

**Supply Chain Collaboration of Ghana's Gold
Mining Industry**

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Dedication

This work is dedicated to my wife Mrs Judith Opongbea Arhin, my daughters, Ewurama Beduwa Arhin and Nana Aba Aduku Arhin, who have stood by me, encouraged, supported, and directly influenced me in achieving this academic height. I am deeply grateful to them, as they were very crucial to the completion of my doctoral studies. I owe them tremendous gratitude as they have been a great source of unflagging inspiration and support in sacrificing a lot for my advancement. But for their support, I would not have completed my academic pursuit with the numerous obstacles I faced. Their inspiration, encouragement and generosity saw me through.

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Abstract

The gold mining industry contributes about 41% of Ghana's export earnings, generating about 14% as tax revenue and a total of 5.5% gross domestic product (GDP). It is essential to salvage the industry's image. Employees of the industry can be laid off and made redundant because the industry's financial position is almost always affected during critical moments. This in most cases result in the holding up of suppliers' payments and operations grinding to a halt due to procurement, logistics and inventory issues. In light of this, an empirical study is being conducted with the aim of identifying the factors of supply chain collaboration in Ghana's mining industry.

Mixed methods were used including a purposive sampling method which was used with survey questionnaires administered on eleven operational mining companies in Ghana. SPSS tool was used in the analysis of data. Semi-structured interviews were conducted at the mines site (company premises) in September 2019 in Ghana. The results identified some factors that affect the collaborative supply chain. These are the pricing of products and service, variable payment systems, open book, the share of company values, and consolidation of orders. Identifying these factors contribute to existing literature which makes this study unique as they have not been discovered in any of the supply chain literature in the context of gold mining. A framework in supply chain collaboration was developed, which is unique to the gold mining sector in Ghana. The result will have managerial implications to drive the gold mining industry's performance forward. Mining organisations will benefit from this study as this can be replicated in other gold mining sectors in Africa and across the globe's mining industry.

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Glossary of Terms and Abbreviations

SCC	Supply chain collaboration
SCM	Supply chain management
ERP	Enterprise resource planning
IT	Information technology
KPI	Key performance indicator
SPSS	Statistical package for the social sciences

CHAPTER 1

INTRODUCTION

1.0 Research background

The need for the study ascends from the fact that gold mining organisations in Ghana are under extreme pressure to change their mode of operation to ensure a sustainable operation. The gold mining industry Ghana is usually characterised by financial challenges during unfavourable gold prices on the world market. The pressure requires corresponding shifts in the mode of operation to ensure the industry attains a competitive edge.

Achieving long-term competitiveness and high operational performance by the mining industry in Ghana, as stated by Kusi-Sarpong *et al.* (2016), has been of great concern; most especially during gold price fluctuations. These pressures require revisions in the modus operandi of the mining supply chain management as it impacts the industry performance as well as the growth of the country's economy. The growth of every economy is based on the effective and efficient management of its supply chain. It is imperative for every economy, most especially the emerging economies, to adopt proper strategies to implement effective supply chain policies to achieve positive growth. According to Ackah *et al* (2014) and Chima (2011), the mining industry combines both international and domestic transportation, ordering and inventory visibility and control, as well as material handling and information technology in achieving a global supply chain. To ensure a collaborative supply chain, it is imperative to explore the possibility of cutting down on unnecessary expenditure, improve operational performance and to add value to the business as well as upholding shareholders'

value. Saruchera and Asante-Darko, (2021) opines that organisations focus on cost reduction strategies by cutting down on unprofitable and excessive expenditures to make their operations profitable.

