KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

EFFECT OF SUPPLY CHAIN DIGITALIZATION ON INTERNAL SUPPLY CHAIN INTEGRATION OF MANUFACTURING FIRMS: A CASE STUDY OF GHACEM LIMITED

By

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DECLARATION

"I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgment is made in the thesis."

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ABSTRACT

Due to global disruptions, technological improvements, the complexity of consumer demand, and the changes in the market, in today's business environment an adaptive supply chain is highly desirable. Integration of supply chain remains a worthy strategy to pursue in that regard. The purpose of this study is to assess the effect of supply chain digitalization on internal supply chain integration of manufacturing firms with focus on Ghacem Limited. The study adopted the cross-sectional quantitative case study research design from 114 administrative staff of Ghacem using purposive sampling technique. The findings revealed positive, moderate relationship between the drivers of supply chain digitalization and internal supply chain integration; negative, moderate relationship between the challenges of supply chain digitalization and internal supply chain integration, a positive, strong correlation between the extent of supply chain digitalization and internal supply chain integration. All the relationships were significant. Furthermore, the drivers and challenges to supply chain digitization revealed both positive and negative associations with the extent of supply chain digitalization. The study concludes and recommends that Ghacem Limited should continue to invest in digitalization of its supply chain to further improve internal supply chain integration. Further studies should be conducted to investigate the impact of digitalization of the supply chain on other aspects of the supply chain such as firm performance, cost, efficiency, and customer satisfaction.

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
DSC	Digital supply chain
IoT	Internet of Things
RBV	Resource Based View
SCI	Supply Chain Integration

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter talks about the background of the study, the statement of problem, research questions and objectives. It also gives the justification of the study, the methodology employed, scope of the study, limitations of the study and finally a brief layout of the study.

1.1 Background of the Study

As a result of global disruptions, technology advancements, overall complexity of customer demand, and industry trends, the modern corporate climate requires more agile and adaptable supply chains. Digitalizing the conventional supply chain is one key differentiator for boosting supply chain management's flexibility and visibility. This is referred to as "digital transformation" (Aamer, Eka Yani, and Alan Priyatna, 2020; Aamer et al., 2021). Ccompanies have already begun investment in digital transformation at a faster pace than they did before COVID-19 outbreaks (McKinsey & Co, 2020). This is the truth despite the fact that the COVID-19 epidemic is still ongoing (LaBerge et al., 2020). The most recent technological innnovations such as artificial intellingenct had an impact on the digitalization of supply chains. This is achieved by providing factual data and openness, which enables exact forecasting of upcoming events and increases the adaptability, sturdiness, and resilience of the supply chain (Bienhaus and Haddud, 2018; Gunasekaran, Subramanian, and Papadopoulos, 2017).

An intelligent best-fit technological system, Digital Supply Chain (DSC) is built on the capacity for massive data disposal and excellent communication and collaboration for digital hardware, software, and networks to sustain and seamlessly integrate interaction between organisations, thereby increasing the value, accessibility, and affordability of services while maintaining their nimbleness and effectiveness (Büyüközkan & Göçer, 2018). As a result of

the disruption caused by digital technology to conventional supply chains, each DSC may have distinct features. These traits are identified by Büyükozkan and Gocer (2018) as swiftness, adaptability, worldwide connection, real-time inventory, intelligence, transparency, scalability, innovation, proactivity, and environmental friendliness (2018).

Internal integration is achieved via the use of cross-functional teams, which can bring together a diverse group of professionals to exchange information and make choices about the development of products, and operations jointly and concurrently (Koufteros, Vonderembse and Jayaram, 2005; Alexander, Anin, and Sarpong, 2016). Internal integration is the process of drawing in distinct functional aspects of the organisation to form a cohesive unit via inter-functional interaction, collaboration, coordination, communication, and cooperation (Flynn et al., 2010; Zhao et al., 2010).

Furthermore, supply chain participants that communicate directly are frequently better equipped to function as an unified force, improve their ability to comprehend the demands of the final consumer, and, as a result, are faster to adapt to market changes (Stein and Sweat, 1998). Good supply chain management requires internal integration (Lambert, Cooper and Pagh, undated). In addition, organisations with a smaller extent of execution will exhibit a lower level of external integration, whilst those that have a high level of implementation will experience the highest levels of external integration (Otchere et al., 2013). Before attempting to generate a greater level of external integration, firms must typically attain a decent amount of internal integration, according to conventional wisdom (Otchere et al., 2013).

1.2 Problem Statement

Scholars (Büyükozkan and Gocer, 2018; Frederico et al., 2019; Sahara, Damar, Elyanto Paluluh, and Aamer, 2019) have noted that despite the increasing attention in the digitalization of the supply chain, the discussion remains in its infancy, necessitating additional research into

the critical success factors of digitalization of the supply chain. While researchers such as Hawes (2016) and Büyükozkan and Gocer (2018) have extolled the advantages of digitalizing the supply chain, others such as Aamer et al. (2021) have outlined the obstacles that digitalizing the supply chain presents. According to Büyükozkan and Gocer (2018), advanced characteristics of supply chain digitization, such as real-time capabilities, the use of information and communications technology (ICT) via multidirectional integration, and seamless connection of technologies, are commercial hurdles. According to Erol et al. (2016), the digitization of the supply chain has improved company performance and increased the economic viability of firms. Ibarra et al. (2018) stated that the lack of agreement on the drivers of supply chain digitization necessitates a comprehensive understanding of the notion.

Studies (Mielli and Bulanda, 2019; Radziwill, 2020; Saldanha, 2019) show that a substantial majority of digital transformation efforts in organisations fail during the execution and upgrading stages, with as much as 70% failing in certain polls. It is crucial to comprehend why certain digital transformation efforts failed during the transformation from the early stages to the comprehensive implementation and scaling phase of the project, therefore the need for this study.

Leaders in charge of supply chain management (SCM) confront substantial obstacles when it comes to integrating supply chain-specific objectives with the entire corporate business plan; as a result, total synchronization is seldom accomplished in reality (Hussain and Nassar, 2010; Otchere et al., 2013). The majority of SCI difficulties stem from uncertainty or a failure to manage the many activities and people involved. Simultaneously, clients have grown more demanding and intelligent, want greater quality, better service, and cheaper prices (Sweeney, 2011). Integration of supply chains has proven to be a tough objective for many businesses (Fawcett & Magnan, 2002). According to studies, unlike other activities a business participates in, there is neither a blueprint for integration nor is there an aggregate measure of whole supply

chain performance against which a firm's performance can be compared to that of its competitors. In addition to complicating issues, the term "supply chain integration" may apply to several diverse concepts, and there are insufficient resources available (Soni and Kodali, 2010).

Unanswered are the niances that exist between the digitalization and supply chain integration for more business success. Supply chain digitalization and supply chain integration has benefits businesses (Bjorkdahl, 2020; Frohlich and Westbrook, 2001; Gimenez, 2006; Lusch et al., 2010), experiements and frameowrks illustrating this relationship remain insufficient.

In their ASEAN study, Tian et al. (2019) reiterated this stance, noting a scarcity of empirical data on the degree to which supply chain digitalization is implemented. Moreover, Büyükozkan and Gocer (2018) argued in their comprehensive study that few studies have been conducted to investigate digitalization's impact on supply chain and suggested that further research be done into the digitalization's impact on supply chain integration (Abdirad & Krishnan, 2020).

This research aims to fill a gap in the existing literature by evaluating the impact of supply chain digitization on Ghacem Limited's internal integration.

1.3 Research Objectives

This research aims to evaluate the impact of supply chain digitalization on the internal supply chain integration of manufacturing enterprises, with a particular emphasis on Ghacem Limited. Specifically, the research aims to:

1. Evaluate the critical drivers for a successful digital implementation at Ghacem.
2. Assess the impact of digitalization of the supply chain on the internal integration of Ghacem.
3. Determine the obstacles to digital supply chain adoption in Ghacem.

1.4 Research Questions

The research aims to address the following issues:

What are the key success factors for digital implementation at Ghacem?

What impact does digitization of the supply chain have on Ghacem's internal integration?

What hurdles does Ghacem face in implementing a digital supply chain?

1.5 Rationale for the Study

The conclusions of this research are significant for a variety of stakeholders, most notably academics and manufacturing sector managers in Ghana.

