Top Management Support				
Our leadership values IT.	1	5	3	1.158
Top management accepts IT implementation risks.	1	5	2.51	1.037
Top management promotes openness and information exchange.	1	5	3.89	1.008
Overall Mean			***3.13***	***1.068***
Employee Knowledge				
IT training boosts comprehension.	1	5	4.01	0.948
IT training boosted confidence.	1	5	3.24	1.162
It company offers IT training.	1	5	4.16	0.859
Overall Mean			***3.80***	***0.990***
Competitive Pressure				
IT boosts competitiveness.	1	5	3.98	0.977
IT implementation by competitors is underway.	1	5	4.36	0.577
Implementing IT will make competitors more competitive.	1	5	4.11	0.863
Overall Mean			***4.15***	***0.806***
Aggregate Mean			***3.71***	***0.970***

Source: Field Survey (2023)

4.4 Correlation Analysis

The data shown in Table 4.7 reveals that there are very significant correlations between the six variables of relational advantages, organizational readiness, top management support, employee knowledge, competitive pressure, and logistics performance. For instance, a correlation value of 0.0 indicates that there is absolutely no link, 0.30 indicates that there is just a moderate correlation, and 0.70-0.90 indicates that there is a considerable association. There is a considerable relationship between all of the different factors as shown in Table 4.7.

Table 4.7: Correlation Analysis

Construct	1	2	3	4	5	6	7
Relational Advantage	1.000						
Organizational Readiness	.610**	1.000					
Top Management Support	.615**	.590**	1.000				
Employee Knowledge	.730**	.598**	.596**	1.000			
Competitive Pressure	.695**	.610**	.586**	.751**	1.000		
Logistics Performance	.742**	.606**	.567**	.726**	.784**	1.000	
Intention to adopt	.678**	.580**	.530**	.756**	.944**	.747**	1.000

** Correlation is significant at the 0.01 level (2-tailed).

Source: Field Survey (2023)

4.5 Reliability Statistics

The reliability table provides Cronbach's Alpha (CA) coefficients for various constructs, indicating the internal consistency or reliability of the measurement scales for each construct. Generally, a Cronbach's Alpha value above 0.70 is considered acceptable for research purposes. From the table, the CA value for relational advantage is 0.842 which suggests a high level of internal consistency for the Relational Advantage construct, indicating that the three items within this scale consistently measure the intended concept. The CA value for organizational readiness is 0.702 indicating an acceptable level of internal consistency for the Organizational Readiness construct. The CA value for top management support is 0.700

suggesting acceptable internal consistency for the Top Management Support construct, meeting the minimum standard for reliability. Also, employee knowledge had a CA value of 0.720 indicates acceptable internal consistency for the Employee Knowledge construct. Similar to Organizational Readiness. Competitive pressure also recorded a CA value of 0.771, which exhibits acceptable internal consistency, suggesting that the items within this scale consistently measure the intended concept. The CA for logistic performance is high, 0.896 indicating excellent internal consistency for the Logistics Performance construct. Also, the CA value for intention to adopt is 0.791 suggesting acceptable internal consistency for the Intention to Adopt construct. The constructs demonstrate acceptable to high levels of internal consistency (Nunnally and Bernstein, 1994; Malhotra and Grover, 1998), which enhances the reliability of the measurement scales used in the study.

Table 4.8: Reliability Statistics

Construct	Number of Items	Cronbach's Alpha
Relational Advantage	3	0.842
Organizational Readiness	3	0.702
Top Management Support	3	0.700
Employee Knowledge	3	0.720
Competitive Pressure	3	0.771
Logistics Performance	4	0.896
Intention to adopt	3	0.791

Source: Field Survey (2023)

4.6 Multi-collinearity Test

According to Pallant (2011), a score of less than 0.1 shows a significant multiple correlation with other variables, indicating the probability of multi-collinearity. Tolerance is the negative of the VIF. The VIF quantifies the effect of collinearity among the variables in a regression model. The VIF is always more than 1 and never less than 1/Tolerance. The existence of multi-collinearity cannot be determined using a VIF value. Multi-collinearity is frequently assume to

exist when the VIF value is more than 10. Additionally, Pallant argued that a VIF score greater than 10 indicates multi-collinearity. Table 4.9 infer that the model lacks multi-collinearity based on the aforementioned criteria since both our Tolerance and VIF values are more than 0.1 and less than 10, respectively.

