KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

INSTITUTE OF DISTANCE LEARNING

KNUST SCHOOL OF BUSINESS

THE COVID-19 PANDEMIC AND DIGITAL TRANSFORMATION OF SUPPLY CHAINS: A STUDY OF MANUFACTURING COMPANIES IN THE WESTERN REGION OF GHANA
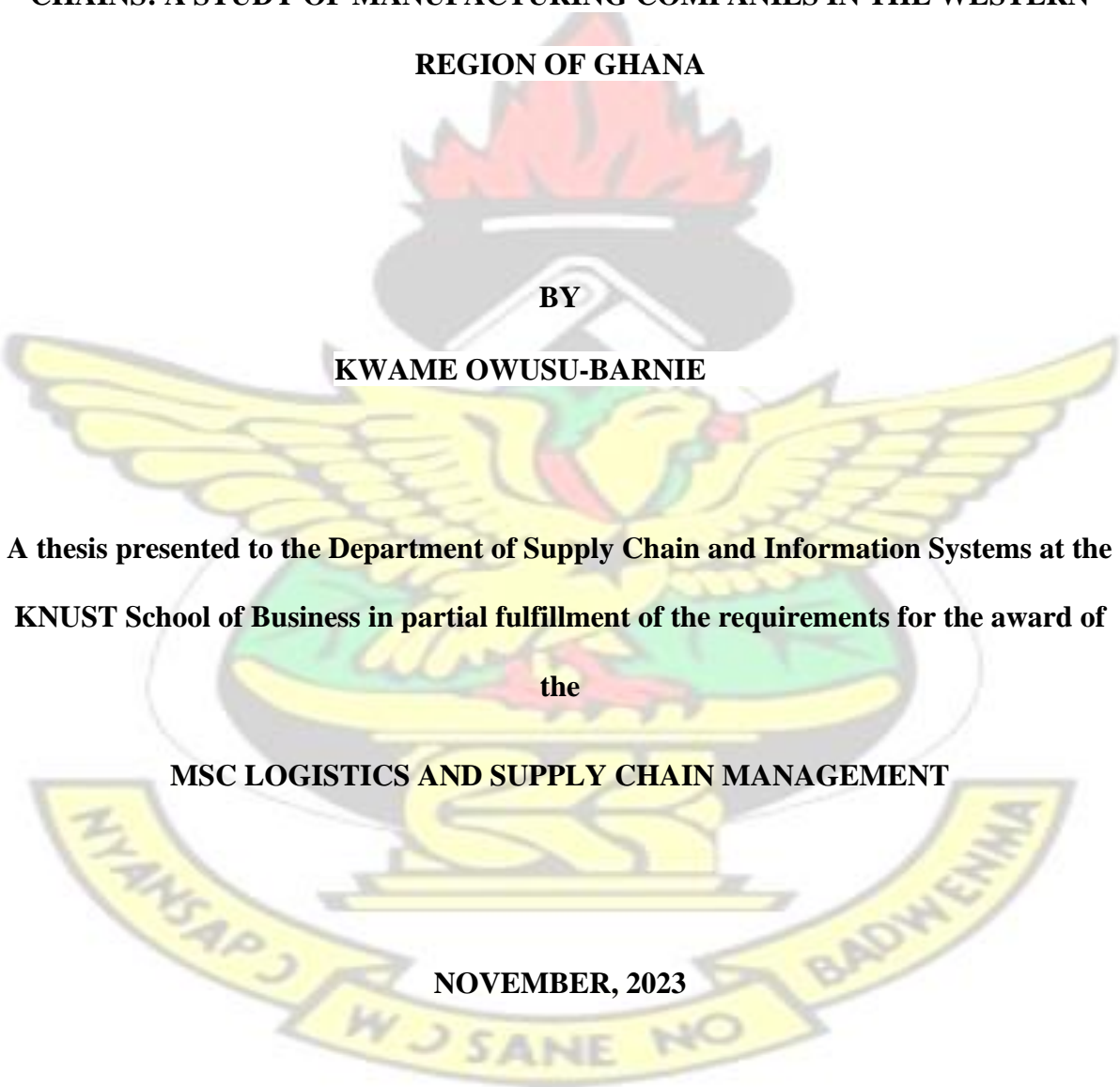
BY

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A thesis presented to the Department of Supply Chain and Information Systems at the KNUST School of Business in partial fulfillment of the requirements for the award of the

MSC LOGISTICS AND SUPPLY CHAIN MANAGEMENT

NOVEMBER, 2023

DECLARATION

We hereby declare that this submission is our own work towards Master's in Logistics and Supply Chain Management that, to the best of our knowledge, it comprises no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text'.

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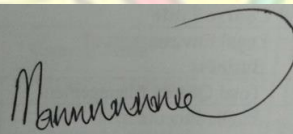
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Dr. Mawuko Dza 08/05/2023

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(Head of Department) Signature Date

DEDICATION

The project is dedicated to the All-Powerful God and my family in appreciation of their countless

favors and leadership throughout my life.

ACKNOWLEDGEMENT

I am grateful that my heavenly father saw me through this course. My deepest appreciation goes out to Dr. Mawoko Dza, my supervisor, for taking the time and patience to give me the guidance and support I required while I was studying.

Lastly, I want to express my gratitude to everyone for their constant love, support, and cooperation throughout this trying time, especially my family, my professors, and each and every one of my friends.

All the best to you all.

ABSTRACT

The study used a descriptive survey approach to evaluate the COVID-19 outbreak and the digitization of the supply chain inside manufacturing businesses in Ghana's western region. The study randomly sampled 100 respondents from 20 manufacturing firms in Western Region. The only method used to gather data for this study was a structured questionnaire with a 100% response rate. Tables and figures presented the findings of a descriptive investigation. The survey discovered that some of the primary digital transformation practices employed by industrial companies in the Western Region of Ghana include e-sourcing, software, predictive analytic tools, and e-tendering. The study also found that found that some challenges of digital transformation within supply chain of the manufacturing companies surveyed included Data security, an unstable network, a cybersecurity challenge, capital expenses, problems with the company's culture, the lack of a digital transformation strategy as a whole, an inflexible legal infrastructure, pushback, and resistance from employees, and a lack of knowledge and experience. Finally, it was also found that some impact of digital transformation Practices on performance included speeding up assembly and palletization, giving an accurate forecast of demand, making the supply chain more visible to improve performance and close gaps, and making process visualization and product design better. The study thus recommended that manufacturing companies use digital transformation practices like specific software & predictive analysis tools to improve asset performance and reliability, enhance visibility, track products and shipment, support scalable operations, improve process visualization and product design.

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ACRONYMS

WHO   -   World Health Organization

SARS-CoV-2   -   Severe Acute Respiratory Syndrome Coronavirus 2.

COVID-19   -   *Coronavirus Disease 2019*

SPSS   -   Statistical Package for Social Sciences

SCM   -   Supply Chain Management

DT   -   Digital Transformation

IoT   -   Internet of Things

AI   -   Artificial Intelligence

MIT   -   Massachusetts Institute of Technology

RBV   -   Resource Based View

IT   -   Information Technology

DMFs   -   Decision-Making Factors

ERP   -   Enterprise Resource Planning

VRP   -   Volta River Project

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The World Health Organization (WHO) declared a global pandemic after the current coronavirus illness (COVID-19), which was first discovered in December 2019 and was caused by the SARS-CoV-2 virus, was first discovered in the Chinese city of Wuhan on March 11, 2020 (Lai et al., 2020). Since then, the pandemic has spread quickly over almost all of the world's countries, including China. Worldwide, COVID-19 has killed thousands of people and afflicted millions of people in all states and territories (WHO, 2020). Governments all over the world have embraced an inhibition strategy to combat the outbreak, relying on a growing social divide, wearing masks, particularly in public places and on transportation, along with several other measures to halt the pandemic's spread and manage the resilience of the healthcare systems. Notably, these actions have frequently resulted in tighter border controls and complete state and federal lockdowns, both of which have a negative immediate impact on consumer spending, investment, and disruptions to global trade and supply networks (Kumar and Managi, 2020).

The development of supply chain resilience (SCRes) to COVID-19 is a topic that academics are currently particularly interested in (Kumar and Managi, 2020; Ivanov and Dolgui, 2020). Many academics and business experts have recommended for stronger supply chain management to deal with the major disruptions brought on by the raging pandemic (Jacobsen, 2020). For instance, Wuhan, the site of the COVID-19 outbreak, is an important hub for the production of automotive parts and a significant supplier of crucial components to major automakers all over the world, such as Volkswagen, General Motors, Hyundai, and Toyota (Kumar and Managi, 2020; Sharma et al., 2020). Due to factory closures and other ripple effects, a number of suppliers with locations in the Wuhan auto manufacturing area have already warned their international clients that they are unable to deliver parts (LMC, 2020).

The long-term impact is yet uncertain, however, as COVID-19 is a relatively recent event and there is insufficient data-driven evidence to enable the global supply networks develop resilient against the disruptions it causes (Yoo and Managi, 2020). This is true even when the ripple effect has spread to a global level.

Delivery delays and product shortages are caused by the COVID-19 pandemic's severe demand unpredictability and disruption of the world supply networks (Tietze et al., 2020). For instance, the Foxconn factory in China had to shut down as a result of the Wuhan shutdown, delaying the introduction of new Apple products (Xu et al., 2020). Businesses must improve their supply chains to achieve on-time delivery and a set level of safety stockpiles in order to decrease the impact of the COVID-19 pandemic on operations (Choi, 2021). Many companies are aggressively deploying a variety of Digital Transformation assets across their supply chains in order to achieve end-to-end transparency, replace staff members who are absent due to COVID-19, anticipate potential risks, and reduce demand uncertainty (Ivanov et al., 2019According to McKinsey (2020), the COVID-19 challenge has sped up international supply chains and management processes by three to four years. Even though businesses that have been quick to adopt Digital Transformation assets appear to have higher revenues and better stock performance, it is debatable whether using these assets increases performance, particularly supply chain performance (Borrett, 2021). 2020 is what Ralston and Blackhurst predict. In order to improve their current information systems, for example, the majority of businesses frequently use desktop productivity tools and software analysis, whereas the proportions of using more advanced Digital Transformation assets like robotic process automation and additive manufacturing are significantly lower (Deloitte, 2018). This narrow-minded mindset, particularly when dealing with the COVID-19 pandemic dilemma, is according to some studies to be the reason why utilizing Digital Transformation assets may not necessarily result in improved supply chain performance (Belhadi et al., 2021). The objective

of this study is to comprehend how digitization altered the supply chain in industrial businesses in Ghana's western region in response to the Covid-19 epidemic.