The academic community may use the study's results as a foundation for future research on digitalization and supply chain integration. The results may serve as the foundation for future academic debate on the topic of digitization of the supply chain in the context of a developing country like Ghana.

Understanding the important success criteria of supply chain digitalization may increase the performance of Ghacem and its supply chain integration for the company's management. In the current era of digitalization, where business success and improved supply chain processes are driven by digitalization, explaining the critical success factors and challenges of adopting and implementing a digital supply chain may assist the managers of Ghacem in increasing the rate of internal integration, which may lead to improved performance.

1.6 Research Methodology

The current study adopted the quantitative research method. Data for the study was collected using structured questionnaire from Ghacem ltd. The study adopted a confidence level of 95% and a margin of error of 5% with a total population of 160 administrative staff of Ghacem. The

total sample size for the study was 114 administrative staff of Ghacem. Adopting the purposive sampling technique data was collected and analyzed using SPSS version 25. Descriptive statistics deployed. Furthermore, the researcher used the spearman rank order correlation to establish effects of supply chain digitalization and supply chain integration.

1.7 Scope of the study

The scope of the study was limited to Ghacem Limited and the administrative employees at the company. The scope of the study was limited to internal integration of Ghanem's supply chain relative to supply chain digitalization in the organization and not other areas of operations of the company.

1.8 Limitations of the research

The present research included some limitations. Due to the COVID-19 epidemic, the researcher conducted the questionnaire using Google Form and shared the URL to the questionnaire with responders. Frequently, the unreliability of the internet hindered the capacity of certain respondents to access the surveys, resulting in delays. In addition, the research was constrained by the problem of secrecy, which discouraged the majority of respondents from completing the questionnaire. However, the researcher informed the participant in writing of the measures that would be followed to guarantee anonymity and confidentiality.

1.9 Organization of the Study

In line with the regulations of the university, the study was organized in five main chapters. Chapter one entails the introductory aspect of the study which includes background to the study, statement of the problem, objectives of the study, research questions, and significance of the study, the research methodology adopted for the study, the scope of the study, limitations and how the thesis is organized. In chapter two, literature is reviewed. The review of literature is centred on thematic areas such as the conceptual review, the theoretical review, empirical

review and the conceptual framework. Empirical studies were reviewed on the nexus between internal supply chain integration and supply chain digitalization . In chapter three, the methodology adopted for the study is further elaborated. The research design, the population of the study, sampling technique and the sample size, data collection method as well as the data analysis methods were all reviewed. In chapter four, the data analysed is presented with tables to further throw more light on the findings. The summary of the findings, recommendations as well as the conclusions were done in chapter five.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter discusses theories and research pertinent to the study's aims. The chapter also examined the conceptual review of the research, in which ideas pertinent to the investigation were examined, as well as the theoretical framework of the study, which examined related theories such the Resource-based perspective and the relational view theory. In addition to examining empirical reviews and research, the study concluded with a discussion of the conceptual framework.

2.1 Conceptual Review

The conceptual review of the research examined the study's terminologies and their relationship to the study.

2.1.1 Digitalization of the supply chain

Legner et al. (2017) stated that digitalization involves transforming analogue signals to digital models, as well as the impact these technologies have on acceptance and functioning. Due to the fact that digitization delivers more benefits to a number of enterprises, it has lately attracted a substantial level of attention from businesses throughout the world. The integration of digital technology across the supply chain enables the use of digital tools for organising and conducting commercial business, transfer of information, and other operations (Sanders and Swink, 2020). Examples of these supply chain digital technologies includes big data analytics (BDA), advanced robotics, 3D printing, sensor-enabled advanced manufacturing solutions, decentralised agent-driven control, advanced tracking, augmented reality, tracing technologies, and other digital technologies (Ivanov et al., 2018). Additive manufacturing and 3D printing allow the fabrication of modules, components, and still-completed elements in a single

dashboard and almost anywhere along the supply chain. (Li et al., 2017). This method has an effect on the structure of the supply chain. For instance, a combined solution built by UPS and SAP allows UPS to 3D-print items directly at distribution centres (UPS, 2018). These digital technology implementations enhance the supply chain's speed, efficiency, and resiliency.

2.1.2 Cyber-physical systems (CPS)

Cyber-physical systems (CPS), according to Hofmann and Rüsch (2017), are digital systems that govern physical processes. According to Hofmann and Rüsch (2017), the physical processes are not only regulated in a unidirectional way but are also connected via feedback loops to the system, which allows the system to adapt. According to Hofmann and Rüsch (2017), flows of data and production are synchronised in real time on the manufacturing shop floor. The integration of interface tools and devices like as sensors, actuators, and communication devices facilitates the execution of these activities (Jansen, 2016). Integrated systems such as MES (Manufacturing Execution System), ERP (Enterprise Resource Planning), and CRM (Customer Relationship Management) are examples of CPS (Kang et al., 2016). CPS is defined similarly to the so-called "Digital Thread," which "enables the collection, transmission, and exchange of data and information across systems throughout the product lifecycle rapidly, reliably, and securely." Some notions of industrial digitalization correspond to the definitions of CPS and "Digital Thread" (Helu, Jr., and Feeney, 2017).

2.1.3 Internet of Things (IoT)

The Internet of Things (IoT) refers to an internet-based technical infrastructure that supports the trade of products and services within a worldwide supply chain network. Internet of Things (IoT) products provide new opportunities in terms of usage, cross-functionality, and greatly increased dependability, amongst many others (Porter and Heppelmann, 2014). However, along with the many opportunities, IoT also poses major risks to the privacy of a company's stakeholders and a threat to the firm's own security (Okano, 2017). Dealing with the threats

presented by digitalization has become a major concern in both academic and business circles (Jansen, 2016).

2.1.4 Internet of services

Web-based services offer new potential for enterprises and individual customers, all of which are easily accessible through online functionalities (Hofmann and Rüsch, 2017). According to Barros and Oberle (2012), the word "service" refers to "a business transaction in which one party offers temporary access to the resources of another party in exchange for the performance of a defined function and the receipt of a connected reward." Human labour and skills, technological systems, information, consumables, land, and other forms of resources might be transferred in this type of transaction. According to Hofmann and Rüsch (2017), Web-based services features serve as the basis for concepts such as Service-Oriented Architecture (SOA), Software as a Service (SaaS), and Business Process Outsourcing (BPO).

2.1.5 Smart factory

According to Hofmann and Rüsch (2017), the Smart Factory is based on the concept of a decentralised production system. According to Kagermann, Wahlster, and Helbig, "humans, machines, and resources are connected as naturally as in a social network" in this system (2013). The CPS, the Internet of Things, and the Internet of Services are combined to build the Smart Factory's base and provide its power. According to Hofmann and Rüsch (2017), the idea of the smart factory highlights the tight interaction of people, commodities, equipment, and logistical systems. According to Hofmann and Rüsch (2017), having visibility and traceability in digitally connected manufacturing processes allows real-time detection of the availability, location, and condition of components, allowing for cost-effective mass customization. The advantages of agility accrue to the standardised industrial supply chain with no increase in costs or hazards (Lee, 2003). The increased complexity of a business's production processes helps the firm regain its controllability and profitability, which in turn helps secure the company's

sustained success over the long term. According to Hofmann and Rüsch (2017), a fully integrated smart factory is capable of realising a substantial portion of its full potential.

2.1.6 Supply chain integration

External integration and internal integration are the two primary forms of supply chain integration (Flynn et al., 2010; Frohlich and Westbrook, 2001; Germain and Iyer, 2006; Leuschner et al., 2013). External integration is the integration of a company's logistical operations with those of its customers and suppliers beyond geographical borders (Stock et al., 1998). The concepts is further described as the divisions and operations inside a factory that are acknowledged as part of an integrated process. External integration, on the other hand, acknowledges the necessity to establish tight, interactive relationships with customers and suppliers (Flynn et al., 2010). Internal integration in logistics and the supply chain refers to the collaboration, coordination, and integration of logistics with other functional areas (Stock et al., 1998). Recent years have witnessed a rise in the amount of study that decisively indicate that internal integration is a precondition for outward integration (Errassaf et al., 2019). (Errassaf et al., 2019). The fact that several studies (Swink and Nair, 2007; Swink and Song, 2007) have only focused on internal integration while disregarding outward integration demonstrates the relevance of internal integration. In his study of the Spanish food sector, Gimenez (2006) showed that enterprises with the greatest degrees of internal integration between logistics, manufacturing, and marketing were also able to attain the highest levels of external integration. This was shown by the organisations' ability to attain the greatest degrees of external integration.