1.1 Problem statement and motivation

The mining sector plays an important role in the Ghanaian economy as it attracts more than half of all foreign direct investment (FDI). According to Ibrahim (2018) and Akabzaa and Darimani (2001), Ghana's mining sector generates more than one-third of all export revenues. It is the largest tax-paying sector in the country and makes a significant contribution to gross domestic product (GDP) and employment creation. The historical importance of Ghana's mining economic development has been well documented and reflected on its colonial name – The Gold Coast – an economy that was dominated by the gold industry. Ibrahim (2018) and Holweg *et al* (2005) indicate that until recently, the industry has enjoyed sustained growth. However, technological advancement, increasing customer requirements and globalization have turned the story around. According to the Ghana Chamber of mines report (2013), Ghana faces budget deficits and rising debt-to-GDP ratios. The economy suffers from persistent trade and current account deficits, and employment growth has not matched the impressive GDP growth. Kusi-Sarpong *et al.* 2016 argue that mining supply chain has been downplayed as a contributory factor in enhancing performance and growth. There has been continued perception that supply chain has no functional place in the mining industry as it was viewed as merely purchasing and expediting/logistics functions. Contracts had been performed by mining and operational managers who had little or no background in supply

chain. This had led to the mining sector losing huge sums of money, affecting their performance and profitability (Ghana Chamber of Mines report 2013). The Ghana Chamber of Mines report (2013) further states that the mining supply chain has been poorly managed even though it should have formed the basis of its sustenance during the world gold price challenges. This has created a direct and continued impact on supply chain throughout the life cycle of the industry and serves to, by default, limit the percentage of the supply chain potential that is available for exploitation by the mining industry. Despite the obvious potential that such developments could afford for improved performance and capacity building, relatively little has been realised. Across the industry, local suppliers are seldom used, and an indigenous service and supply sector for the mining industry has not developed to any significant extent. Furthermore, despite the advanced capacity of the Ghana mining service sector and continued evidence of world-leading innovation in this sector, Ghana does not appear to be benefitting proportionally from the activities taking place in the field of supply chain.

With the evolution of supply chain management over the years, Hong *et al* (2014) argue that many researchers and professionals are seeking the best solution to assist organisations to sustain their businesses. As mentioned by Ramanathan (2014), the traditional supply chain has been viewed as materials movement rather than information flow. The dynamics of the market and increasingly competitive business environment has changed this twist from the traditional way to adapt to the current changing situation. The attention on a collaborative relationship in the supply chain has necessitated researchers in recent times to explore the concepts and topics relating to supply chain collaboration. According to Igwe *et al* (2016),

this has become necessary because most organisations are now focusing on reducing their cost by cutting down on unprofitable and excessive expenditures to make their operations more profitable. Researchers have highlighted the relevance of supply chain management by investigating the impact of relationships between the actors in the chain. Hudnurkar *et al* (2014); Lehoux *et al* (2014) maintain that supply chain collaboration is one of the essential elements for successful supply chain management as it improves integration and coordination between supply chain processes and ultimately leads to total cost reduction.

According to Whipple and Frankel (2000), understanding the relationship existing between firms within the supply chain is crucial in today's business environment.

Researchers such as Singh *et al* (2017), Cannella *et al* (2011), Lehoux *et al* (2014) and Ramanathan and Gunasekaran (2014) have argued that supply chain collaboration enables companies to enhance their efficiency, enjoy economies of scale, on-time information sharing, better and faster response to changes and cost-sharing. Supply chain collaboration has been perceived as one of the useful tools in achieving an organisation's long-term competitiveness (Min *et al.* 2005; Wiengarten *et al.* 2013). This is because it is believed that effective and efficient collaboration of an organisation's supply chain could help improve performance and increase profitability (Cai *et al.*, 2014) and most importantly the mining industry in Ghana.

The recent passing of the Legislative Instrument (L.I 2173) in Ghana on the Local Content Act (Ackah and Mohammed, 2020) has affirmed the notion that supply chain collaboration is critically needed to sharpen the mining industry in Ghana. Considering the increasing

demand for minerals, Luzzini and Brandon-Jones (2015) maintain that the gold mining industry needs to focus on global networking to find expertise and innovative way of sustaining the industry. For the past century, the mining industry has been used to the same old methods, combining both human and heavy machinery. But a more collaborative effort with effective networking is needed to keep up with the ever-changing business environment and the future needs of the industry.

This study is, therefore motivated by the gap identified between the mining industry and the collaborative effort of supply chain actors as well as the insufficient academic prominence in this area.