1.2 Statement of the Problem

Previously, prior to the epidemic, businesses were not required to make an instant investment in digital technologies. But because of the lockdowns, the epidemic, and people working from home and living there full-time, we had to adjust our living arrangements, and people began to buy nearly everything online (Haraldsson et al., 2020). Many firms have been under pressure to change the way they now conduct business since they must connect with end consumers who demand greater personalization options for the things they purchase (Haraldsson et al., 2020). This has reduced the procedures for production, material management, and real-time order planning. We still have a lot of questions about how to manage prosperous, long-lasting businesses after COVID-19. Businesses around the world are being affected by the COVID-19 outbreak, which continues to raise numerous questions regarding its possible future waves, types, and effects. This has compelled a lot of businesses to change how rapidly they update their goods and to rethink the role that technology plays in the supply chain (Haraldsson et al., 2020).

Black swan events like the COVID-19 outbreak necessitate detailed comprehension of both the short- and long-term effects, as well as accurate risk estimates (Nakamura & Managi, 2020a). Businesses would be able to create appropriate response and mitigation plans as a result (Kochan and Nowicki, 2019). Due to the subjectivity and uncertainty surrounding the effects of the current outbreak on the supply chain, it has been difficult to fully identify the risk scenarios and develop effective response strategies thereto, particularly over the long term (Kumar and Managi, 2020; Ivanov and Dolgui, 2020).

The COVID-19 supply chain analysis is still in its early stages by necessity. There haven't been many micro-scale analyses that have sought to conceptually understand the COVID-19

problem more extensively (Alok et al., 2022). Some studies suggest areas for further research based on a review of the literature. However, the current discussion about global supply chains frequently ignores the problems that businesses are currently having with their supply networks as a result of COVID-19 and its mitigation efforts (Alok et al., 2022). In light of these challenges, supply chain managers must reconsider their supply chain planning in order to avoid such problems in the future (Alok et al., 2022). In addition to having an impact on supply chain activities, the COVID-19 pandemic also had a number of implications on tier relationships, corporate policies, and networks of related linksBusinesses are making adjustments to their inventory management systems, for example (Choi et al., 2021; Donthu & Gustafsson, 2020); (b) the pandemic may change the power dynamics in the supply chain; (c) supply networks must become more resilient; and (d) business strategies are changing. In light of the Covid-19 outbreak, it is crucial to take the supply chain's digital transformation into account. The following goals are attempted in this study in an effort to close the gaps:

1.3 Objectives of the Study

The main goal of the study is to evaluate how supply networks are changing in the Covid-19 era.

The study's specific targets are;

I. To determine the supply chain management techniques employed by Western Ghanaian industries who have embraced digital transformation.

II. To investigate the difficulties associated with digital transformation faced by Ghana's Western region's manufacturing firms.

III. III. To investigate how the digital transformation has affected the productivity of manufacturing companies in Ghana's Western region.

1.4 Research Questions

    i.   i. Which supply chain management approaches do manufacture companies in Ghana's Western area use?

    ii. What challenges do manufacturing companies in Western Ghana confront as they go through a digital transformation?

What effect does Ghana's Western region's manufacturing companies' performance under the digital transformation have?

1.5 Significance of the Study

For a number of reasons, research on the COVID-19 pandemic and supply chain digitization is essential. First, by adding to the corpus of knowledge regarding the supply chain digital transformation of business. Thorsten et al. investigated the effect of COVID-19 on business performance in 2021, while EverSream investigated Supply Chain Maintenance in the Face of the COVID-19 Crisis. The COVID-19 crisis made digital transformation crucial to firm success, and these studies were conducted concurrently with those by (Borrett, A., 2021), (Fei, et al., 2022), and (Fei, et al., 2022). The studies are not just for academic research; businesses can use the findings to improve their supply chains. The many factors at play in a digitalized supply chain and the alterations that follow on the technological, organizational, and environmental levels will also be made clear (Axel and Peter, 2016).

1.6 Scope of the Study

The supply chains of manufacturing firms in Ghana's Western Region will be the subject of the study. Because it is a region with a high population and one that engages in manufacturing, the western region was chosen for this study. The study will look at supply chains and digital transformation, so its findings cannot be applied generally. The following factors will serve as the study's guiding principles: improving the core supply chain process, ensuring adequate

supply chain business process orientation, investigating new business models, building an adaptable and agile supply chain, and using data to inform important decisions.

1.7 Summary of Research Methodology

This investigation used a descriptive research design. The sample size was made up of certain manufacturing industries in Ghana's west. The quantitative technique of the study used structured questionnaires to gather data about the digital transformation of the manufacturing businesses in Ghana's western region. The information was gathered using both primary and secondary sources. A review of the literature in books, journal articles, journals, published reports of international organizations, and other sources essential to the research subject was done in order to gather secondary data, which was subsequently combined with primary data from target respondents. To gather information from respondents who were thought to have in-depth knowledge of the research topic, a purposive sampling technique was used. The information gathered from the completed questionnaire was updated and checked for accuracy. In order to examine the updated data utilizing tables, figures, and graphs, the statistical program SPSS's regression analysis tool and descriptive statistics had to be used.

1.8 Ethical Considerations

According to Kalof et al. (2008), a study that is planned ethically maximizes benefits for researchers and study participants, upholds respondents' rights, and lessens risks to respondents. In this study, the following ethical considerations were mentioned: Without any force or pressure, the participants are free to participate. The participants will also receive all pertinent information about the study. The participants' anonymity would also be protected. By respecting the confidentiality of the participants' responses and personal information, the researcher will ensure that there is no harm done to the participants.

1.9 Structure of the Study

There will be five chapters in the study, each of which is outlined below:

Chapter 1 covers the background to the study, statement of the problem, objectives of the study, and research questions. It also provides an overview of the research methodology and outlines the study's structure. The literature review is included in Chapter 2, which also includes an introduction, an empirical review, a theoretical review, and a conceptual framework.

Introduction, research design, study population, sample and sampling techniques, research tools, data sources, and data analysis are covered in Chapter 3.

The interpretation of the outcomes and conclusions of the analysis that was done will be covered in Chapter 4. Summary of the findings, conclusions, and suggestions is presented in Chapter 5.

1.10 Limitation of the Study

The research is limited to selected manufacturing companies in Western Region of Ghana. Since there were only limited observations (100 responses), in this study the revalidation of variables was not done. There was lack of systematic confirmatory research that hinders general agreement on the instrument's usage. Secondly, there is complex concept and that includes companies' network to produce and deliver final output, thus the overall domain cannot be studied in one research. This study's data included responses taken from single respondents of a firm that could generate possible biasness in response. The analysis results must be interpreted focusing on the limitations. The utilization of the single respondent can develop some inaccuracy in measurement.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter analyzes relevant theories and prior research on connected subjects. Supply chain models and theories, digital supply chain transformation, and COVID-19 are all covered in this chapter as well. This chapter also discusses how our research models are integrated with prior findings.

2.2 Conceptual Review

2.2.1 Supply Chain

The core of every organization is its supply chain (MacCarthy et al., 2016). The structure, scale, arrangement, and methods used to plan, direct, and manage supply chains all change with time, according to MacCarthy et al. (2016). Planning, sourcing, manufacture, distribution, and delivery of goods or services from the place of origin to the location of consumption are the basic elements of a supply chain (Ghauri & Gronhau, 2020). Today's supply chain is far more intricate.

Numerous parts, referred to as supply chain nodes, are connected by flow pathways to form a supply chain network. The supply chain is constantly threatened by the constant and oftentimes remarkably quick changes in the world. The four Ps of the supply chain—goods, personalization, people, and process—can be managed by businesses to consistently and profitably meet customer expectations (Gaurav et al., 2015). The high efficiency of the supply chain is greatly influenced by the significance of the four Ps. The primary goal of every organization is to maximize value for its stakeholders or clients, which can be demonstrated by metrics like return on assets (ROA), return on investment capital, or monetary profit. In terms of their relative value and contribution to corporate performance, SCM (supply chain management) methodologies are now well supported by empirical evidence (Narasimhan et al., 2001). The last 20 years have seen significant growth for SCM (Chen & Paulraj, 2004).

2.2.2 Supply Chain Constraints

Many different supply chain issues, including variable and uncertain demand, globalization, increased consumer expectations, and new product releases, must currently be addressed by firms. Thanks to the adoption of omnichannel (Gaurav et al., 2015), consumers want seamless, interesting purchase experiences across a variety of channels. There are a few challenges, including:

Improving response times to demand fluctuations

1   Delivering goods profitably

2   Managing inventory costs

3   The digital explosion

4   Unexpected events or circumstances are some of the problems.

The main issue of modern supply chain management is to operate inside a very complex supplier network while reducing reaction times to consumers' ever-increasing needs. Another problem is to provide items profitably while carefully monitoring each step of the supply chain to preserve cost control and profits. Gaurav et al. (2015) found that accurate forecasting and prompt decision assistance are crucial for efficient inventory management. Due to the tremendous growth that digital commerce has had over the past 10 years, customers are starting to adopt multi-channel and omnichannel experiences. Although it may be challenging to successfully manage the internet and digital enablement, these are crucial components (Seyedghorban et al., 2020). Because the supply chain is made up of diverse components and several interdependent operations, unexpected events like pandemics and conflict may also offer significant risks or severe obstructions. Industry 4.0, also known as the fourth industrial revolution, is currently in progress as businesses alter their strategies to enter fully integrated boundaries and become more transparent in their business practices, including their supply

chain management, which may be one of the success factors of the businesses in recent years (Seyedghorban et al., 2020).