According to the results of a research done by Germain and Iyer (2006) external integration would only affect the performance of a firm if there is no internal integration occurring. Therefore, both theoretical reasoning and practical data support internal integration as the the means by which external customer and supplier integration ar are achieved. This shows that

pursuing internal integration is a successful approach for boosting external integration. This is due to the fact that both conceptual reasoning and practical data support internal integration as the enabling factor for outward customer and supplier integration (Errassaf et al., 2019; Zhao et al., 2011). In other words, the integration of supply chains cannot be successful if there is not a substantial level of internal integration.

2.2 Theoretical Review

2.2.1 Resource Based View (RBV)

Strategic management's overall objective is to strengthen a company's market position by maximising the value of its most valuable resources (Richard, 2000). According to the definition supplied by Boyd et al. (2010) RBV is coordinating the factors that influence customer satisfaction with the company's market standing. One of the basic ideas of the theory is that better corporate performance is built on tools originating from the culture of the organisation and competencies that cannot be readily copied by rivals. (Nwankpa and Roumani, 2016). According to Nath et al. (2010), RBV perceives an organisation as its resources and capabilities. To be more explicit, the RBV method defines in an efficient way how organisations establish and maintain competitive advantages (Lin and Wu, 2014). As a result, the RBV has evolved into a comprehensive and effective theory of sustained exceptional performance in the field of strategic management (Barney and Arikan, 2001).

Several scholars have adopted a resource-based perspective to evaluate the influence of information technology on corporate performance (Rivard et al., 2006; Haseeb et al., 2019; Wu et al., 2006; Zhuang and Lederer, 2006). Due to the characteristics of newly produced technology and the use of resources, the adoption of digital technologies may result in fundamental and paradigm-shifting alterations (Han, 2017). Providing that the RBV demonstrates a direct link between resources and competitive advantage together with a well-explained dependent construct and the strategic importance of individual resources, The RBV,

according to Wiengarten et al. (2012), gives insight on the contentious debate over whether or not IT resources may be employed for long-term performance enhancement. This is because the RBV demonstrates a direct link between resources and competitive advantage.

According to Wu and Chiu (2015), information technology (IT) resources, both tangible and intangible, can be perceived as "valuable, rare, irreplaceable, and non-substitutable" in order to achieve performance superiority; these four characteristics are categorised as the RBV theory's four characteristics. The RBV theory is also considered one of the five pillars of strategic management. On the other hand, Wu et al. (2006) argue that when information technology (IT) is the only thing implemented, it may not meet the RBV criteria because there are relatively low barriers to imitation by other companies, which means that the opportunities associated with IT are likely to diminish relatively quickly.

This dissertation attempts to apply Industry 4.0 to the concept of SCM. On the basis of these considerations, it seems that the examination of Industry 4.0 might contribute to the advancement of SCM, especially SCI, which is organization-specific and difficult to replicate across businesses. Because the Industry 4.0 construct in this dissertation refers to an organization's proficiency in IT exploitation, the RBV serves as the foundation for the development of this construct throughout this study. Sector 4.0, also known as the utilisation of modern technologies achieved via system-based thinking, provides a corporation with a continuing competitive advantage in their industry (Wu et al., 2006).

2.2.2 Relational View

Diverse inter-firm connections may be a source of competitive advantage, which is one of the most compelling arguments for the relational approach (Dyer and Singh, 1998; Chen et al., 2013). If the relational view is added to the RBV, it is possible to achieve a competitive advantage by focusing on dyads and networks of organisations as the fundamental units of

analysis (Wieland and Wallenburg, 2013). Organizations interact in order to uncover abnormal "relational rents," which Dyer and Singh describe as the foundation of the relational perspective (1998). (Fawcett et al., 2015). Notably, relational rents need four characteristics: "relation-specific assets," "knowledge exchange methods," "complementary resources/capabilities," and "effective governance" (Dyer and Singh; He et al., 2013). (Dyer and Singh, 1998; Zacharia et al., 2011); (Dyer and Singh, 1998; Zacharia et al., 2011). Therefore, firms that emphasise collaboration with SC partners may realise greater financial returns than those that adhere to the conventional concept of a competitive advantage (Paulraj et al., 2008). Previous research studied how adding SCs may improve performance management by maximising the use of an organization's resources and skills (Lee et al., 2014; Chen et al., 2013; Prajogo et al., 2016; Sanders et al., 2011). According to Lee et al. (2014, p. 286), information systems are an inter-organizational source and pioneer for integrating SCs. Information systems thus contribute to inter-organizational performance. Chen et al. (2013) investigate the effect of information technology integration inside companies and knowledge sharing with major suppliers on SCP.

According to Prajogo et al. (2016), the integration of supplier and buyer logistics operations gives a competitive advantage to businesses. This source of advantage involves the exchange of information and coordination of action between these two entities. Sanders et al. (2011) hypothesise that information exchange between buyers and suppliers, performance feedback, and investments in inter-organizational IT all play a crucial part in the performance improvement process. As mentioned earlier, an organization's internal and external resources, as well as the links between a company's SC partners, are all tied to the organization's competitive success. This research examines how digitization of supply networks impacts internal supply chain integration using the relational view theory as a theoretical framework. As a result, the present research adopts a relational view to analyse the network interactions in

which organisations are embedded and a resource-based perspective (RBV) to evaluate the superiority of their performance from a resource perspective.

2.3 Empirical Review

2.3.1 The Internal Integration Concept in Supply Chain Integration

Internal integration is defined by Chang et al. (2016) as "the coordination and cooperation of information, procedures, and behaviour inside an organisation." Danese et al. (2013) define "internal integration" as the degree to which distinct divisions within a company may interact. This partnership's objective is to resolve differences and generate acceptable solutions. Departments inside a firm, according to Qi et al. (2017), must operate as part of an integrated system, and corporate structures, as well as the objectives of these firms must work cooperatively and synchronistically to satisfy the expectations of the company's clients (Flynn et al., 2010; Silvestro and Lustrato, 2014). (Flynn et al., 2010; Silvestro and Lustrato, 2014).

Two key aspects that contribute to the internal integration of organisational processes are the exchange of information and collaborative decision-making across departments within an organisation (Chaudhuri et al., 2018; Jajja et al., 2018). Moreover, Birasnav and Bienstock (2019) note that a company's integrated system, which comprises a common information system structure for delivering goods and services, boosts internal production system integration and enhances coordination and cooperation among internal entities. This is shown by the fact that a company's integrated system includes an information system framework for the distribution of products and services among its employees. Academics in the domains of operations and performance management highlight "internal integration" often (Danese and Bortolotti, 2014; Beheshti et al., 2014; Ellinger et al., 2015; Gimenez et al., 2012; Huang et al., 2014). According to Chang et al. (2016) (page 292), internal integration has a much greater impact on corporate performance than external integration. According to Chaudhuri et al.

(2018), page 705, the degree of an organization's internal integration has a significant impact on its flexibility performance. Boonitt and Yew Wong (2011) found a favourable correlation between internal integration and customer delivery performance. According to the findings of the research, there is a correlation between internal integration and delivery performance, and this correlation may be strengthened by the use of information technology to enhance internal integration.

According to Silvestro and Lustrato (2014), a lack of internal integration results in subpar supply chain management effectiveness. Furthermore, research indicates that organisations should emphasise internal integration over external integration. This is due to the fact that internal integration is seen as the basis for supplier and customer integration (Delic et al., 2019; Cagliano et al., 2006; Chang et al., 2016; Sacristán-Daz et al., 2018). According to Sacristan-Daz et al. (2018), "the function of internal integration is crucial for technical and social links via external integration efforts as a result of growing information, financial, and physical flows between partners." According to Cagliano et al. (2006), the primary reason why most firms fail at external integration is a lack of commitment to internal integration.

According to the results of Glenn Richey and colleagues (2009), it is prudent for businesses to investigate organisational obstacles from the inside out, since these obstacles may be instantly remedied. According to the findings of the research, internal planning failure happens when there is a lack of an effective planning process, but external monitoring failure occurs when the external environment is not effectively monitored. According to Zailani and Rajagopal (2005, p. 383), internal functions should be integrated system-to-system, and cross-functional behaviour should be adapted, as opposed to focusing solely on the functions of individual departments within a company; this is also required for the successful operation of supply chain activities. In addition, internal integration simplifies the process of "communication across all corporate divisions by removing functional boundaries" (Kim and Chai, 2016, p. 468).