Table 4.9: Multi-collinearity Test

Model		Collinearity Statistics	
		Tolerance	**VIF**
1	(Constant)		
	Relational Advantage	0.377	2.653
	Organizational Readiness	0.511	1.956
	Top Management Support	0.52	1.922
	Employee Knowledge	0.339	2.951
	Competitive Pressure	0.365	2.74

Source: Field Survey (2023)

4.7 Impact of IT in Supply Chain Processes

CP, TMS, OR, RA, and EK explain 90% of IA's variability, according to the model's statistical analysis. Table 4.10 reveals that the model's adjusted R-squared value of 0.897 is a good fit to the data, considering the number of predictors. Table 4.10 provided estimate standard error of 0.971. The model's predictions are close to the actual values. The Durbin-Watson value of 1.557 indicates no residual autocorrelation. The model's assumptions were satisfied. The independent factors and response variable are significantly correlated.

Table 4.10: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.949[a]	.900	.897	.971	1.557

a. Predictors: (Constant), CP, TMS, OR, RA, EK
b. Dependent Variable: IA

Source: Field Survey (2023)

The statistical analysis of variance (ANOVA) reveals that the regression model has a high level of significance ($p < .001$). Predictors CP, TMS, OR, RA, and EK in the regression model explain a large amount of variation in the dependent variable (IA). Based on the F-value of 349.233, it can be inferred that the predictors have a significant impact on the dependent variable. There is strong evidence that the predictors contribute considerably to the prediction of IA, since the sum of squares for the regression (1647.664) is much bigger than the sum of squares for the residuals (183.056). The findings suggest that the regression model is a suitable match for the data, and the predictors have a noteworthy impact on the dependent variable.

Table 4.11: Analysis of Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1647.664	5	329.533	349.233	.000[b]
	Residual	183.056	194	.944		
	Total	1830.720	199			

a. Dependent Variable: IA

b. Predictors: (Constant), CP, TMS, OR, RA, EK

Source: Field Survey (2023)

This model shows no significant link between RA (Relational Advantage) and IA (Intention to adopt) ($p = 0.567$). This means that the level of Relational Advantage experienced by the manufacturing firms in Ghana does not have a significant impact on their intention to adopt IT for improving logistics performance.

In this model, OR (Organisational Readiness) does not significantly affect IA (Intention to adopt) ($p = 0.961$). This implies that the level of organizational readiness of the manufacturing firms in Ghana does not have a significant impact on their intention to adopt IT for improving logistics performance.

The model shows a significant connection between TMS (Top Management Support) and IA (Intention to adopt) with a p-value of 0.023. The TMS standardised coefficient (Beta) of -0.072

in Table 4.12 indicates a negative connection between TMS and IA. This shows that Ghanaian firms with more top management support are less likely to use IT to improve logistical performance. A negative coefficient shows that top management support reduces IT adoption intention.

EK (Employee Knowledge) is correlated with IA (Intention to Adopt) with a p-value of 0.002. EK and IA are positively correlated according to the Beta value of 0.123. In Ghanaian manufacturing organisations, staff knowledge is positively correlated with the aim to utilise IT to improve logistical performance. A positive coefficient implies that employees' knowledge about IT is correlated with their will to embrace it. IT adoption improves as employees learn more about it and its advantages.

With a p-value of less than 0.001, the model demonstrates a strong and significant association between CP (Competitive Pressure) and IA (Intention to adopt). The standardised analysis shows a strong positive correlation between CP and IA with a Beta value of 0.880. The assertion implies that Ghanaian industrial businesses' willingness to use IT to improve logistics is related to their competitive pressure. The study claims that growing market competition leads companies to use IT as a strategic reaction to acquire an edge. The coefficient shows that as competition rises, businesses embrace IT.