2.2.3 Supply Chain Visibility and Agility

According to Barratt and Oke (2007), a company's access to high-quality information describing various demand and supply elements depends on how visible its supply chain is, which includes supply visibility, demand visibility, and market visibility. (2013) Williams and others. Research suggests that supply chain visibility can boost flexibility (Wang and Wei, 2007), lessen transaction uncertainty (Lee et al., 1997), and minimize costs associated with stock shortages or, alternatively, surplus inventory. Research has also been done on the non-technical and technical aspects of the factors influencing supply chain visibility (Barratt and Oke, 2007). However, relationship commitment (Moberg et al., 2002), interorganizational trust (Barratt and Oke, 2007), and internal and external supply chain linkages are thought to be the main non-technical factors affecting supply chain visibility. The Internet of Things and the deployment of big data analytics are two essential technical elements boosting supply chain visibility. Supply chain agility, according to Wamba et al. (2020), is the capacity of a supply chain to quickly react to abrupt or rapid changes in the market. Agile supply chains can help businesses estimate demand more accurately, react to market changes, and be more responsive to the market (Christopher, 2000). According to Braunscheidel and Suresh (2009), supply chain agility is crucial for increasing competitive advantage and reducing the likelihood of supply chain interruptions as a result. (2017) Chan and associates. Numerous studies have been conducted on the variables affecting supply chain agility (Shekarian et al., 2020). For instance, Kim and Chai's (2017) study of 272 manufacturing companies revealed that regular supply chain information exchange promotes prompt decision-making and market flexibility. Chan et al. (2017) found that two organizational flexibility factors—strategic flexibility and manufacturing flexibility—are essential requirements for supply chain agility through their

analysis of 141 garment manufacturers. Using a sample of 300 Thai manufacturing companies, Smart & Mekhum (2020) discovered that big data analytics had a significant impact on supply chain agility.

2.2.4 Supply Chain performance

Since supply chain management may boost organizational efficiency and profitability while creating value for all parties involved in the supply chain, some academics claim that a company's performance is largely determined by how effective its supply network is (Estampe et al., 2013). The novels were written in 2003 by Rosenzweig and other authors. Supply chain performance, in particular, gauges a business's capacity to offer clients high-quality products and services delivered in precise quantities and at predetermined intervals (Whitten et al., 2012). The literature has covered the elements that impact supply chain effectiveness. By simulating a hospital supply chain, Kochan et al. (2018) found that boosting supply chain visibility boosts customer response and reduces inventory costs. A total of 205 top buying managers were examined.

2.2.5 Covid-19

The highly contagious novel coronavirus infection 2019 (COVID-19), which initially surfaced in China in December 2019, then spread to the rest of the world in early 2020. Vvarious facets of society have suffered as a result of lockdowns and new survival techniques, which have also stopped various activities. Every aspect of the economy is impacted by the epidemic, but some industries and businesses have been damaged worse than others, including those that rely on supply chains, travel, leisure, and customer interactions (Anayi et al., 2020).

2.2.5.1 Impact of Covid-19 on Supply Chains

Numerous economies have suffered because of the coronavirus illness 19, which severely decreased the number of lives worldwide. Supply chain management finds it particularly challenging to meet unforeseen demand for some commodities when production and travel limitations are in force at the same time (Meyer et al., 2021). Organizations are struggling to

address the issues brought on by the COVID-19 dilemma because of a lack of resources, including money and specialized skills. It has become more common to make purchases via digital, Internet-based means. According to Klein & Todesco (2021), government financial aid programs and changes to the supply chain have a substantial impact on how well enterprises run and retain viability. Every sector benefits from using the supply chain. Numerous lockdowns caused manufacturing to be disrupted, which extended and accelerated the previously existing supply chain issues. These lockdowns continued to impede, if not completely stop, the movement of raw materials and completed commodities. Due to their extensive reliance on foreign suppliers and increased complexity, the majority of enterprises have developed and outsourced many production and supply chain tasks. As a result, they are particularly vulnerable to disturbances that may be brought on by a variety of natural phenomena outside their control (Meyer et al., 2021). To better serve its end users, the market need an effective supply chain. Disruptions have brought about new opportunities due to changes in consumer behavior, market equilibrium, and digital technologies. The company can have difficulties. More connected operations and open information exchange between organizations, their suppliers, and potential clients are made possible by technological and digital improvements. A digital supply chain has many benefits, including quickness, adaptability, worldwide connectivity, intelligence, openness, and scalability. To address supply chain digitalization, distinct areas of the supply chain's numerous components, however, have different methods in place (Seyedghorban et al., 2020).

2.2.6 Digitalization
Digitalization, which changes how business is conducted within industrial value chains using Internet of Things (IoT) technologies, intensive data exchange, automation, and process optimization to improve productivity and profitability by significantly reducing costs and errors, is ushering in the fourth industrial revolution. The next parts (Parida et al., 2019) discuss

the concepts around digitization and how they have affected firms' capacity for change adaptation.

The term "digitalization," which serves as a framework, refers to the use of digital opportunities (Seyedghorban et al., 2020). The process of transforming analog technology into digital is known as digitalization. For over 30 years, it has been used in commercial activities. This process gave rise to the phrase "digital transformation". The impact of "digitalization" on society has been hotly debated ever since the term first originated. The North America Review used the term "computerization" for the first time in a modern context in 1971 (Seyedghorban et al., 2020). The enormous volume of research-related content that has been generated shows how the rise of digital media has impacted and influenced contemporary culture. There is discussion on the effects of digitization. We must enable automation, improve data quality, acquire and organize all the data, use cutting-edge technology, and implement intelligent software in order to increase process efficiency, reduce transaction costs, and better manage the business (Rachinger et al., 2018).

Additionally, digitalization was described by Gorensek et al. (2018) as the adoption or expansion of the usage of digital technology by businesses, industries, and countries. It also describes the process of converting various analog information streams into digital bits. IMD claims that while governments work to go digital and get ready for the future of the digital economy, technology is a force that affects entire economies in addition to people, enterprises, and organizations (2019). However, in order to prosper, the majority of enterprises have adjusted to the new business climate it has created. Digitalization has an effect on society, how people live, and our personal life. The retail supply chain is one of these areas where consumer usage and buying patterns have changed and are still changing. Depending on the nature of their industry, retailers must now offer clients more than just necessities. Digital transformation

is the result of these adjustments to the fundamental political, economic, cultural, or other processes that underlie digitalization (Gorensek et al., 2018).

2.2.7 Digital Transformation

The process of incorporating digital technology into all business processes through modifications to operational and customer value delivery techniques is known as "digital transformation," to put it simply. Incorporating new social, digital, and mobile technologies into an organization's working and thought processes is a process, according to Gorensek et al. (2018). It is necessary to alter how the organization is conducted in order to stimulate innovation and the development of new business models for the benefit of the company's employees, clients, suppliers, partners, and shareholders. Westermann, Bonnet, and McAfee performed extensive research into digital transformation by interacting with executives from more than 50 prominent firms at the MIT Center for Digital Business and the Capgemini Research Institute. According to the findings (Gorensek et al., 2018), digital transformation occurs in businesses where it has been applied at varying rates and with varying degrees of success. According to Gorensek and Kohont (2018), the elements of digital transformation include customer understanding, top-line growth, customer touchpoints, process digitalization, worker enablement, performance management, digitally transformed business, new digital business, and digital globalization.

The author discovered that many traditional firms are effectively completing digital transformation because they are under pressure from customers, workers, and competitors, unlike digital businesses. Businesses are under pressure to implement a worldwide strategy that can utilize the benefits of digital technology and transformation in order to reduce costs, reduce risks, and meet customer needs (Seyedghorban et al., 2020). Our client experience, operational procedures, and business models are the three primary business pillars that managers are digitally modernizing. The three elements that make up each of these pillars include, but are

not limited to, customer comprehension, top-line growth, new digital enterprises, and redefining digital globalization (Gorensek et al., 2018).

2.2.8 Digital Transformation in Supply Chain

In order to maximize (reinvent) operational efficiency, enhance customer value creation, mitigate operational and compliance risk, and create new revenue opportunities, "digital transformation" (Schmarzo et al., 2020) is the process of identifying, codifying, and operationalizing actionable customer, product, and operational insights (propensities). As was already stated, there are many things that digitization can be utilized for. Unfortunately, a lot of companies think that digital transformation just means digitalizing business operations and consumer interactions.The author found that many traditional businesses are actually undertaking a digital transformation because, unlike digital businesses, they are being pressured by customers, employees, and competitors. Businesses are being pushed to adopt a global strategy that might maximize the advantages of cutting costs, lowering risks, and meeting customer requests.

One key development brought about by supply chain management's digital revolution is the development of AI and machine learning algorithms. Artificial intelligence that can be evaluated more effectively is used in these algorithms to replace human calculations and scenario analysis. SCM is significantly impacted by AI and digital transformation, which also contributes to higher requirements for flexibility, efficiency, and productivity. (Yin, 2018). Pandemics, armed conflict, ransomware attacks, cyberthreats, governmental sanctions, and new laws and regulations are just a few of the risks to the global supply chain. Digital transformation is improving supply chain effectiveness, as has frequently been seen. Using integrated decision support systems, digital transformation can be used throughout the supply chain to calculate costs and assess risk. However, digital management cybersecurity must be tackled immediately and on an individual basis. (Creazza et al., 2022) developed the concept

of "cyber supply chain balanced reliance," which is based on balancing the supply chain's cyber risk with the required procedures and activities.

Smart logistics, which includes automated warehousing, remote fleet control, and freight tracking, is one of the most recent developments in supply chain technology. Real-time tracking helps make deliveries of goods quicker and less time-consuming by identifying inefficiencies in delivery routes and transportation performance. Embedded sensor technologies enable more accurate demand forecasting and restocking because they can simultaneously respond to requests from a distance and monitor, collect, and report data from the immediate region (Fitzgerald, 2021).

The digital thread also needs to integrate processes and people in addition to data and technology. The entire supply chain may become more responsive in terms of design, manufacture, and volume through improving data sharing. Access to the data across corporate networks is essential for achieving end-to-end visibility, which can lead to win-win situations. Online retailers developed digital order forms and online storefronts to enable remote consumer interaction both during and after the pandemic. by putting new products on display in-store using augmented or virtual reality technology. Ingenious interactions between customers and suppliers mix the real and virtual worlds (Fitzgerald, 2021).

2.3 Theoretical Review

Theory-driven research is crucial since digital technology is developing so quickly. Understanding the topic of supply chain digitalization is made easier by using the proper theories. Research on supply chains is challenging because, in the absence of knowledge and literature, it is challenging to put theory into practice and provide greater understanding and guidance. The Resource-Based View (RBV) idea is applied in this study.