Consequently, internal integration focuses mostly on integrating a company's consistent operations, procedures, and strategy.

2.3.2 Integration of Supply Chain Components (SCI)

Despite the fact that SCI has been intensively researched over the last two decades, no concessions have been made in terms of concept measurement and operationalization (Alfalla Luque et al., 2015, p. 244). SCI may also be seen as a multidimensional phenomenon due to the fact that past study has analysed the concept in terms of several subcomponents (Liu et al., 2016, p. 14; Chang et al., 2016; Birasnav and Bienstock, 2019). Some academics have broken SCI into three components in order to examine it from a broader perspective: "supply integration," "internal integration," and "customer integration" (Zhao et al., 2015; Beheshti et al., 2014; Ataseven and Nair, 2017; Birasnav and Bienstock, 2019; Jajja et al., 2018; Lotfi et al., 2013). The most successful firms, according to this study, mix their customers, suppliers, and internal operations.

The multimodal nature of SCI, according to Zhao et al. (2015), makes it challenging to determine the relationship between SCI and performance. According to Beheshti et al. (2014), the supply chain strategy should comprise internal integration operations inside the business and a framework for integrating these activities with supply chain partners to achieve substantial integration benefits. According to Ataseven and Nair, internal integration refers to intra-organizational features, while customer integration and supplier integration examine linkages that firms enhance in their upstream and downstream processes (2017). According to Jajja et al., information sharing, shared decision making, and collaboration between partners and internal departments inside enterprises are essential qualities for evaluating effective integration through SCs (2018). However, integration with both suppliers and customers is often considered external integration (Chaudhuri et al., 2018, Danese et al., 2013; Willis 2016).

In order to demonstrate external integration, this dissertation applies similar supplier and customer integration concepts.

Moreover, other writers concentrate only on certain facets of SCI, such as customer integration (Enkel et al., 2005; Piller et al., 2004), supplier integration (Petersen et al., 2005; Das et al., 2006), or both (Petersen et al., 2005; Das et al., 2006). (Zhou et al., 2018; Frohlich and Westbrook, 2001). Using web-based implementation methodologies, Zhou et al. (2018) assess the degree of supplier and customer e-supply chain integration. The assessment also covers "web-based procurement utilisation," "order scheduling and tracking," "inventory planning," and "demand forecasting" for supplier integration, as well as "customer profiling, online order taking, after sales assistance, and demand forecasting" for customer integration. Frohlich and Westbrook (2001) examine the supplier and customer integration practises of 322 manufacturing companies. The five primary integration strategies, known as "arcs of integration," represent "inward, peripheral, supplier, customer, and outward-facing groups." Other studies using diverse methodologies identify the characteristics of SCI (Campbell and Sankaran, 2005; Cagliano et al., 2006; He and Lai, 2012; Kim and Cavusgil, 2009; Tsanos et al., 2014). Campbell and Sankaran (2005) enhance their framework by basing it on enterprises' experiences and perspectives on SCI, and they classify their SCI components as "internal integration," "forward integration," and "reverse integration." On the basis of an organisational structure, their inductive model focuses on numerous internal integration aspects, including backward SC activities and forward SC activities.

Cagliano et al. (2006) concentrate specifically on upstream supply chain dynamics with the aim of integrating production and logistics. Using a lean paradigm, the two key components "integration of information flows and physical flows" were evaluated. He and Lai (2012) examine the impact of operational and strategic supply chain integration on company

performance, taking into consideration the integration strategy and the breadth of external and internal integration.

Kim and Cavusgil (2009) use two components to quantify SCI: "Interfirm Activity Integration (IAI)" and "Interfirm Systems Integration (ISI)". IAI represents the extent to which SC partners engage in collaborative planning and forecasting, while ISI represents the readiness of a company's SC communication system to support interfirm activities. Tsanos et al. (2014) conceive SCI by emphasising two elements: "Information Integration" and "Coordination of Operational Decisions (OPC)". According to their respective definitions, information integration promotes information flows among SC members, while OPC operations include the integration of physical flows among partners.

2.3.3 Factors that motivate supply chain digitization

It is essential to have a thorough understanding of the reasons that inspire manufacturers to adopt digital technologies, since these variables may considerably affect adoption behaviour and consequences (de Vass et al., 2018; Fernando et al., 2018; Hanninen et al., 2018). In addition, businesses must link their actual adoption operations with the drivers so that the results are more closely aligned with their original business goals (Correani et al., 2020). (2018). Gunasekaran and colleagues The rising globalisation of the globe is increasing the complexity of supply networks and generating new operational challenges. Due to the growing complexity of business processes and the rising cost of labour, manual labour is no longer a viable method of production. There is a greater than ever before urge to reduce expenses and increase productivity in procurement, manufacturing, storage, and transportation (Bienhaus and Haddud, 2018; Baruffaldi et al., 2019) Numerous organisations in the industrial sector have conducted research on how to replace inefficient outdated management systems with faster and more precise digital management solutions. These companies have also investigated methods to use the internet of things (IoT) and large amounts of data to enhance lean and agile operations

and supply chain activities. Typically, operational challenges and goals are straightforward to comprehend (Hanninen et al., 2018). Adoption is essentially a bottom-up problem-solving strategy that often involves identifying problems, establishing goals, developing digital solutions, putting them into action, receiving feedback, and making any necessary adjustments. Additionally, strategic orientations have a substantial effect on the adoption of digital technology. Internet companies such as Amazon, Alibaba, and Google were among the first to adopt digital technology-based business methods. This trend continues to exist now (Hanninen et al., 2018). A significant number of manufacturing companies are presently exerting significant effort to incorporate digital strategies into their fundamental business operations. They think that digital technology may lead to both incremental and disruptive innovation (Chavez et al., 2017; Moretto et al., 2017; Ranganathan et al., 2011; Reeves et al., 2011). Others utilise it for future product development (Sgaard et al., 2019; Garcia-Muina et al., 2018). According to the findings of several studies, client expectations are a crucial impetus for manufacturing companies to use digital technology (Soliman and Meade, 2005; Chen et al., 2015; Seethamraju, 2014). There is a growing market need for digitalized goods, techniques, and services across a variety of business types. Consequently, businesses must use digital technology to better meet the requirements of their customers and manage their relationships with those customers (Chen et al., 2015). Numerous businesses use it as a marketing strategy since it helps to portray businesses favourably. Innovative and digital. One organization's digitization efforts have an effect on the other supply chain participants. When one of the significant actors in a supply chain decides to use a particular digital system, the other participants in the supply chain are frequently put under pressure to adapt to the new system (Holmstrom and Partanen, 2014), resulting in a variety of power positions throughout the supply chain. Due to its stronger negotiating leverage, the dominant firm in a supply chain is typically the first to initiate the digitization process. By modifying their supplier selection

criteria, collaboration style, and other practises, they exert pressure on other firms and serve as a model for others to emulate. To prevent extinction, businesses must adapt and respond to digital innovation, maintain close cooperation with the dominant firm, and enhance the whole supply chain (Gunasekaran et al., 2016; D'lppolito et al., 2019). Strong supply chain partners are driving digital innovation, therefore this is the case. Many companies' decisions to embrace digital technologies are driven by a desire to stay at the forefront of technology advancements and to retain a tight relationship with supply chain partners.

Competition is another external factor that may be investigated (Chen et al., 2015; Adamson et al., 2017; Büyükozkan and Gocer, 2018). Adopting digital technology may assist industrial businesses boost their competitiveness, particularly if their rivals are already doing so. According to Chong and Chan (2012), the majority of companies will embrace a digital technology if their rivals are already using it. They feel that this is the direction of the whole industry. Therefore, they have an irrational worry that if they do not do it, they will be overtaken by competition and fall behind.

2.3.4 Digitalization of the supply chain and supply chain internal integration

Moreover, a number of studies suggest that the use of digital technology across the supply chain may be a crucial factor in the rise of integration inside the organisation (Gautr, 2020; Mukhopadhyay & Kekre, 2002). For instance, Srinivasan and colleagues (1994) conducted a field study of the logistical operations at Chrysler Corporation manufacturing facilities. Implementing electronic data exchange (EDI) delivers enormous benefits, as it simplifies the addition of data into the supply chain process and significantly reduces the number of failed shipments. Using enterprise resource planning (ERP) and customer relationship management (CRM) digital transformation technologies, Rai et al. (2006) demonstrated how an IT infrastructure may facilitate the integration of supply chain processes. This results in long-term improvements in the performance of the company.