Table 4.12: Regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	-.059	.296		-.200	.841
	RA	.021	.036	.021	.574	.567
	OR	-.001	.030	-.002	-.048	.961
	TMS	-.074	.032	-.072	-2.285	.023
	EK	.127	.040	.123	3.162	.002
	CP	.917	.039	.880	23.421	.000

a. Dependent Variable: IA

Source: Field Survey (2023)

4.8 Impact of IT on Logistics Performance

Table 4.13 shows a moderate association between ITA and LP in the linear regression model. A statistical study of the independent-dependent connection was provided in Table 4.13. The independent variable explains 65.9% of the dependent variable's variability, according to R-squared of 0.659. Adjusted R-squared is 0.657, reflecting the amount of variation in the dependent variable that can be explained by the independent variables in the model, taking into account the number of predictors. Table 4.13 shows the estimate's standard error is 2.462. Average deviation from projections. Model residuals contain no autocorrelation, according to Durbin-Watson value 1.867. The ITA variable predicts logistics performance.

Table 4.13: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.812[a]	.659	.657	2.462	1.867

a. Predictors: (Constant), ITA

b. Dependent Variable: LP

Source: Field Survey (2023)

According to the ANOVA table, the regression model predicts LP well. The regression model explains a significant amount of dependent variable variance, according to statistical analysis. This is corroborated by the strong F-statistic of 382.490 and low p-value of 0.000. ITA and LP seem to be correlated. The regression sum of squares is 2319.091 and the residual total is 1200.504. The user provides regression and residual mean squares. Statistical analysis evaluates regression model quality using these values. The regression's mean square is 2319.091, indicating the dependent variable's variance that can be explained by the model's independent variables. The residual's mean square is 6.063, indicating the dependent variable's fluctuation that cannot be explained by the model's independent variables. ANOVA findings indicate that the regression model fits the data and that ITA is a significant predictor of LP.

Table 4.14: Analysis of Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2319.091	1	2319.091	382.490	.000[b]
	Residual	1200.504	198	6.063		
	Total	3519.595	199			

a. Dependent Variable: LP

b. Predictors: (Constant), ITA

Source: Field Survey (2023)

IT adoption (ITA) and logistics performance (LP) are positively correlated, according to the research. Table 4.15 show that ITA and LP are positively correlated. The ITA coefficient is 0.268 with a 0.000 p-value. ITA increases LP by 0.268 units. The research sample reveals that improved information technology systems and practises by organisations boost logistics performance.

Table 4.15: Regression coefficients

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.518	.726		2.091	.038
	ITA	.268	.014	.812	19.557	.000

a. Dependent Variable: LP

Source: Field Survey (2023)

4.9 Discussion of Findings

The main objective of the study is to evaluate the impact of information technology in supply chain management among manufacturing firms in Ghana. An evaluation of the key findings in light of the current goals has been presented in this section.

4.9.1 Factors affecting Technology adoption

The initial goal of this study evaluate the level of adoption and usage of IT in supply chains in manufacturing firms in Ghana. The result implies that competitive pressure, employee

knowledge, and relational advantage are the level/factors of adoption and usage of IT in supply chains. The aforementioned assertion posits that crucial factors or levels such as competitive pressure, employee knowledge, and relational advantage influence the adoption and utilisation of IT in supply chains. The aforementioned factors exert a significant influence on the degree to which supply chain companies adopt and proficiently employ IT systems and strategies.

The findings align with the UTAUT Model and TOE framework, suggesting that competitive pressure, employee knowledge, and relational advantage play crucial roles in influencing the adoption and usage of IT in supply chains. According to the UTAUT Model, performance expectancy (competitive pressure), effort expectancy (employee knowledge), and social influence (relational advantage) significantly impact technology adoption. Similarly, the TOE framework emphasizes the importance of organizational factors (competitive pressure, relational advantage) and knowledge-related factors (employee knowledge) in shaping technology adoption within an organizational context, reinforcing the relevance of these theories in explaining the observed results.