2.3.1 Resource-Based View (RBV) Theory

RBVs, or resource-based perspectives, describe how particular uses and combinations of tangible and intangible resources (commonly referred to as features) may offer a business a competitive edge. The unique characteristics of a resource, as well as its capacity to create barriers to entry and generate economic rents, are commonly emphasized in the development of RBVs (Lavie, 2006). The study also paid close attention to traditional RBV, with ownership serving as the primary area for resource management in the business. On the other hand, purchasing, outsourcing, or managing the complete supply chain depends on partners' capacity to close skill gaps while concentrating on key strengths. Therefore, fundamentally monopolistic resources, as envisioned in traditional resource-based systems, may pose a threat to cooperatively managed agreements to manage shared and non-shared resources to gain a competitive advantage (Lavie, 2006). The supply chain, in RBV's opinion, provides explanatory power to illustrate the idea of network resources. According to Miller and Rose (2003), integrating resource-based concepts into supply chain management lays a significant emphasis on structural analysis and the discovery of several strategies for establishing a competitive edge in the market. The study's obvious objective, according to Halldorson et al. (2007), is to implement a resource-based strategy to assist important supply chain management choices. In interorganizational agreements, we will, on the one hand, take advantage of the geographic and resource barriers created by our joint efforts in order to react to uncertainties and changes in company structure. Businesses are aware that depending simply on internal resources is insufficient to maintain a competitive edge due to a shortage of resources or the intensity of competition in this particular context (JAP, 2001). This study also emphasizes the value of taking a resource-based approach to understanding how technology is used in the globalized era. Public and private organizations alike are continuously looking for methods to stand apart from the competition. According to academics who have acknowledged the significance of information technology (IT) competence as a critical organizational capability

(Wade & Hulland, 2004; Chen et al., 2014), an information technology (IT) capability that shares the qualities of rarity, non-substitutability, and non-replicability can support higher company performance. According to studies on the relationship between IT competence and superior performance (Ravichandran et al., 2005; Radhakrishnan et al., 2008), the ability of IT competence to maximize the value of other organizational resources and capabilities may explain some variations in an organization's performance. Despite the fact that the study views IT competence as a beneficial resource, it can also indirectly affect other resources or talents within the organization (Kohli 2008; Grover).

The digitalization of the supply chain is impacted by decision-making factors (DMFs). One of the key steps in the digitalization process is using digital technology resources to improve the supply chain. As a result, the theory of the Resource-based approach can help with both the analysis of important DMFs and the application of the created framework (Deepu and Ravi, 2021).

According to the RBV hypothesis, a company can gain and keep a competitive edge by making use of its unrivaled resources (Paulraj, 2011). From a resource-based approach, businesses may increase performance and generate value by putting strategies in place that make the most of their internal resources and capabilities. According to this idea, an explanation of the connection between certain procurement methods and organizational success is required. Furthermore, it is essential to demonstrate how companies may use sound procurement processes as a skill to boost performance and create a competitive advantage, particularly when doing so in conjunction with the company's resources (Paulraj, 2011).

2.4 Conceptual Framework
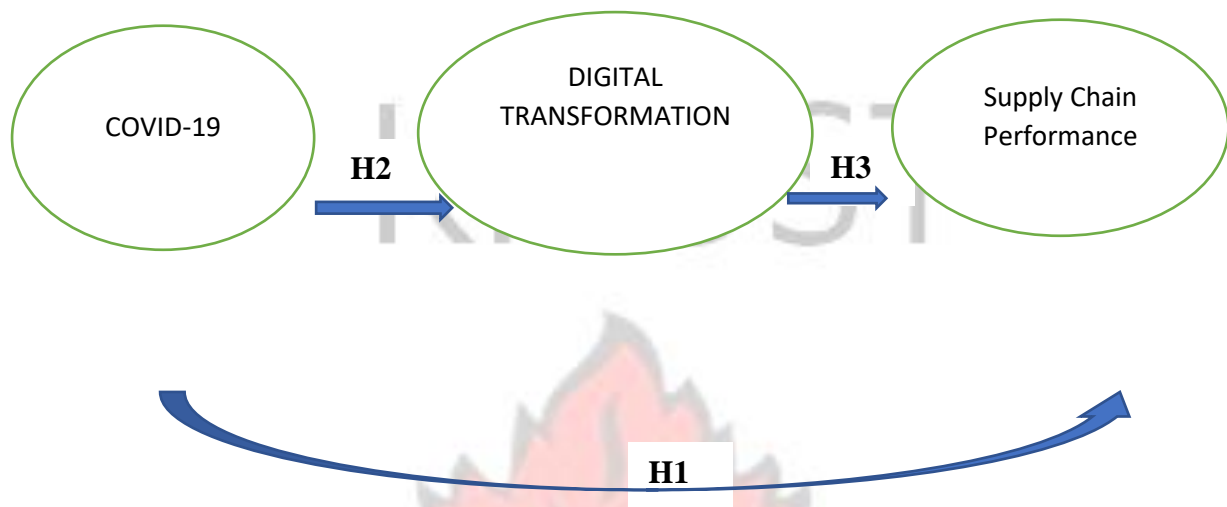
Figure 2.1 Conceptual Framework

The literature research clearly shows that the COVID-19 Pandemic and the expansion of the digital supply chain are connected. Three key factors have been highlighted for this analysis: the COVID-19 pandemic situation, the supply chain, and technological progress. Unfortunately, we were unable to find a theoretical framework that addressed all three important characteristics throughout our search for one on which to base our study. As a result, we have chosen to speculate on the relationships between those three factors, each of which we have examined using a different framework.

From the empirical review and conceptual framework above, the researcher comes out with the hypothesis below.

2.4.1 The effectiveness of the supply chain during the Covid-19 pandemic

Due to border restrictions, worker relocations, suspension of transit, and other circumstances, the Covid19 epidemic has significantly impacted supply chains. These changes showed a higher demand for goods and services in international trade, which forced businesses to raise

prices. Because of this, producers were forced to multiply their prices, which raised the cost of living for the average person. Many nations, not just one or two, saw price hikes. perhaps though the pandemic is starting to recede a little, it will still be months or perhaps years before its full impacts are understood. Manufacturing companies claim that there are still significant transportation and raw material constraints in place, and that these limits have recently gotten worse (McPartland, 2021).

H1 – Supply chain performance is harmed by Covid-19.

2.4.2 Covid-9 and Digital Transformation
The supply chain has been significantly impacted by the COVID-19 epidemic. Significant delays or problems occurred in both the production cycles and the logistics of transportation. There is a lack of supply because the market is inaccessible or output has dropped. The COVID-19 outbreaks at their operational sites have forced the closure of the production, packaging, sales, and service facilities (Agroknow, 2022).

Disruptions were a given as a result of the lockdowns. The customer demand is, however, also evolving away from conventional brick and mortar channels and toward digital change. Remote site inspections and supplier audits may be completed swiftly and effectively thanks to digital software solutions. Through dependable and secure software platforms, a lot of crucial information must be exchanged digitally (2022; Agroknow).

H2 – Covid-19 has accelerated digital transformation within the supply chain.

2.4.3 Digital Transformation and Supply Chain Performance
The goals of this project, according to Schmarzo et al. (2020), are to "optimize (reinvent) operational efficiency, enhance customer value creation, mitigate operational and compliance risk, and create new revenue opportunities."

Digitalization can be utilized to accomplish a multitude of things, as was previously stated. Unfortunately, a majority of businesses believe that digital transformation solely refers to

digitizing client interactions and corporate processes. The development of AI and machine learning algorithms is a significant development in supply chain management's digital revolution. These algorithms perform a more detailed investigation of artificial intelligence than human computations and scenario analysis. SCM is significantly impacted by AI and digital transformation, which also increases the demand for productivity, efficiency, and flexibility (Yin, 2018).

H3 – The supply chain benefits from digitalization.

2.5 Chapter Summary

This chapter assessed the research on the COVID-19 pandemic and supply chain digital transformation. The conceptual framework, theoretical justifications, empirical analyses, and conceptual underpinnings of the study were all described in this chapter. More information on the study's methodology is given in the chapter that follows.
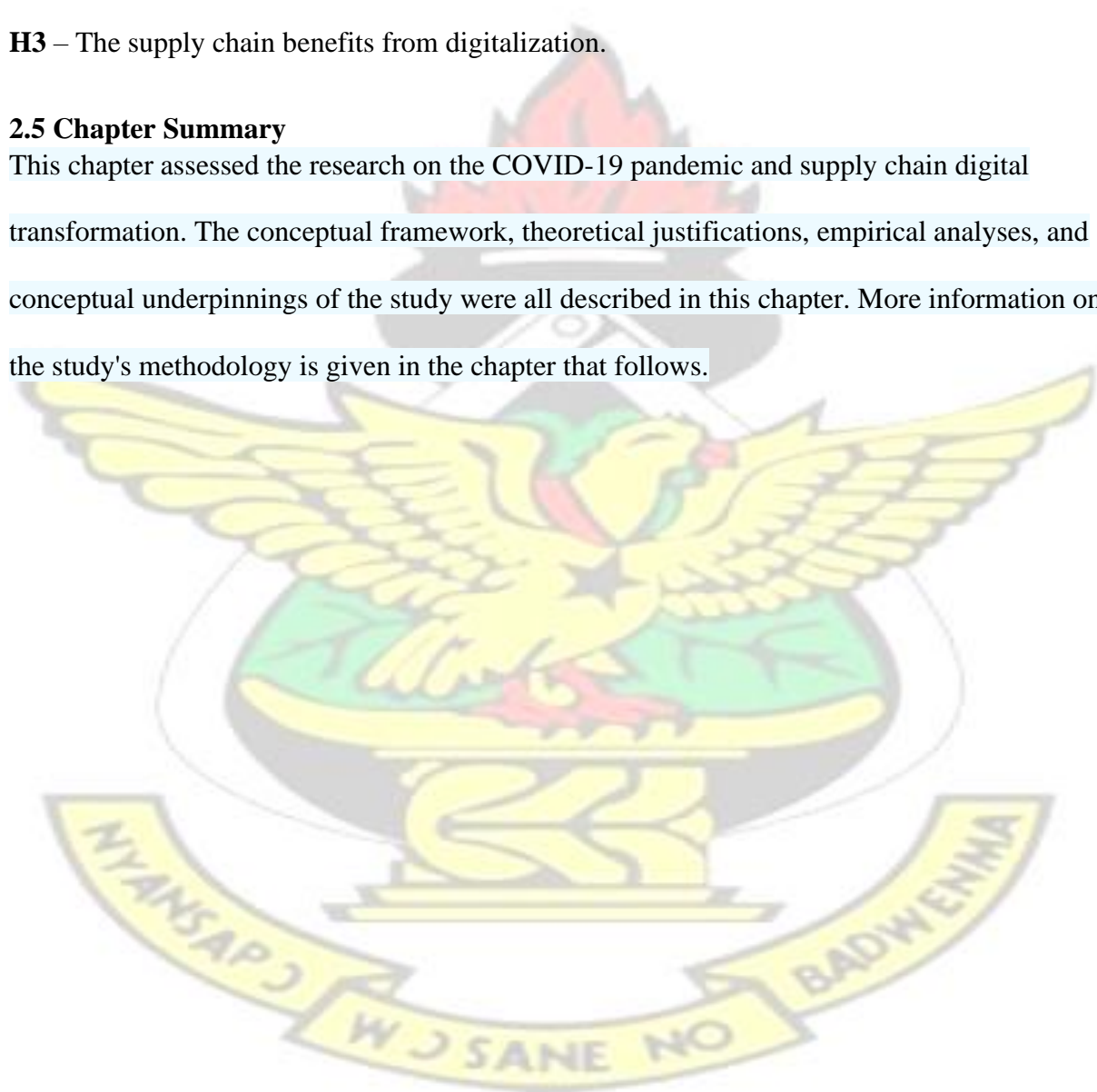
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter will address the research design, population sample, sampling method, data collection tool, questionnaire validation, tool administration, and data analysis method.