Gautr (2020) adds that digital innovations are likely able to provide integration across the different departments of a firm (such as material management, planning, and scheduling), guaranteeing that teams advance in unison towards common goals. According to the findings of the research, the use of digital technology enables supply chain integration, resulting in enhanced financial performance. Despite the undeniable significance of digitization in the process of supply chain integration, the actual statistics are confusing. SCI is essential to achieving a competitive edge since the rivalry is increasingly across supply chains and not between individual businesses (Song et al., 2019). The distinguishing characteristics of OCR include activities with continuous information exchange, cooperative operations, and supply chain networks spanning several channels that allow the consolidation of the order fulfilment process (Hubner et al., 2016). Implementing OCR thus requires not only the internal integration of merchants, but also the coordination of activities with other firms participating in the whole supply chain (Cai et al., 2020).

By decreasing functional barriers, the fundamental benefit of internal integration is that it makes it easier for departments across all channels to communicate. This may take the shape of cooperative operations, continuous information exchange, order fulfilment process conflation, integrated inventories, and cross-channel customer management (Chen et al., 2018). To successfully deliver speedy, faultless, adaptable, and efficient omnichannel service, firms must establish a consistent and comprehensive connection with their many suppliers. The term "supplier integration" refers to a strategic partnership in which merchants and suppliers interact on all aspects of manufacturing (such as jointly deciding on inventory levels) (Delic et al., 2019; Song and Song, 2021). Thirdly, retailers are responsible for managing their pull-based supply chains and are required to continually provide consumers with added value (Vishal et al., 2019). Customer integration refers to the process of acquiring information about each individual customer. Improving one's understanding of the needs and behaviours of one's target

market enables one to make better business decisions and boost one's competitiveness (Rodrguez-Torrico et al., 2017; Feyissa et al., 2019). Previous research (Feng and Shanthikumar, 2018; Cole et al., 2019; Yu et al., 2020) has shown a connection between digitalization and the most crucial supply chain management concerns (e.g., information sharing, supply chain cooperation, demand planning). For instance, Feng and Shanthikumar (2018) noticed that manufacturing companies may now get individualised client data via the use of smart devices, enabling them to modify their sales process, product design, and customer service. Few scholars have performed exploratory research into the relationship between digitization and SCI. Shi et al. (2020) and Feyissa et al. (2019) shown, for instance, that digitalization can coordinate complicated activities within a supply chain by fostering enhancements in a company's cooperation and communication abilities, as well as its level of SCI. This was accomplished via digitalization's potential to enhance supply chain intelligence (SCI). Yu et al. (2020), supported by the resource-based approach and organisational capability theory, found that supplier and customer IT systems greatly enhance supplier and customer system and process integration.

2.4 Conceptual framework

The conceptual framework of the study which highlights the relationship between the dependent and independent variables of the study is presented in figure 1 below.

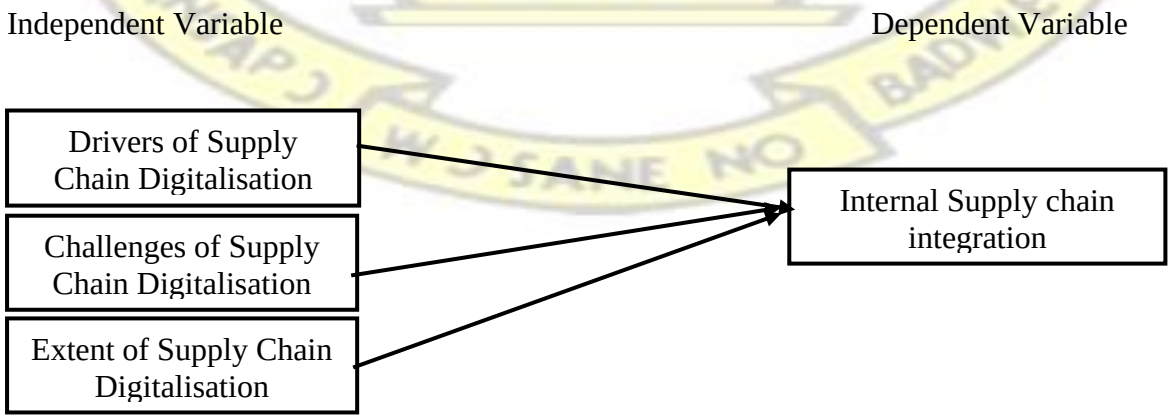

Figure 2.1: Conceptual framework

There a number of research works which show that digitalization is very important in establishing integration in the organization (Gautr, 2020). One of these articles by Srinivasan et al. (1994) discovered that employing andelectronic data interchange (EDI) streamlines the integration of data into the supply chain steps and sharply reduces blunders made during logistical operations. According to research by Rai et al. (2006), implementing data - driven business tools like enterprise resource planning (ERP) and customer relationship management (CRM) into an organization's Information systems architecture facilitates supply chain process integration, that will in turn results in lasting improvements in business achievement. This idea is bolstered by the investigation of Gautr (2020), who notes that innovative tools are thought to allow merging throughout different business operations (such as inventory control, organizing, and timing) to guarantee that groups advance in harmony towards shared objectives. Evidence from these research indicate that implementing digital technologies in the supply chain can help boost company success. While there is little room for doubt about digitalization's significance in the operation of distribution network unification, there is little in the way of hard data to back up that claim. Supply chain automation is thus hypothesised to positively affect internal integration.

CHAPTER THREE

RESEARCH METHODOLOGY AND ORGANISATIONAL PROFILE

3.0 Introduction

According to Collis and Hussey (2016), a researcher's technique encompasses his complete approach to finishing his work. The research objectives are fundamental to the strategy. This chapter focuses on the study's design, the population, and the sample unit. In this chapter, the sample methodology, data collection methodologies, and data analysis process are emphasised prominently. The researcher also describes the methods employed to ensure the validity and reliability of the studies. This chapter addresses ethical considerations as well.

3.1 Research Design

The study used a quantitative cross-sectional case study research approach (Rahi, 2017). It is a case study of Ghacem limited and a cross-sectional research since data were obtained from participants at a single moment in time. The acquired information was examined utilising quantitative methods.

3.2 Research population

Schutt (2011) defined a study population as the set of individuals or other elements to which the findings of a study can be generalized. For the current study, the population is the administrative staff of Ghacem limited which totals 160 at the end of July, 2022 hence the population considered for the study is 160 administrative staff of Ghacem.

3.3 Sample Size and Sampling Techniques

3.3.1 Sampling techniques

The primary importance of sampling for quantitative researchers is to select samples that are representative of the population, a sample size that is representative of the bigger population

and whose findings produce accurate generalization of the entire population. Based on the theory of probability, the study adopts the purposive sampling technique to select the study participants. According to Neuman (2009), the advantages of using purposive sampling in quantitative research are its time and cost efficient and produce accuracy of findings.

3.3.2 Sample size

A sample is a subset of a population (Schutt, 2011). Kothari (2004) postulated that the sample size for a study should not be too large nor too small. Researchers Diamantopoulos & Schlegelmilch 2000; Woldemichael, 2012; Qayyum et al., 2013) postulated that for a quantitative study, the sample size should not be less than 30 participants. The study adopted the Krejcie & Morgan (1970) formula for known population size which is stated as

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

Where:

$n = sample\ size$

$N = Population\ size$

$e = acceptable\ error\ of\ sample\ size$

$\chi^2 = Chi-square\ df = 1\ and\ reliability\ level\ of\ 95\%\ (\chi^2 = 3.841)$

$\rho = population\ proportions\ (assumed\ at\ 0.5)$

Based on the above, the calculated sample size is presented as

$$n = \frac{(3.841)^2(160)(0.5)(1-0.5)}{(0.05)^2(160-1) + (3.841)^2(0.5)(1-0.5)}$$

$n = 114$

To account for non-responses, the researcher added 25 percent to the projected minimum sample size, bringing the total sample size for the study to 114.