1.2 The aim of the research

This research aims to develop a framework for supply chain collaboration in Ghana's gold mining industry. This research differs from previous studies as this focuses on exploring a collaborative relationship with mining organisations and suppliers by establishing empirical linkages between collaborative supply chain and organisational performance. The majority of previous studies focused on collaboration concerning sustainability.

1.3 Objectives of the study

To satisfy the conditions of this research and to answer the critical questions about supply chain collaboration, the following objectives have specifically been highlighted.

1. To develop an understanding of supply chain collaboration in the mining industry.
2. To identify the underpinning theories of supply chain collaboration and its effects on Ghana's mining industry.
3. To identify the factors affecting supply chain collaboration in Ghana's gold mining industry through an in-depth field study.

1.4 Research questions

Determining a specific research problem usually involves raising the questions and how to achieve the research objectives. The following are the research questions and objectives:

RQ1: What is the state of supply chain collaboration in Ghana's mining industry?

The objective of this research question is to develop an understanding of supply chain collaboration in the mining industry.

RQ2: How may supply chain collaboration affect the performance of mining companies in Ghana?

The objective of this research question is to identify the underpinning theories of supply chain collaboration and its effects on Ghana's mining industry.

RQ3: How to improve supply chain collaboration in the Ghana mining sector?

The objective of this question is to identify the factors that affect supply chain collaboration in Ghana's gold mining industry.

1.5 Literature review

A broad evaluation of existing literature applicable to supply chain collaboration was undertaken which placed the research study in context and demonstrating how it builds on previous research. The review considers the history of supply chain collaboration, definitions of various supply chain collaborations, supply chain collaboration in the global industry, supply chain collaboration in Africa, supply chain collaboration in Ghana in other industries and supply chain collaboration in the gold mining industry. This investigation was undertaken to gain understanding into the supply chain collaboration in the Ghana's gold mining industry. The literature was dissected to ensure that the research instruments adopted in the present study were devised to show the theoretical and practical attributes that are considered in the literature.

1.6 Research methodology

A critical review of literature relating to the research topic was undertaken. This informed the selection process for the appropriate methodology for this research. Mixed method was argued to be the suitable approach to offer an in-dept understanding of supply chain collaboration in Ghana's gold mining industry. This was adopted to demonstrate rigour, validity and to reinforce the results and discussions of the study in chapter 4 and chapter 5.

A valid survey questionnaire of 101 were collected and used from the gold mining companies

in Ghana. A total of 6 interviews were conducted with 4 interviews being used for this study because of duplication of responses. These were used to strengthen the survey questionnaires. Additionally, the choice of methodology helped the researcher to understand the phenomenon under study from the respondents' perspective. The methodology was found to be appropriate to provide the data required needed to achieve the aim and objectives and to answer the research questions.

1.7 Significant contribution of the study

This study contributes to the body of knowledge in the field of gold mining supply chain in diverse ways. The significant areas of contribution are:

- The first study of its kind to investigate supply chain collaboration in the context of the gold mining industry in Ghana, which provides the stage for empirical investigations to be conducted in future research.
- The study presents a theoretical perspective that evaluates the theory of supply chain collaboration to offer an understanding of supply chain collaboration in the context of gold mining in Ghana.
- The study contributes to literature by incorporating data from Ghana into the empirical generalisations, where managerial implications are identified with significant contributions made with particular reference to Ghana's gold industry.
- The framework proposed in this study is validated with a justification that offers a good fit to the data. This therefore justifies the contribution to the study this research presents to validate the factors in the model.

Further details of significant contributions are discussed in chapter 6.