3.2 Research Design

The research design, the framework within which the study is carried out, includes the gathering and analysis of information that are pertinent to the investigation (Kothari, 2004). The strategy for gathering trustworthy and accurate data that satisfies the study's goals and offers the insights required to respond to the research questions is laid out in the plan. The researcher's approach was descriptive and quantitative technique. In order to statistically analyze the population sample, a descriptive and quantitative technique seeks to gather quantifiable data. The features of the demographic segment can be compiled and defined using this well-liked market research instrument.

3.3 Population

Ngechu (2014) claims that an investigation's population is a precisely defined grouping of the subjects of the inquiry, including the individuals, services, things, and events. The supply chain specialists working for manufacturing companies in Ghana's western area will be the study's target audience. The population for this study would be made up of 132 respondents from 20 manufacturing firms because there was no established record with the names of supply chain specialists employed by manufacturing companies in Ghana's western region.

3.4 Sampling Method

The manufacturing companies for the study will be chosen using the purposive sampling . Many times, researchers think that if they use sound judgment and gather a representative sample, they can save time and money (Clark & Creswell, 2008). 100 participants from 20 manufacturing enterprises will be chosen for the study using deliberate sampling. Due to the nature of the study, the supply chain divisions of the companies would be chosen as the

respondents. The respondents will be selected for the study at random to guarantee that everybody has an equal probability of being chosen (Kim & Wang, 2019; Lohr, 2019).

3.5 Sample Size

The sample size of a statistical population is a restricted subset, and by examining the sample's features, we can learn more about the population as a whole. The number of units determines how many participants can be included in the study (Bryman & Bell, 2015). A sample size is employed when there are time and resource constraints or when the population being studied is too big (Schindler, 2018). Numerous methods can be used to determine the sample size. This can be done in a number of methods, including employing censuses for small populations, replicating sample sizes from relevant studies, using published tables, and using algorithms (Singh & Masaku, 2014). Taro Yamane, a statistician, developed the Taro Yamane technique in 1967 to establish the sample size for a certain population. Below is a mathematical example of the Taro Yamame method.

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

n denotes the sample size.

N = the number of people (132)

e = the minimum margin of error (5%)

$$n = \frac{132}{1 + 132(0.05)^2} \quad n = \frac{132}{1 + 132(0.0025)} \quad n = \frac{132}{1 + 0.33} \quad n = \frac{132}{1.33} = 100$$

This gives an estimated sample size of 100

3.6 Data Collection Method

In the context of science, the word "data collection method" refers to the process of gathering pertinent data that may be utilized to answer research questions in an efficient manner. An answer to a research question can be found through data collection (Manoj, 2006). The study's

main research technique was a questionnaire. Each responder from the organization under inquiry will be given a uniform questionnaire. Only closed-ended questions will be included on the survey. Structured questionnaires are popular because they are easy to administer, easy to evaluate, inexpensive, and time-saving (May 2004).

Each respondent will receive a questionnaire because they will be distributed one at a time. Another advantage of doing surveys in-person is that the researcher can answer any questions that respondents may have as they complete the survey. The necessity to assure tool consistency as well as the requirement to quantify respondents' responses for simple analysis both had an impact on the decision to use closed-ended questions.

3.7 Data Analysis

Data collection, modeling, and transformation are all processes in the data analysis process that are used to highlight important information for making suggestions, choosing a course of action, and drawing conclusions (Glinger, Morgan, & Leech, 2009). Data will be updated and verified for accuracy after being collected from the completed form. The new data will then be entered into the social sciences statistical program SPSS version 25 for analysis. SPSS is computer program that is used to gather and analyze unprocessed data from research instruments like questionnaires, according to Saunders (2003). SPSS will be used because the study's data collection is descriptive and statistical presentation must be done utilizing tables, graphs, and charts (Glinger et al., 2009).

3.8 Validity and reliability

According to Gay (2011), a research tool's dependability is assessed by how consistently it generates data and findings after several trials. The validity of a piece of study is determined by how accurate and meaningful its findings are (Mugenda & Mugenda, 2003). The validity and dependability of the data collection technology typically impact the accuracy of the data acquired (Kothari, 2004). Using the Cronbach Alpha test, the researcher will evaluate the

surveys' validity and dependability. The Cronbach Alpha result must be higher than 0.60, as indicated and deemed appropriate by researchers (Manoj, 2006), in order for the questionnaire responses to be considered reliable.According to Gay (2011), a research tool's dependability is assessed by how consistently it generates data and findings after several trials. The validity of a piece of study is determined by how accurate and meaningful its findings are (Mugenda & Mugenda, 2003). According to Kothari (2004), the validity and dependability of the data collection technology typically impact how accurate the data that have been obtained are.

3.9 A Brief History of Manufacturing Companies in Ghana

The Nkrumah administration launched an industrialisation drive after Ghana gained independence in 1957, increasing manufacturing's GDP contribution from 10% in 1960 to 14% in 1970. The largest of these industrial operations, the Volta Aluminum Company (Valco) smelter, as well as sawmills and timber processing operations, cocoa processing operations, breweries, cement manufacturing, oil refining operations, textile manufacturing operations, and vehicle assembly operations were all produced as a result of this expansion. Many of these businesses, however, were only able to continue due to protection. The economy stagnated from 1970 to 1977, then entered a recession from 1977 to 1982 due to a lack of hard currency to purchase supplies and replacement parts, the overvalued cedi, and poor management in the state sector. The manufacturing industry struggled in the years that followed, never entirely recovering. The widespread underutilization of industrial capacity, a problem since the 1960s, drastically grew throughout this time. In big and medium-sized facilities, the average capacity utilization had decreased to just 21% by 1982. The foreign exchange supply for imported fuel and machinery greatly improved once the ERP was established, and capacity utilization gradually grew to over 40% in 1989. However, by 1987, the production of the manufacturing sector had dropped by 26 and 35 percent, respectively, from 1975 and 1980.

The country's endeavors to boost the capital-intensive aluminum industry, which has attracted the greatest attention, serve as the best examples of Ghana's experience with industrialisation projects after independence. The beginning of the development of this project was in the middle of the 1960s with the building of a 1,186-megawatt hydroelectric dam at Akosombo on the lower Volta River. The Volta River Project (VRP), which the Nkrumah government saw as essential to creating an integrated aluminum industry based on harnessing Ghana's substantial bauxite reserves and its hydroelectric potential, was centered on the Akosombo Dam. In the 1970s, Valco, which utilized 60% of the hydroelectricity the VRP provided and produced up to 200,000 tons of aluminum yearly, became the company's primary client. A severe drought and changing global economic conditions in the 1980s had a significant detrimental impact on Ghana's aluminum industry. Large-scale bauxite reserves were found in Australia and Brazil, which led to an oversupply of the substance worldwide and a protracted slump in the aluminum market. Early on in the 1970s, Valco discovered significant fresh supplies in Kibi, but soon recognized that it would be far less expensive to import semi-processed alumina from South Korea and Jamaica. The disagreement over Valco's refusal to construct an aluminum production facility between Kaiser & Reynolds, the government, and Valco was contentious. The severe drought that persisted from 1983 to 1985, which worsened the effects of unfavorable market conditions, limited the Akosombo Dam's capacity to produce energy. As a result, the smelting was momentarily stopped. After the halt, the production of aluminum took some time to resume. Aluminum production and exports were very small in the early 1990s. Input purchases became unaffordable after the currency undervalued significantly in 1983, harming businesses in the manufacturing sector. Some firms found it challenging to compete with imports that were more affordable due to trade liberalization, while manufacturers found it challenging to retain liquidity due to the ERP's severe monetary regulations. Because to legislation mandating them to pay 100% of their input costs upfront, a protracted recession,

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hyperinflation, out-of-date technology, low demand, and stringent regulations, several sectors of the economy are already struggling. According to local press sources, at least 120 factories have reportedly shuttered since 1988, mostly as a result of import competition. The leather, electrical, electronics, and pharmaceutical industries were particularly hard hit. In 1990, the New Match Company, the only manufacturer of safety matches in the country, too went out of business.

It was difficult for the government to support neighborhood companies because of the usage of ERP strategies. Because it was dedicated to privatization and the hegemony of free market forces, the government was unable to directly assist local industry or even alter those laws.