Competitive pressure pertains to the extrinsic factors and market complexities that impel enterprises to embrace IT to maintain competitiveness and fulfil customer requisites (Tyler et al., 2020). The statement suggests that the competitive environment within the industry motivates companies to allocate resources towards information technology solutions and exploit technological advancements to optimise their supply chain activities (Pozzi et al., 2023). The term "employee knowledge" pertains to the extent of proficiency and comprehension that employees possess with respect to IT systems and their utilisation in the context of supply chains (Arsawan et al., 2022). The idea posits that proficient and competent IT personnel are more inclined to promote and facilitate the implementation and utilisation of IT within their respective enterprises (Pitafi et al., 2020). The proficiency possessed by individuals can be crucial in facilitating the effective integration and application of information

technology systems within the field of supply chain management (Kgobe and Ozor, 2021). The concept of relational advantage pertains to the establishment of strategic alliances and partnerships between companies and their stakeholders, including suppliers, customers, and other entities within the supply chain (Wang, 2020). The statement suggests that firms that maintain robust and cooperative associations with their supply chain counterparts are inclined to implement and leverage IT solutions to augment communication, coordination, and information sharing throughout the supply chain (Dutta et al., 2020).

4.9.2 Impact of IT in Supply Chain Processes

The next goal examines the impact of IT in supply chain processes among manufacturing firms in Ghana. The result show that relational advantage and organisational readiness do not have a significant impact on the level of intention to adopt IT in SC processes. The results align with the UTAUT Model, which posits that factors like performance expectancy and effort expectancy significantly influence users' intention to adopt technology. Relational advantage and organizational readiness, not exhibiting significant impact, may suggest that these factors are not as salient in determining individuals' intention to adopt IT in supply chain processes. UTAUT emphasizes the influence of performance expectancy (akin to relational advantage) and effort expectancy (similar to organizational readiness) in shaping technology adoption intentions, making it a suitable theoretical framework for interpreting these findings. The finding is also consistent with prior studies that have suggested the restricted influence of relational advantage and organisational readiness on the inclination to implement IT in supply chain settings (Kumar Bhardwaj et al., 2021; Su et al., 2023). The result also indicates a negative connection between TMS and IA. The present finding aligns with prior studies that have emphasised the importance of top management support as a crucial determinant affecting the adoption of technology within organisational settings (Salahshour Rad et al., 2018). The

result finally show that employee knowledge and competitive pressure have a significant impact on the level of intention to adopt IT in SC processes. This finding aligns with prior studies (Dube et al., 2020; Sutduean et al., 2019; Lu and Deng, 2022). According to Wong et al. (2020), organisational characteristics refer to an institution's technological and financial capacity and capability to adopt novel technologies. According to Kemble et al. (2020), the employment of technology's PU has a favourable influence on various organisational components. Both corporate competency and inter-organizational preparedness hold significant importance. Within an inter-organizational context, the utilisation of digital technologies such as blockchain technology is implemented to enhance a firm's fundamental efficacy concerning accountability, optimised and dependable operations, and the cultivation of confidence (Werner et al., 2020).

According to Kamble et al. (2020), the degree to which an innovation is perceived as superior to the pre-existing idea is referred to as relative advantage. According to Wong et al. (2020), the concept of considerable advantage pertains to the disparity between the benefits that a company can potentially acquire and the efforts that are necessary to introduce an innovative solution. The adoption of new technologies in the supply chain management (SCM) is significantly influenced by the concept of relative advantage, as posited by Bhattacharya and Wamba (2018). The integration of blockchain technology has the potential to enhance various aspects of the supply chain management (SCM) process, including accountability, transparency, accessibility, confidentiality, credibility, fraud mitigation, dependability, and efficiency, as evidenced by scholarly research (Helo & Shamsuzzoha, 2020; Reyna et al., 2018; C. L. Chen, 2019; Roeck et al., 2020). According to Werner et al. (2021), the degree of openness of a system has a positive impact on productivity as well as on the quality of customer service and support. Wong et al. (2020) assert that the characterization of executive leadership endorsement is contingent upon the perspective of top management regarding the significance