1.8 Structure of the Thesis

This thesis comprises six chapters that are structured as follows: Chapter 1 is the introduction. It talks about the background to the research, aims and objectives of the study. Chapter 2 reviews other literature relating to supply chain and supply chain collaboration. Chapter 2 also accounts for supply chain enablers, supply chain collaboration from the global perspective, the African and the Ghanaian contexts as well as the supply chain collaborative framework. Chapter 3 discusses research methods, the methodology espoused and the justification for adopting the method. Chapter 4 discusses the research results with an analysis of the data by SPSS software. Interviews used in complimenting the study will also be addressed in this chapter. Chapter 5 will discuss the results presented in chapter 4. Designed and development of a conceptual framework of the supply chain in the mining industry will be presented. Originality and contribution to knowledge as well as the research gaps and limitation of the study will be discussed. It will also present recommendations for further studies. Chapter 6 will end with a conclusion, highlights of the aims and objectives of the study as well as a summary of the originality of the study.

The next chapter will present literature review for this study.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In a world where supply chain competes with supply chain instead of an organisation against organisation, Muktadir *et al* (2021) and Mentzer *et al* (2001) assert that social supply chain concepts are progressively more crucial to maintain success. According to Habib *et al* (2021) and Ramani and Kumar (2008), the strategic supply chain needs effective processes, robust infrastructure, responsive information systems and collaborative communities to be aligned with the mission of the business.

This study investigates supply chain collaboration with a focus on the mining industry in Ghana. The analysis of supply chain collaboration will seek to offer researchers further insight into the concept and contribute to the body of knowledge linked to supply chain collaboration in the mining industry in Ghana. In line with the argument by Sinkovics and Roath (2004) and Habib *et al* (2021) regarding strategic orientation and high-performance collaborative relationship provides, the author of this research believes that examining supply chain collaboration offers practical value to researchers through the method of increasing the success of supply chain collaboration, identifying the leading factors, successful collaboration and determining organisations' performance success.

This research will seek to focus on existing literature whilst utilising journal articles, investigation and analyses of supply chain collaboration models as well as examining the

gaps to understand the concept of collaboration.

2.1 Supply chain management

The importance of supply chain management has heightened as a result of many organisations accessing different markets to pursue efficiency, increased production, and market share. According to Soosay and Hyland (2015), stiff competition has necessitated supply chain professionals to consider other strategies and approaches to create value for their customers. Soosay and Hyland (2015) further argued that supply chain management has evolved over the years and now operational in a more dynamic environment, characterised by globalisation, rapidly changing advanced technologies and rise in customer sophistication and responsiveness which calls for a more integrative and collaborative approach. Ramanathan (2014) posited that the traditional supply chain had been considered as a movement of materials rather than the flow of information. Market dynamics and increasingly competitive business environment has changed this twist from the traditional way to adapt to the current changing situation. Understanding the relationship existing between firms within the supply chain is crucial in today's business environment. Supply chain relationships have changed from being adversarial to a more collaborative one. It has changed from competitive and optimism in nature to trust and interdependency. According to Whipple and Frankel (2000), this is basically due to the supply chain management concept being popular and the concept being adopted by scholars and professionals. However, Soosay and Hyland (2015) indicated that the attention on the collaborative relationship in the supply chain has heightened in recent years and therefore has necessitated researchers in recent times

to explore the concepts and topics relating to supply chain collaboration. In the light of this, it has become imperative for researchers to highlight the relevance of supply chain management by investigating the impact of relationships between the actors in the chain, hence supply chain collaboration being a topical issue to be considered.

2.2 Definition of supply chain collaboration by various authors

Many authors have shared their views on supply chain collaboration, and it is imperative to detail some of these phenomenal definitions. According to Soosay and Hyland (2015), supply chain collaboration is one of the most widely discussed topics in business environments in recent times. This is because it has been considered as one of the factors that enable organisations to maintain their competitiveness in the market. Singh *et al* (2018) and Barratt (2004) indicated that the subject of collaboration had been extensively discussed by many scholars from different perspectives as a wide and encompassing term that needs a further explanation when positioned in the supply chain context. Horvath (2001) therefore believed that collaboration provides a great advantage for business partners which is seen as the driving force behind every successful supply chain management. Ironically, there seems not to be a generally concerted definition of collaboration, as almost every researcher holds a diverse perspective on the definition.