In order to support the creation of new firms, the government of Ghana established the Ghana Investment Center in 1986. The manufacturing sector accounted for the majority of projects that were approved between 1986 and 1990. It was estimated that the allowed ventures would require an investment of US$136 million in 1989 and US$138 million in 1990. Once dominant, the lumber sector was supplanted by chemicals in 1990. The establishment of an organization to handle economic distress was made by the government in 1991 in response to concerns that "unrestrained imports" of foreign goods were harming domestic enterprises. Funding for regional business was included in the 1992 budget, with $2 billion set aside as financial assistance for "deserving firms." The creation of joint ventures and the utilization of foreign financing, however, were the two key trends in manufacturing. A $8 million Taiwanese plant that could produce 10 tons of iron and steel products per hour began testing in Tema in 1989 and was one of the most significant new firms. Despite the fact that the investment code had been in existence since 1985 and that more than 500 projects had been approved, as of the end of 1989, only approximately half of them had actually begun. Joint ventures with both domestic and foreign partners made up 80 percent of the projects that were approved, accounting for 90

to 95 percent of the total projects. The liberalization of imports, diversification, and the expansion of small-scale industries were all reforming the sector.

In June 2021, the first phase of the Dzata Cement facility's construction was finished, and commercial production at Ibrahim Mahama's company in Ghana started. First fully owned by Ghanaians, the company manufactures cement. 1.2 million tonnes per year of production were predicted from the company's first phase. It is anticipated that the factory will generate 3 million tonnes annually after the two project phases are complete.

3.8 Chapter Summary

The final section of this chapter covered the research design and methodology, the background of Ghana's manufacturing sector, the population of interest, the sampling strategy, the sample size, the method of data collection, the data analysis, and the validity and reliability of the findings. The chapter discussed the decision that changed the investigation's research design.
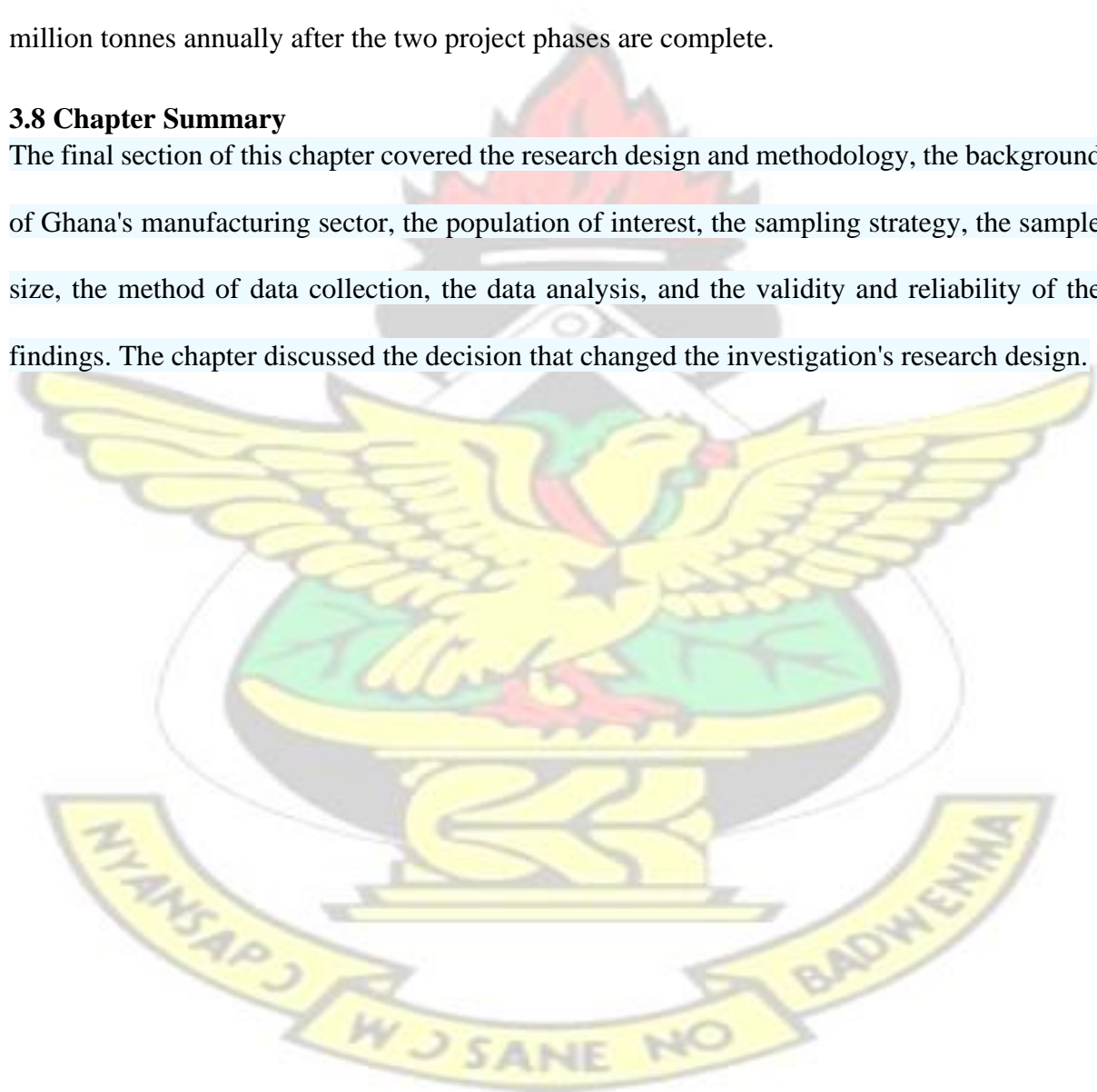
CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1. Introduction

This chapter presents the study's findings. The goals of the investigation will determine the results. The results are displayed using tables and graphs. The findings include an evaluation of the effects of the digital transformation on the performance of the manufacturing firms along with a quantitative analysis of the respondents' sociodemographic data and the supply chain practices used by the manufacturing companies in Ghana's Western Region.

4.2 Demographic Data

Table 4.1: Gender Distribution

		Frequency	Percentage	Valid Percentage	Total Percentage
	Male	64	64.00	64.00	64.00
Valid	Female	36	36.00	36.00	100.0
	Total	100	100	100	

Source: Field Survey 2022

In the biodata of the respondents who were willing to participate in the study, gender was one of the most crucial indicators. According to Table 1, men provided 64% of the 100 responses, while women provided 36%. This shows that men participated in the study at a higher rate than women.

Table 4.2: Age Distribution

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
21 – 30	35	35.00	35.00	35.00
31 – 40	58	58.00	58.00	83.00
41 - 50	17	17.00	17.00	100.0
Total	100	100	100.0	

Source: Field Survey 2022

According to the respondents' age distribution, as is shown in Table 4.2 above, there were three age groups among the respondents, with 35% between the ages of 21 and 30 and 17% between the ages of 41 and 50. Given the age range of the responses, it appears that the majority of study participants are young and active.

Table 4.3: Level of Education

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Diploma	15	15.00	15.00	15.00
	Higher National Diploma (HND)	18	18.00	18.00	33.00
	1ST Degree	43	43.00	43.00	76.00
	Masters	24	24.00	24.00	100.0
	Total	100	100.0	100.0	

Source: Field Survey 2022

In the analysis of respondents' educational levels, Table 4.3 showed that 43% of respondents held a first degree, 24.0% held a master's degree, 18% held a higher national diploma (HND), and 15% held a diploma. The bulk of responses were inferred to be first-degree people. The knowledge-based theory put forth by Grant (2007) is directly supported by this finding. He argues that a company's knowledge base determines the potential of its human resources, which is largely decided by the kind of training it offers its employees. The prevalence of professionals throughout the supply chain and the high concentration of highly educated workers both significantly improve an organization's capacity to recruit and retain talented workers.

Table 4.4: Working Experience

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Less than 2 years	7	7.0	7.0	7.0
	2 - 4 years	15	15.0	15.0	22.0
	5 - 8 years	53	53.0	53.0	75.0
	More than 8 years	25	25.0	25.0	100.0
	Total	100	100.0	100.0	

Source: Field Survey 2022

According to Table 4.4, the respondents' job experiences were as follows: Less than two years of experience are held by 7.0% of people, two to four years by 15.0%, eight years or more by 25.0%, and five to eight years by 53.0%. The findings show that both inexperienced and experienced workers were chosen to respond to the test questions.

4.3 Digital Transformation Practices

Table 4.5: The supply chains of manufacturing companies in Ghana's Western Region adopt digital transformation techniques.

No	Digital Transformation Practice	Frequency
1	E-Sourcing	85
2	E-Tendering	72

3	Blockchain	21
4	Internet on things (IoT)	52
5	Software	80
6	Predictive analytic	78
7	Virtual Reality	32
8	Cloud computing	13
9	Robotics	43

Source: Field Survey 2022

To illustrate how digital transformation is being used, Table 4.5 shows the supply networks of industrial enterprises in Ghana. It reveals that 80 percent of respondents from 20 manufacturing companies approved of the use of specialized software, 78 percent approved of predictive analytics, 72 percent approved of electronic tendering, 52 percent approved of the use of the Internet of Things (IoT), 43 percent approved of the use of robotics, 32 percent approved of virtual reality, 21 percent approved of blockchain, and 13 percent approved of the use of cloud computing. This may indicate that Ghanaian producers are familiar with digital transformation strategies. The table shows that the most popular digital transformation strategies are e-sourcing, software, predictive analytics, and e-tendering. This is consistent with Kim's list for

2021, which also includes the most widely used digital transformation technology. The outcomes validate Nancy's (2019) ranking of the best practices for digital transformation.

4.4 Challenges Inherent to Digital Transformation

Table 4.6: Challenges

| Digital Transformation Challenges	Mean	Std. Deviation
Cyber Security Challenge	3.84	0.813
Capital Expenditure	3.81	0.837
Inflexible legal infrastructure	3.58	0.855
Employee pushback and resistance	3.55	1.077
Unstable Network	3.87	.991
Corporate Culture Issues	3.80	.888
Lack of Knowledge and Experience	3.45	1.077
Data Security	4.08	.646
Lack of overall digital transformation strategy	3.72	.877

Field survey: 2022

The inherent challenges of the digital transformation are represented in Table 4.6, together with their averages and standard deviations. Data security was rated as the top challenge to digital transformation activities in the supply chains of industrial enterprises in Ghana's western area

by the respondents, according to Table 4.6 (mean = 4.08). They also agreed (mean = 3.87) that an unstable network poses a challenge for digital transformation strategies in the supply chains of the manufacturing companies in Ghana's western region. Capital spending (mean = 3.81) and cyber security (mean = 3.84) were the next two challenges. This supports Shehmir's claim that the pandemic has expedited digital transformation and that organizations who hastily adopt digital solutions risk failing. The respondents (mean = 3.80) agreed once more that supply chain challenges associated with digital transformation techniques inside the manufacturing enterprises in Ghana's western area are related to corporate culture difficulties. This supports a study by Phan (2021) that found corporate culture to be a significant barrier to digital transformation in business. The absence of a comprehensive digital transformation strategy represented the following difficulty (mean = 3.72). This concurs with Levi's list of the top business-impacting digital transformation challenges for 2021 and Eric's top five digital transformation issues for 2022. rigid legal framework (3.58 on average). The workforce's pushback and opposition was the next problem (mean = 3.55). This backs up Eric's (2022) list of the top five digital transformation barriers, and the study backs up Shehmir's (2022) assertion that reluctance to accept new digital solutions is a significant barrier to a company's digital transformation. The problem that presented the least difficulties was a lack of knowledge and experience (mean = 3.55).