of adopting blockchain technology. The adoption and utilisation of technology necessitates the involvement of managers. According to Dubeye et al. (2018), the manner in which senior management executes a change is contingent upon the attainment of the desired outcome. In order to secure management support, it is often necessary to undertake certain measures such as eliminating impediments and cultivating an environment that promotes innovation and commitment. According to Kamble et al. (2020), the level of support provided by top management has an impact on both the PEU and PU. The competencies and proficiencies of personnel are crucial factors in the successful adoption and integration of novel technologies. The inadequacy of skilled personnel (as posited by S. Kamble et al., 2018) could potentially impede the realisation of one's aspirations for acceptance. According to Kamble et al. (2020), it is necessary to provide training to the personnel of a company to enable them to effectively utilise and appreciate the advantages of blockchain technology. Competitive pressure from industry rivals can impact the performance of an institution. In order to attain a competitive edge, enterprises must incorporate state-of-the-art technology. According to Wong et al. (2020), blockchain technology represents a state-of-the-art advancement that has the potential to confer a competitive advantage to a business. According to Shi and Yan (2016), competitive pressure prompts firms to adopt innovative technology. Moreover, it is possible for companies to interact with their competitors through computer networks, as suggested by Kamble et al. (2020).

4.9.3 Impact of IT on Logistics Performance

The last goal of this study explore the impact of IT on logistics performances among manufacturing firms in Ghana. The result show that adoption of IT in SC management has a significant influence on logistics performance. The results suggesting a significant influence of IT adoption on logistics performance align with the Technology-Organizational-

Environmental (TOE) framework. This framework emphasizes the interplay between technological factors, organizational context, and environmental influences in shaping technology adoption outcomes. In this context, the adoption of IT in supply chain management (SCM) is seen as a technological factor impacting logistics performance, supporting the TOE framework's focus on the technological dimension influencing organizational outcomes. The finding is also align with prior studies that have emphasised the influence of information technology implementation on the efficiency of logistics operations. Logistics efficiency is improved when IT is used and integrated in supply chain management (SCM), according to the research literature. Increasing operational efficiency, inventory management, order fulfilment, and customer satisfaction are just some of the ways that IT has been praised by Khaliunaa and Ramzani (2019) and Faruquee et al. (2023). In order to facilitate timely information interchange, synchronisation, and cooperation across supply chain partners, Kraude et al. (2022) performed a research that emphasises the need of integrating information technology (IT).

According to studies done by Sheel and Nath (2019), integrating IT improves the supply chain's efficiency, responsiveness, and overall effectiveness. Riyadi et al. (2021) report that successful IT implementation has enhanced logistics performance and boosted customer satisfaction via tighter coordination of the supply chain. According to Agyabeng-Mensah et al. (2019), the use of IT in manufacturing has decreased lead times, enhanced production planning, and increased operational efficiency. According to Antoni et al. (2020), improvements in routing and scheduling, inventory management, and order fulfilment have all been linked to the increased use of IT in the transportation and distribution industry. According to Chiu et al. (2021), the retail industry benefits from IT integration due to its ability to better estimate demand, restock inventory, and manage customer relationships. Jean-Francois et al. (2021) argue that the incorporation of IT into the healthcare sector has the potential to increase supply

chain traceability, simplify product tracking, and improve patient safety. Effective adopters and users of IT are predicted by Bag et al. (2020) to reap the benefits of improved operational efficiency, increased customer satisfaction, and enhanced supply chain management.

CHAPTER FIVE

SUMMARY OF RESULTS, CONCLUSION, AND RECOMMENDATIONS

5.0 Introduction

This study presents a summary of the results, conclusion, and suggestions derived from the research conducted. The findings indicate that there are significant correlations between the variables under investigation. Based on these findings, conclusion and recommendations were drawn. In addition, suggestions are provide for future research and practical applications of the study's results.

5.1 Summary of Findings

5.1.1 Factors affecting Technology adoption

The initial goal of this study evaluate the level of adoption and usage of IT in supply chains in manufacturing firms in Ghana. The result implies that competitive pressure, employee knowledge, and relational advantage are the level/factors of adoption and usage of IT in supply chains. The aforementioned assertion posits that crucial factors or levels such as competitive pressure, employee knowledge, and relational advantage influence the adoption and utilisation of information technology (IT) in supply chains.