3.4 Data Sources and Types

Researchers use two types of data sources while doing research: primary and secondary. The phrase "primary source" is used to refer to any source that is unique. A primary data source is an original data source, which means that the data was acquired directly by the researcher for

a specific study purpose or project (Salkind, 2010). There are several methods for gathering primary information. The most common methods are interviews, self-administered surveys, field, experiments and field observation. Primary data collection is more expensive and time consuming than secondary data collecting. Nevertheless, for some types of research, original data collection may be the only realistic choice. The majority of the data used by the researcher is primary data collected through a standardized questionnaire. The questionnaires were targeted at directors, managers, supervisors and officers in various departments.

3.5 Data Collection Methods

The study relied on the use of structured questionnaire to collect primary data for further analysis. The questionnaire was in five sections. Section A was on the demographic variables of the respondents. Section B to E was on the study objectives. The questionnaire was on a five-point Likert scale with 22 items where 5 means strongly agree and 1 means strongly disagree. The questionnaire was administered to respondents via google forms. The researcher uploaded the questionnaire on google forms and shared the link with the respondents. This was done to easily track responses and also save time on printing and distribution of hard copies.

3.6 Data Analysis Method

Field data was edited, coded and entered into the SPSS version 25 software. The completed questionnaires were edited to ensure consistency and completeness in the responses from the participants. The data was analyzed using simple descriptive statistics and inferential statistics to assess the effect of the supply chain digitalization on internal supply chain integration.

3.7 Validity and Reliability Tests

When substantiated by evidence, validity is the quality of being correct or truthful. Messick (2006) defines research validity as the extent to which empirical evidence and theoretical rationales support the appropriateness of interpretations. In this study, both criterion and

construct validity were used. Criterion validity is established when the study results gained through one measure are equivalent to those obtained from a more direct or previously validated assessment of the same phenomenon. When there are no evident validation criteria, construct validity is used. The factors of the study were obtained from existing knowledge and research.

According to Fraenkel and Wallen (2013), a study is considered accurate if it can be used by a variety of researchers under highly consistent conditions, with predicted findings and predictable outcomes. The dependability of a study over time reflects its consistency and duplicability. According to Fraenkel and Wallen (2013), dependability refers to the absence of measurement errors in a test result. The accuracy of the test decreases as measurement errors grow. Cronbach alpha was used to establish the reliability of the scale, which was modified from Karimi and Rafiee (2014).

3.8 Ethical Implications

According to Leedy and Ormrod (2010), the majority of ethical issues fall into one of four categories: informed consent, secrecy, security, and honesty. All participants were given a concise explanation of why the study was being done, granting them full consent to participate. The researcher maintained the nature and quality of the participants' performance strictly private. There was no data linking respondents to their responses. The participants were not exposed to any additional stress, shame, or loss of self-esteem, and the researcher reported his findings openly and honestly.

3.9 Profile of the case company (Ghacem Ltd)

Ghacem is a Ghana-based cement manufacturing company, which is a subsidiary of the HeidelbergCement Group, a global building materials company. The formation of Ghacem Limited was a watershed moment in Ghana's history. The Government of Ghana and Norcem

AS of Norway established Ghacem on August 30, 1967. Ghacem has manufactured over 30 million tonnes of cement from its very start. The company has a strong focus on internal supply chain integration to ensure efficient and cost-effective production of its cement products. This includes the integration of its raw materials procurement, manufacturing, logistics, and distribution processes.

Currently, Ghacem has a number of accredited Distributors and Direct Customers through-out the country. Periodic meetings are held with these cherished Customers to establish the necessary partnership and a fruitful journey between the two. An awards ceremony is held at the begining of every year to honour these galant Distributors and Direct Customers (Ghacem, 2022).

3.9.1 Structure

Ghacem has mainly 12 departments namely; Shipping and Logistics, Finance, Audit, Commercial, IT, Human Resource, Maintenance, Technical Support, Production, Quality Assurance, EHS and Procurement departments. The various departments are made up of directors, managers, heads of sections, supervisors, officers, contractors and national service personnel.

3.9.2 Products

Ghacem offers four cement brands in the Ghanaian market. Ghacem Extra (42.5N) is an ultra-high-strength material for structural applications involving significant loads. The Ghacem Super Strong (42.5R) is used for precast and block products. The Ghacem Super Rapid (32.5R) is designed for plastering, block laying, and other applications, whilst the Ghacem Super Cool (32.5N) is intended for general masonry uses (Ghacem, 2022).

3.9.3 Corporate Social Responsibility

The economic and social intervention focuses primarily on infrastructure development with a strategic emphasis on health and education, in addition to unique initiatives. Ghacem cement foundation was created in 2002 as the primary engine of Ghacem's corporate social responsibility (CSR) initiatives (Ghacem, 2022).

3.9.4 Ghacem and Digitalization

Ghacem has implemented digitalization in its supply chain in order to increase efficiency, reduce costs and improve customer experience. The company has been able to improve its supply chain management by integrating digital solutions such as the use of digital tools, automation and IoT to improve its supply chain visibility, cost reduction and improve its inventory management.In recent years Ghacem has channeled considerable energy into several digital technologies with the aim of improving work and satisfying customers:

1. A self-serve mobile application has been developed inhouse for customers to be able to remotely order and pay for cement without needing to be physically present at various selling points.

2. Tracking systems available to customers for cement hauled from the plants to various destinations to follow on the delivery and get information on delivery time.

3. An ERP software package provides information on stock levels and replenishment levels.

4. Microsoft SharePoint and Power automate are currently used for inter-departmental liaison to automate manual operations and make work easier and faster.

5. Expert systems are in place to control portions of raw materials in the milling system during manufacturing.

The company has not stopped there, but has continues to advance digitally in operational areas.

CHAPTER FOUR

PRESENTATION OF RESULTS, ANALYSIS AND DISCUSSION

4.0 Introduction

This chapter presents the results of the analysis carried out using Jamovi version 2.2.5. Data was collected from 114 sampled employees in Ghacem ltd. The data was analyzed using the descriptive statistics and Spearman rank correlation.

4.1 Demographic Characteristics

The age, gender, department, level of education, and years of experience of the respondents were assessed. The results of the descriptive statistics in table 4.1 show that the majority of the respondents (44.7%) were between the ages of 20 -30 years. A few of them (5.3%) were between the ages of 51-60 years. This indicates that the administrative staff of Ghacem Limited consisted of fairly younger people. A larger proportion of the respondents (64.9%) were male as well. Most of the respondents worked in shipping and logistics. The next most common departments was IT followed by both Maintenance and Technical support; and Production and Quality Assurance. The least common department was Environment, Health and Safety and Human Resource management. Slightly more than half of the respondents had a bachelor's degree while only 4.4% had Doctorates with a similar proportion having Professional Certificates and the remainder holding Master's Degrees. Almost all the respondents had worked in their fields for at least one month to at most 15 years. Only 5.3% had experience above this range.

Table 4.1 Demographic Characteristics

Age	**Frequency (*n* = 114)**	**Percentage(%)**
20-30 years	51	44.7%
31-40 years	39	34.2%
41-50 years	18	15.8%
51-60 years	6	5.3%
Gender		
Male	74	64.9%
Female	40	35.1%
Department		
Shipping & Logistics	25	22%
Commercial	12	10.5%
Accounts	12	10.5%
Maintenance & Technical Support	15	13.2%
IT	16	14%
Production & Quality Assurance	15	13.2%
EHS & HR	10	8.8%
Procurement	9	7.9%
Highest Level of Education		
First Degree	61	53.5%

Table 4.1 Demographic Characteristics

Masters' Degree	43	37.7%
Doctoral Degree	5	4.4%
Professional Certification Only	5	4.4%
Experience		
0-5 years	51	44.7%
6-10 years	36	31.6%
11-15 years	21	18.4%
16-20 years	4	3.5%
21 years and above	2	1.8%

4.2 Drivers of Supply Chain Digitalization

The respondents were asked to submit how much they agreed to statements seeking to assess their opinions on the drivers of supply chain digitisation. A large proportion of the respondents strongly agreed to the statement, " DSC increases the transparency and traceability of processes at the organization " proving with a mean of 4.62 and a standard deviation of 0.630. ". Only a handful of the respondents admitted neutrality. The item with the least mean is "A common user interface enables the organization to work more efficient and effective," with a mean score of 4.47 and a standard deviation of 0.598.

These findings show that the respondents acknowledge that DSC helps them improve upon transparency and traceability of processes in their companies and that these serve as factors leading to the adaptation of digital technologies.