4.5 Effects of Digital Transformation

Figure 4.1: Effects of the digital revolution on industrial companies' productivity in Ghana's Western Region
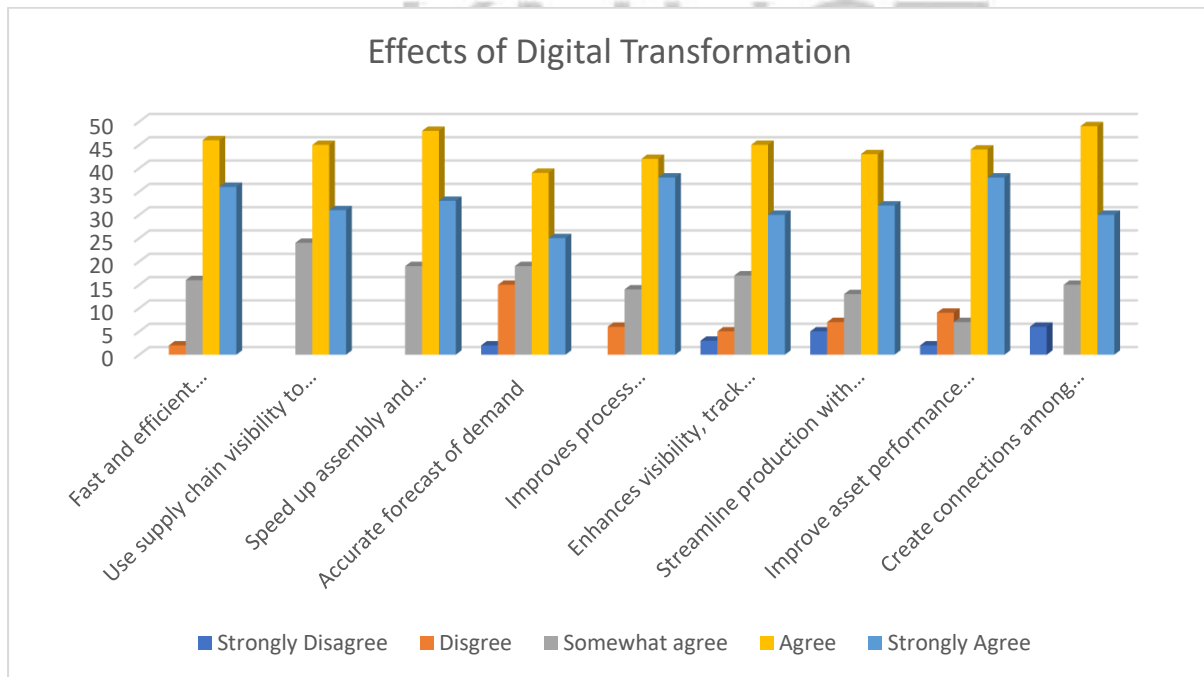
Source: Field Survey 2022

Figure 4.1 shows that 36 respondents, or 36% of the total, strongly agreed with the assertion that digital transformation has made procurement processes in the manufacturing industry rapid and efficient. 46 respondents, or 46% of those surveyed, agreed with this assertion. 16 respondents, or 16% of those who responded, somewhat agreed with this statement, whereas only 2 respondents, or 2%, disagreed. This suggests that most respondents have firsthand knowledge of how quickly and efficiently technology is used in the procurement process. This supports Gartner's (2022) assertions regarding the benefits of enterprise digital transformation strategies. Figure 4.1 reveals that 31 respondents, or 31%, strongly agreed that digital transformation has improved the use of supply chain visibility to improve performance and address gaps, and that 45 respondents, or 45% of the respondents, agreed that this has

happened. Furthermore, 24 participants (24% of the sample) strongly agreed. This demonstrates that supply chain insight is now more effectively used to boost productivity and close gaps as a result of digital transformation. Gartner (2022) claims that this demonstrates the value of digital transformation strategies for businesses. A further 48 respondents, or 48% of the sample, agreed that the digital transformation has sped up assembly and palletization, as seen in figure 4.1. This remark was strongly agreed with by 33 respondents, or 33% of the sample, and slightly agreed with by 19 respondents, or 19%. This means that as a result of the digital transition, palletization and assembly will speed up. According to Gartner (2022), this illustrates the significance of digital transformation methods for enterprises.

Figure 2 further shows that 39 respondents, or 39% of the total respondents, concurred that digital transformation provides them with accurate projections and demand. The majority of respondents—25, or 25% of the total—strongly agreed that the digital transformation helps them generate accurate predictions and demand, while 19 respondents, or 19% of the total—slightly agreed. 15% of the respondents, or 15 people, disagreed, and 2% of the respondents, or 2, disagreed vehemently. According to all of the respondents, digital transformation enables them to estimate and predict demand more accurately. This supports what Gartner (2012) said about the significance of enterprise digital transformation plans.

In terms of the enhancement of process visualization and product design, 42 respondents, or 42% of the total, agreed with the statement; 38 respondents, or 38% of the total, strongly agreed with the statement; 14 respondents, or 14%, slightly agreed; and 6 respondents, or 6%, disagreed. This suggests that the digital transition has helped to advance process visualization and product design. This shows, in Gartner's opinion (2022), the value organizations place on digital transformation approaches.

It is simpler to comprehend what is happening, track things as they are being made, distribute them, and provide scalable assistance for operations, according to 45 respondents, or 45% of the whole sample. 30 respondents, or 30% of all respondents, agreed that digital transformation improves visibility, product tracking, shipment, and scalable operation support. However, 5 respondents, or 5% of all respondents, disagreed vehemently, while 3 respondents, or 3% of all respondents, strongly disagreed. Expanding operations, managing products, shipping them, and keeping tabs on what's happening are thereby made simpler by digital transformation. According to Gartner (2022), this illustrates the significance of digital transformation methods for enterprises.

Figure 4.1 reveals that 43 respondents, or 43%, agreed that embracing digital transformation may help them decrease manufacturing waste. 32 respondents, or 32%, said they were "very sure" that digital transformation will help them cut manufacturing waste. 13 people, or 13%, said they partially agreed. Five respondents, or 5%, strongly disagreed, while seven respondents, or 7%, disagreed. According to Gartner (2022), this illustrates the significance of digital transformation methods for enterprises.

As shown in Figure 4.1, 44 respondents, or 44%, agreed that digital transformation increases asset performance and reliability, while 38 respondents, or 38%, strongly agreed with this statement. Digital transformation does not increase asset performance and reliability, according to 9 respondents (or 9%), whereas 2 respondents strongly disagreed. This shows, in Gartner's opinion (2022), the value organizations place on digital transformation approaches.

In addition, 49 respondents, or 49%, agreed that digital transformation has integrated systems, people, and processes to promote cooperation and speed up innovation. 30 of them, or 30%, said they strongly agreed. Digital transformation has connected systems, people, and processes, according to 15 respondents (15%) who agreed slightly with this statement and 6 respondents

(6%), who strongly disagreed. According to Gartner (2022), this illustrates the significance of digital transformation methods for enterprises.

According to the data above, there is a direct correlation between the performance of manufacturing organizations and digital transformation.

4.6 Summary

The chapter includes details on the gender, age distribution, educational background, and employment history of the respondents. According to the study's goals, the chapter conducts additional analysis on the data that was gathered. The descriptive statistics function in Excel and SPSS 26's statistical program for social sciences were both used to analyze the data. The results were analyzed using tables and a bar chart that displayed frequencies, percentages, the mean, and the standard deviation.
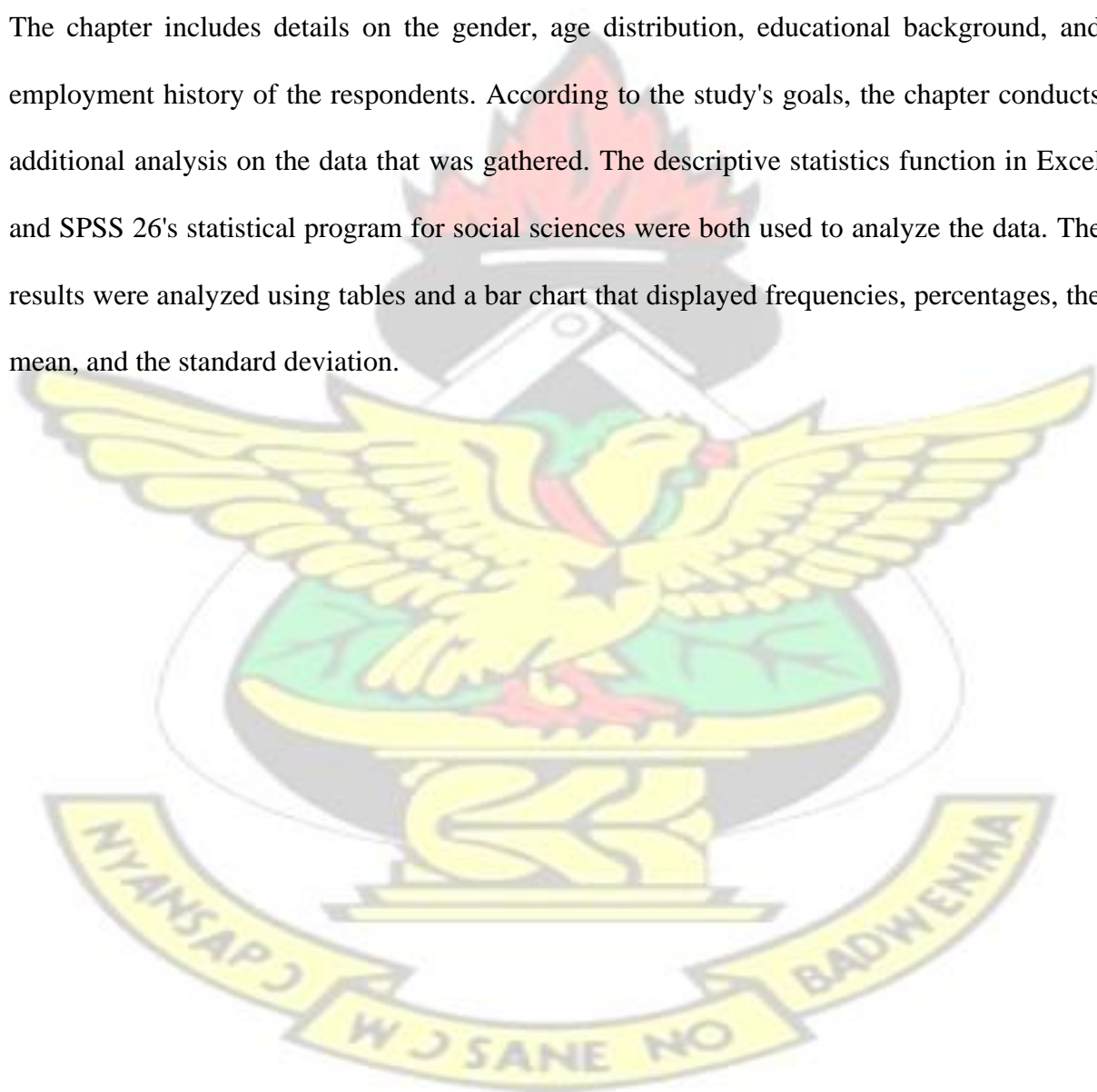
CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATION

5.1 Introduction

The chapter provides information about the respondents' gender, age distribution, educational background, and employment history. In accordance with the study's goals, the chapter conducts additional analysis of the data that was gathered. The data was examined using Excel and SPSS 26, a statistical program for the social sciences. The outcomes were examined using tables and a bar chart containing frequencies, percentages, the mean, and standard deviation.

5.2 Summary

Supply chain experts from manufacturing organizations in Ghana's Western Region took part in the research. Three main goals served as the foundation for the research. In Ghana's Western Region, manufacturing companies face a number of supply chain challenges. The first objective is to identify these challenges. The second objective is to investigate these challenges. The third objective is to determine how these practices' supply chains are affected by digital transformation. The relevant literature was reviewed in Chapter 2. One of them addressed the definition of terms associated with the digital transition. The study objectives served as the foundation for developing the research questions. A questionnaire was developed by the researcher to gather information from respondents. These surveys were distributed to a sample of 100 individuals from 20 manufacturing companies. Each and every one of the 100 participants completed the questionnaires for the analyses, yielding a 100% overall return rate. Interviews were also used to collect information from those respondents who didn't have time to read, and those who needed help understanding the technical jargon received it. Coding and response analysis were carried out using Excel and the statistical program for social sciences (SPSS 26), which includes descriptive statistics. Tables and a bar chart made up of percentages and frequencies were used to assess the results.

5.2.1 Digital Transformation Practices

The study's main goal was to create a list of the various digital transformation strategies used by industrial firms in Ghana's Western Region throughout their supply chains. The Internet of Things (IoT), robotics, virtual reality, predictive analytics, and specialized software were a few of the digital transformation techniques used in Ghanaian industrial firms. The most popular digital transformation strategies, according to the report, were e-sourcing, software, predictive analytic tools, and e-tendering. The internet of things, robots, and virtual reality were used to a lesser extent. The least popular practices were blockchain and cloud computing.

5.2.2 Challenges of Digital Transformation Practices

The second goal was to determine what challenges industrial businesses in Ghana's Western Region encountered when converting to a digital supply chain. The study discovered certain issues with digital transformation in the supply chains of manufacturing businesses in Ghana's Western Region. These issues included an unstable network, a cybersecurity challenge, capital expenses, issues with the company's culture, a lack of a comprehensive digital transformation strategy, a strict regulatory framework, and a lack of knowledge and experience.

5.2.3 Effects of digital transformation practices on performance

The primary goal of the study was to assess how digital transformation strategies affected the effectiveness of the supply chains used by industrial enterprises in Ghana's Western Region. The study found a positive correlation between organizational performance and digital transformation initiatives. The study found that manufacturing organizations perform poorly when no digital transformation strategies are used, but that strategies like software, robots, predictive analysis tools, e-sourcing, and e-tending have a favorable impact on performance.

Digital transformation strategies that expedite assembly and palletization, deliver a precise demand prediction, increase supply chain visibility to narrow performance gaps, and enhance process visualization and product design have an impact on performance.

5.3 Conclusion

The study's findings indicate that the manufacturing businesses in Ghana's Western Region employ a range of digital transformation techniques to raise productivity. A few obstacles were found to be impeding the processes of digital transformation.

The study discovers that using digital transformation systems helps manufacturing companies in accelerating assembly and palletization, providing accurate demand forecasts, improving supply chain visibility to address gaps and improve performance, enhancing process visualization and product design, enhancing asset performance and reliability, achieving accurate lead times, and creating connections between systems and processes to improve collaboration and accelerate innovation

5.4 Recommendation

The following recommendations are offered in light of the study's results and conclusions: Robotics, specific software and tools for predictive analysis, e-sourcing and e-tending, and other technology must be incorporated into Ghanaian industrial businesses since they affect the operation of the business. Manufacturing businesses must also utilize software and predictive analysis tools to improve visibility, track goods and shipments, support scalable operations, better process visualization, and improve product design. They must also utilize e-sourcing and e-tendering in order to expedite and streamline the procurement process and obtain an accurate lead time. They must advance robots, offer precise demand estimates, enhance supply chain visibility to increase efficiency, and fix any gaps in order to hasten assembly and palletization. The companies must either outsource cybersecurity or improve their present cybersecurity

approach, which includes identifying risks and vulnerabilities in third-party applications and implementing patch management. The establishment of an organizational culture that welcomes change rather than rejecting it is the final step, and top management must lead by example in this regard. In order to accomplish this, it is vital to put into place a change management strategy that explains the relevance of the digital transformation to all employees in a straightforward manner.

5.5 Future Research

This study focused on how a pandemic's digital disruption will affect the supply chain. In order to determine how internationalization has changed in connection to digital transformation, the tools employed in this context, and whether the challenges mentioned in the current study have persisted or new ones have emerged, it may be possible to do more research on the post-pandemic study.
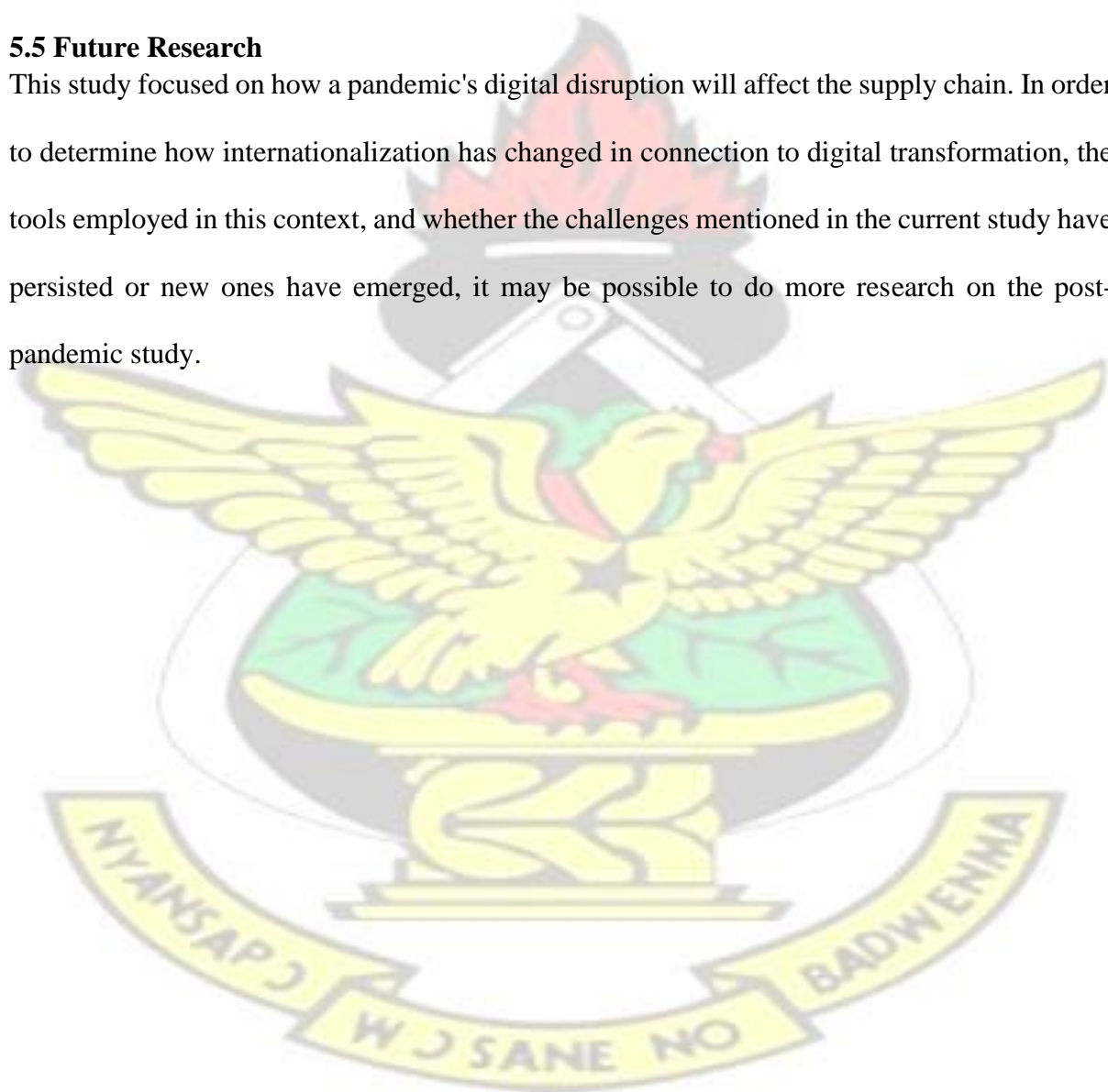
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