5.1.2 Impact of IT in Supply Chain Processes

The next goal examine the impact of IT in supply chain processes among manufacturing firms in Ghana. The result show that relational advantage and organisational readiness do not have a significant impact on the level of intention to adopt IT in SC processes. The result also indicates a negative connection between TMS and IA. The result finally show that employee knowledge and competitive pressure have a significant impact on the level of intention to adopt IT in SC processes.

5.1.3 Impact of IT on Logistics Performance

The last goal of this study explore the impact of IT on logistics performances among manufacturing firms in Ghana. The result show that adoption of IT in SC management has a significant influence on logistics performance.

5.2 Conclusion

The primary aim of this research is to evaluate the impact of information technology in supply chain management among manufacturing firms in Ghana. The research is quantitative. This study uses descriptive and explanatory research designs. 200 individuals were selected using stratified random sampling. SPSS v26 performed the statistical analysis. Competitive pressure, staff knowledge, and relational advantage seem to impact supply chain IT adoption and use. Relational advantage and organisational preparation do not significantly affect supply chain IT implementation intentions. TMS seems to negatively correlate with IA. Employee knowledge and competitive pressure strongly impact supply chain IT adoption intentions. The results show that integrating IT into supply chain (SC) management improves logistical efficiency. The research found that firms must be able to make educated judgements and adopt strategies to enhance logistics performance to gain a competitive advantage.

5.3 Recommendations for Management

The present study proposes potential measures to assess the effects of information technology on supply chain management in the context of manufacturing enterprises:

- Competitive pressure, staff knowledge, and relational advantage seem to impact supply chain IT adoption and use (see Table 4.12). The report argues that management must understand their industry's competitive environment and deploy IT solutions to stay ahead. Companies must regularly assess market developments, technical

advances, and competing IT plans to stay competitive. Companies should provide IT training, courses, and resources to employees. This will let them use IT technologies to improve supply chain efficiency. Management requires supplier, customer, and stakeholder collaboration, communication, and trust. Information, resources, and best practises should improve supply chain IT solution deployment and use.

- The findings indicate that the influence of relational advantage and organisational readiness on the degree of intention to implement information technology in supply chain processes is not statistically significant (see Table 4.12). The findings suggest a negative correlation between transcranial magnetic stimulation (TMS) and internet addiction (IA). The findings indicate that the level of intention to adopt IT in supply chain processes is significantly influenced by employee knowledge and competitive pressure. According to the findings of the research, it is recommended that organisational leadership create a favourable environment that promotes the integration of information technology within the supply chain operations. The aforementioned objective can be attained by capitalising on the proficiency of the workforce and adapting to market competition, while simultaneously overcoming any foreseeable impediments or challenges. The aforementioned will facilitate the efficient implementation and assimilation of information technology solutions, leading to enhanced supply chain efficacy and competitiveness.
- The result show that adoption of IT in SC management has a significant influence on logistics performance (see Table 4.15). The study suggests that management ought to utilise the potential of IT adoption in supply chain management to improve logistics performance. The aforementioned outcomes are expected to be achieved through the implementation of measures aimed at enhancing operational efficiency, inventory

management, supply chain visibility, customer satisfaction, and competitive advantage.

5.4 Limitations and Recommendation for Future Research

The study may have been conducted on a specific set of manufacturing firms in a particular context, which limits the generalizability of the findings. Future research should consider larger sample sizes and diverse industries to ensure broader applicability. The study likely employed a cross-sectional design, which captures data at a specific point in time. Longitudinal or experimental designs could provide more robust insights into the causal relationships between variables. The study may have relied on self-reported data, which can be subject to response biases and measurement errors. Future research could employ objective measures or multiple data sources to enhance the validity and reliability of the findings. The study may not have fully explored all the contextual factors that can influence the relationships between variables. Future research should consider incorporating additional contextual variables such as industry-specific characteristics, market conditions, and cultural factors. Quantitative analysis was use in the study. Comparable studies may need qualitative research. Future studies should investigate the mediating and moderating variables that may influence the relationships identified in the study. For example, organizational culture, leadership style, and technological infrastructure could play a role in shaping the impact of IT adoption on logistics performance.

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