Table 4.2 Descriptive Statistics

Variable	Min	Max	Mean	Std. D
Digital Supply Chain (DSC) enables the organization to operate with full remote access	3	5	4.57	.638
A common user interface enables the organization to work more efficient and effective	3	5	4.47	.598
DSC tools are helpful for internal and external communication and collaboration	3	5	4.60	.591
DSC increases the transparency and traceability of processes at the organization	3	5	4.62	.630
DSC helps to automate and speed up transactions and processes	2	5	4.59	0.676

4.3 Challenges of Supply Chain Digitalization

Five items were used to determine the challenges of supply chain digitalization. The item with highest mean as indicated in the table below is "Suppliers of the company are not included in the process of digital transformation," with a mean 2.09 and its standard deviation is 1.094. On the other hand, the item with a least mean is "Leadership management within my organization does not support creative freedom for creativity and innovation," with a mean of 1.77 and a standard deviation of 1.227. The results here show that Ghacem Limited's ability to adapt digital systems is relatively streamlined due to the relative lack of infrastructural and company cultural challenges. However further discussions with IT heads in the company revealed that financial constraints and cyber security concerns limited the extent to which digitalization was implemented.

Table 4.3 Descriptive Statistics

Variable	Min	Max	Mean	Std. D
Existing infrastructure in the organization cannot handle digital transformation	1	5	2.03	1.156
Leadership management within my organization does not support creative freedom for creativity and innovation	1	5	1.77	1.227
Suppliers of the company are not included in the process of digital transformation	1	5	2.09	1.094
My organization has uncertainty and fears about supply chain digitalization	1	5	1.79	1.109
My organization does not have a clear digital transformation strategy	1	5	1.87	1.156
Employees in my organization do not have the appropriate capabilities for the digitalization of the company	1	5	1.95	1.204

4.4 Internal Supply Chain Integration

In order to assess the implementation of supply chain integration in the respondents' organizations, they were asked statements that measured the variable. Five items were used to determine the internal supply chain integration. The item with highest mean as indicated in the table below is "My organization has integrated information systems among different departments/channels," with a mean 4.53 and its standard deviation is .731. On the other hand, the item with a least mean is "My organization implements process integration, such as integrated warehousing and distribution," with a mean of 4.34 and a standard deviation of 0.796.

These findings show that Ghacem Limited has been relatively successful in implementing an internal integration of their supply from the perspective of the administrators. This is a relevant finding since it can help understand other metrics the company operates under. Many studies have found relationships between internal supply chain integration and firm performance (Martín-Peña et al., 2019; Martínez-Caro et al., 2020). These findings can provide key insights to future studies on firm performance in Ghacem Limited.

Table 4.4 Descriptive Statistics

Variable	Min	Max	Mean	Std. D
My organization has integrated information systems among different departments/channels	1	5	4.53	.731
My organization shares real-time operational data among departments/channels	1	5	4.40	.828
My organization has developed mechanisms for internal information sharing and confidentiality	1	5	4.46	.766
My organization implements process integration, such as integrated warehousing and distribution	1	5	4.34	.796
My organization creates network of cross-functional teams to corporate decision-making mechanism	1	5	4.46	0.731

4.5 Extent of Supply Chain Digitalization

The final variable of interest was the extent to which the respondent's organization, Ghacem had an integrated internal supply chain. 3 items were used to determine the supply chain digitalizaation. The item with highest mean as indicated in the table below is " My organization has standard operating processes which are modified to include new digital technologies," with a mean 4.53 and its standard deviation is .789. On the other hand, the item with a least mean is "My organization has implemented digital self-serve technologies for employees, business partners, customers to use," with a mean of 4.32 and a standard deviation of 0.944. These findings reflect the relative success that Ghacem has in the integration of their internal supply chain.

Table 4.5 Descriptive Statistics

Variable	Min	Max	Mean	Std. D
My organization has clear digital goals and specific investment for digital strategy in its annual budget	1	5	4.47	.801
My organization has standard operating processes which are modified to include new digital technologies	1	5	4.53	.789
My organization has implemented digital self-serve technologies for employees, business partners, customers to use	1	5	4.32	.944

4.6 Relationship between Supply Chain Digitalisation and Internal Supply Chain Integration

In order to fully achieve the study objectives, the effect of supply chain digitalisation on internal supply chain integration was assessed using spearman's rank correlation. The results of the analyses represented in table 4.6 showed the following relationships between the variables.

Table 4.6 shows a positive, moderate relationship between the Drivers of Supply Digitalisation and Internal Supply Chain Integration, significant at $p<0.001$, a negative, moderate relationship between the Challenges of Supply Chain Digitalisation and Internal Supply Chain Integration, significant at $p<0.001$, and a positive, strong correlation between the Extent of Supply Chain Digitalization and Internal Supply Chain Integration, significant at $p<0.001$.These results show that digitalisation has a positive impact on internal supply chain integration at Ghacem Limited.

The negative relationship between the challenges of supply chain digitalisation and internal supply chain integration is due to the fact that challenges to digitalisation hinder an organisation's ability to successfully adapt digital systems thus limiting their ability to integrate their supply chains (Gupta et al., 2022).

These findings are also consistent with the findings of Liu & Chiu (2021). Liu & Chiu (2021) posit that digitalisation increases the efficiency within supply chains inevitably leading to an internally integrated supply chain. Iddris (2018) also notes from an extensive systematic review that information sharing, which is a key feature of digital supply chains, breaks down barriers between departments leading to successful internal integration.

According to Yang et al. (2021) the desire of an organisation to solve operational problems or further improve processes is a significant driver to digitalisation. This conclusion provides some background for understanding how the drivers of supply chain digitalisation positively

impacted internal supply chain integration. The drivers assessed reflect the motivations of the administrative staff within Ghacem Limited. In theory, these motivations would lead them to adapt digital technologies hence contributing to their successful internal supply chain integration.

In addition to this, the drivers of supply chain digitalisation and the challenges to supply chain digitalisation had positive and negative relationships with the extent of supply chain digitalisation. Yu et al. (2016) findings show that both IT and marketing capacity have a strong beneficial influence on Supply chain integration. Agrawal et al. (2019) also indicated that lack of support from top management, organisational structure, lack of strategic orientation, and lack of digital skills and talent, are barriers to supply chain digitalisation which are consistent with the findings of this study.

4.7 Correlation Analysis

Table 4.6

Variables	DSCD	CSCD	ISCI	SCD
Drivers of Supply Chain Digitalization(DSCD)	1	-.497**	.564**	.520**
Challenges of Supply Chain Digitalization(CSCD)	-.497**	1	-.488**	-.450**
Internal Supply Chain Integration(ISCI)	.564**	-.488**	1	.836**
Supply Chain Digitalization(SCD)	.520**	-.450**	.386**	1

4.8 Validity and Reliability of Scale Items

Table 4.7

Scale	Cronbach's α
Drivers of Supply Chain Digitalisation	0.745
Challenges of Supply Chain Digitalisation	0.928
Internal supply chain integration	0.856
Extent of supply chain digitalisation	0.894

All scales had Cronbach's alpha values above 7.0 which is an indicator of an acceptable level of reliability, or internal consistency, of a set of scale or test items.

4.8 Regression Analysis

Table 4.8 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.839[a]	.703	.695	1.275

a. Predictors: (Constant), Internal Supply Chain Integration, Challenges of Supply Chain Digitalization, Drivers of Supply Chain Digitalization

Table 4.9 ANOVA[a]

Model		Sumof Squares	df	Mean Square	F	Sig.
1	Regression	423.886	3	141.295	86.953	.000[b]
	Residual	178.746	110	1.625		
	Total	602.632	113			

a. Dependent Variable: Supply Chain Digitalization

b. Predictors: (Constant), Internal Supply Chain Integration, Challenges of Supply Chain Digitalization, Drivers of Supply Chain Digitalization

Table 4.10 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.006	1.663		-.605	.547
	Drivers of Supply Chain Digitalization	.061	.069	.058	.879	.381
	Challenges of Supply Chain Digitalization	-.015	.024	-.038	-.601	.549
	Internal Supply Chain Integration	.590	.049	.785	11.943	.000

a. Dependent Variable: Supply Chain Digitalization

From the above tables, it can be seen that drivers of supply chain digitalization has a positive and significant influence on (β= 0.58, p = 0.000). According to this study, challenges of supply chain digitalization has a negative influence on supply chain digitalization(β= -0.38, p = 0.000). Moreover, the relationship between internal supply chain integration and Supply Chain digitalization is positive and significant (β= 0.785, p =0.000). This means that for supply chain digitalization to be improved, firms should pay much attention to drivers of supply chain digitalization and internal supply chain integration.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The last chapter of the study gives a brief on the findings of the study which was carried out based on the stated objectives of the study. The chapter also draws conclusions based on the relevant findings of the study and made recommendations which are significant to academia, industry and policy makers. Recommendations for future studies are also made based on the findings and limitations of the study.

5.1 Summary of findings

Ghacem Limited is a cement production firm in Ghana with a long history of operations. The company has been in business for almost 50 years and has become one of Ghana's most recognisable names in the construction sector. Ghacem Limited has a well-established supply chain network and a great reputation for supplying high-quality products and services to its clients. With the growing interest in supply chain digitization, Ghacem Limited is eager to investigate the possible benefits of digitalization of its supply chain.

The study aimed to investigate the relationship between the drivers of supply chain digitalisation, the challenges of supply chain digitalization, and the extent of supply chain digitalisation as the independent variables and the internal supply chain integration as the dependent variable. The study was conducted by surveying 114 administrative staff at Ghacem Limited and conducting descriptive statistics and spearman's rank correlation. The findings revealed that Ghacem's administrative staff are young executives with sufficient experience. The findings also revealed positive, moderate relationship between the drivers of supply chain digitalisation and internal supply chain integration; negative, moderate relationship between the challenges of supply chain digitalisation and internal supply chain integration, a positive,

strong correlation between the extent of supply chain digitalization and internal supply chain integration. All the relationships were significant. Furthermore, the drivers and challenges to supply chain digitization revealed both positive and negative associations with the extent of supply chain digitalisation.

5.2 Conclusion

These findings show that Ghacem has successfully adapted digital tools and has a well-integrated supply chain. The associations reveal that the digitalisation efforts led to the well-integrated supply chain.

5.3 Recommendation

This section discusses the recommendations that the authors deduced from the findings. Recommedation are made for the management of Ghacem Limited, policy makers and further studies.

5.3.1 Recommendations for case company and policy makers

Ghacem Limited should continue to invest in digitalization of its supply chain to further improve internal supply chain integration. This is due to the rapid rate at which technology in the corporate world evolves. This complacency is not a choice and continuous improvement should be a priority to top management. This is even more necessary when the recent Covid-19 pandemic tested the resilience of supply chains worldwide. Revealing that remote operations and digital tools could still ensure the operation and integration of supply chains.

Policy makers should provide support to organisations in the form of tax incentives, funding and training programs to encourage investment in digitalization of the supply chain.

5.3.2 Recommendations for further studies

Further studies should be conducted to investigate the impact of digitalization of the supply chain on other aspects of the supply chain such as firm performance, cost, efficiency, and customer satisfaction. Further studies can also investigate the moderating or mediating effects of variables such as employee technological capabilities, attitudes to change, and stakeholder management. Finally further case studies on other firms in Ghana can be conducted to further expand the knowledge base. The researcher recommends that to get a comprehensive understanding of supply chain digitalization, the same variables should be expanded to other firms in the manufacturing sector of the country in order to assess the level of supply chain digitalization among manufacturing firms in Ghana.

This study has a flaw in that the respondents can only give the predetermined responses because of the quantitative design used to gather data using a survey tool based on a Likert-style evaluation. Future study can address this shortcoming by incorporating qualitative interviews with a subset of participating groups. Using this method will also help in confirming the accuracy of the findings.

5.4 Implications

This section presents some of the implications the present study's findings have on theory and practice.

5.4.1 Implication to theory

According to Sanchez-Flores (2020), research in developing nations is lacking and has to be further studied in order to fill the gap in the existing literature on digitalization and internal supply chain integration. The findings of this study contribute to theory and also helped in closing the gap in literature on supply chain digitalization in the context of developing economy such as Ghana.

5.4.2 Implication to practice

The introduction of cutting-edge digital tools and apps has altered the way businesses interact with their employees, clients, and vendors. When found in such a situation, businesses should begin making preparations for DSC adoption. They have no choice but to embrace digital technologies immediately because their competitors have already begun integrating them into their supply chains. Businesses that fail to adapt to these shifts in the marketplace today run the risk of being left behind and will have a harder time competing as time goes on. The company's leadership should foster an atmosphere where creativity is prioritised, where there is an attitude of dedication, and where everyone from the top down has a digital mentality. Existing resources should be allotted in a manner that promotes DSC usage, and the scope of the strategy should be sufficiently broad to accommodate the possibilities and demands of digitalization. New knowledge and abilities are needed to fully embrace digitization. It's crucial for businesses to have data scientists and researchers on staff who possess the necessary skills for data collection, cleaning, and analysis. Talented individuals with these abilities are indispensable for the supply chain's digital change.

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APPENDICES

APPENDIX A

QUESTIONNAIRE

Dear respondent,

I kindly seek your indulgence to participate in this academic exercise towards the award of an MSc. Degree in Supply Chain. Your responses will be treated confidentially. Thank you.

SECTION A: DEMOGRAPHICS CHARACTERISTICS

Please select by checking (✓) all that apply.

1.Please indicate your age in years

20-30 years [ ] 31-40 years [ ] 41-50 years [ ] 51-60 years [ ]

2. Please indicate your Gender:

Male [ ] Female [ ]

3. Please indicate your department in this firm

Shipping &Logistics [ ] Commercial [ ] Accounts [ ] Maintenance & Technical Support [ ] IT [ ] Production & Quality Assurance [ ] EHS & HR [ ] Procurement [ ]

4. Please indicate your highest level of education

First Degree [ ] Master's Degree [ ] Doctoral Degree [ ] Professional Certification only []

5. Please indicate your years in experience working with the current organization

0-5 years [ ] 6-10 years [ ] 11-15 years [ ] 16-20 years [ ] 21years and above [ ]

SECTION B: Drivers of Supply Chain Digitalization

This section seeks to assess the drivers of Supply Chain Digitalization in the organization. Please rate your responses with 1 being strongly disagree and 5 being strongly agree

Use a scale of 1-5, **where (1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree and 5=Strongly Agree)**

Drivers of Supply Chain Digitalization	1	2	3	4	5
Digital Supply Chain (DSC) enables the organization to operate with full remote access					
A common user interface enables the organization to work more efficient and effective					
DSC are helpful tools for internal and external communication and collaboration					
DSC increase the transparency and traceability of process at the organization					
DSC helps to automate and speed up transactions and processes					

SECTION C: Challenges of supply chain digitalization

This section seeks to assess the challenges of supply chain digitalization in the organization. Kindly rank your response to the statements where 1= strongly disagree and 5=strongly agree

Use a scale of 1-5, **where (1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree and 5=Strongly Agree)**

Challenges of supply chain digitalization	1	2	3	4	5
Existing infrastructure in the organization cannot handle digital transformation					
Leadership management within my organization does not support creative freedom for creativity and innovation					
Suppliers of the company are not included in the process of digital transformation					
My organization has uncertainty and fears about supply chain digitalization					
My organization does not have a clear digital transformation strategy					
Employees in my organization do not have the appropriate capabilities for the digitalization of the company					

SECTION D: Internal supply chain integration

This section seeks to assess the extent of internal supply chain integration in the organization. Kindly rank your response to the statements where 1= strongly disagree and 5=strongly agree

Use a scale of 1-5, **where (1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree and 5=Strongly Agree)**

Internal Supply Chain Integration	1	2	3	4	5
My organization has integrated information system among different departments/channels					
My organization shares real-time operational data among departments/channels					
My organization has developed mechanisms for internal information sharing and confidentiality					
My organization implement process integration, such as integrated warehousing and distribution					
My organization creates network of cross-functional teams to corporate decision-making mechanism					

SECTION E: Extent of Supply Chain Digitalization

This section seeks to assess the extent of supply chain digitalization in the organization.

Please rate your responses with 1 being strongly disagree and 5 being strongly agree

Use a scale of 1-5, **where (1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree and 5=Strongly Agree)**

Supply Chain Digitalization	1	2	3	4	5
My organization has clear digital goals and specific investment for digital strategy in its annual budget					
My organization has standard operating processes which are modified to include new digital technologies					
My organization has implemented digital self-serve technologies for employees, business partners, customers to use					