In his view, Anthony (2000) opined that supply chain collaboration involves two or more companies sharing the responsibility of exchanging common planning, management, execution, and performance measuring information. According to Singh (2018), a company

is said to enjoy collaboration with other companies when management and information among others are shared for their common good.

Supply chain collaboration has also been defined by Soonhong *et al* (2005), as the driving force behind effective supply chain management and maybe the ultimate core capability. Soonhong *et al* (2005) view collaboration as having strong management capabilities by the companies coming together.

As different authors share their diverse views on collaboration, Wang *et al* (2016) state that this would not be enough if other factors such as risk, strategic alliances, and management structures among others are not considered. This definition, however, seems to have some gaps. In view of this, definitions by other authors need to be explored further.

According to Fawcett *et al* (2015) and Ellinger *et al* (2000), collaboration has been defined as the process of creating a competitive advantage through common respect, trust, sharing of information, joint ownership of decisions and collective responsibility for outcomes between buyers and sellers.

Heide (1994) and Ralston *et al* (2017) posited that the resulting effect of collaboration, however, is to achieve a collective goal through a collaborative effort which further affects corporate profitability positively by increasing sales and reducing the cost of operations.

Even though the definitions above seem to focus on the customer with the aim of making profits, it still has not been conclusive on the subject under review.

Duong *et al* (2020) and Bowersox *et al* (2003) argued that collaboration emerges when two

or more firms voluntarily agree to integrate human, financial, and/or technical resources in an effort to create new efficient, effective, or relevant business model.

Crum and Palmatier (2004) noted that supply chain collaboration is characterised as “*cooperative behaviour*” or “*joint decision making*” between companies and represents a willingness versus a requirement, to engage in inter-organisational efforts.

According to Al-Doori (2019) and Finley and Srikanth (2005), collaboration has been defined as diverse entities working together, sharing processes, technologies, and data to maximise value for the whole group and the customers they serve.

Even though these definitions are highlighting the joint efforts by organisations and customers, there is a gap in the definition that needs to be filled. Consequently, other authors’ view on collaboration has to be examined.

Collaboration, as viewed by Kahn *et al* (2006) and Chen *et al* (2017), is a process based on trust, mutual respect, information sharing, joint ownership of decisions and collective responsibility for outcomes. Singh and Power (2009) maintained that collaboration is when multiple supply chain players exchange basic information and have a long-term relationship. Nimmy *et al* (2019) and Simatupang and Sridharan (2005) mentioned that collaboration is the close cooperation among autonomous business partners or units engaging in joint efforts to effectively meet end-customer needs with lower costs.

Similarly, Herczeg *et al* (2018) and Stank *et al* (2003) defined collaboration as a process of decision making among interdependent parties, involving the joint ownership of decisions and collective responsibility for outcomes.

In a different twist, Banchuen *et al* (2019) and Skjoett-Larsen *et al* (2003) viewed collaboration as two or more parties in the supply chain jointly planning a number of promotional activities and working out synchronised forecasts, on the basis of which the production and replenishment processes are determined.

It is evident from the above researchers that supply chain collaboration involves dealing with other partners to achieve greater success for mutual benefits. According to Simatupang and Sridharan (2002), collaboration assists different members in the chain to match up to demand with supply more effectively than individual members. Supply chain collaboration involves multiple organisation or autonomous business organisations that engage in a mutually agreed relationship for their common benefits. Simatupang and Sridharan (2002) mentioned that in order to ensure the success of such a relationship, there must be mutual trust, sharing of critical information, joint decision making, and integrated supply chain process. Clearly, two or more companies joining forces in working together are able to achieve competitive advantage as against individual companies acting alone. Wu *et al* (2018) and Olorunniwo and Li (2010) argued further that supply chain collaboration exists when there is a relationship between independent business entities that are characterised by openness, trustworthiness as the companies share risks, benefits, and costs together. Highlighting further on collaboration, Simatupang and Sridharan (2005) indicated that collaboration is *“the close cooperation among autonomous business partners or units engaging in joint efforts to effectively meet customers’ needs with lower costs”*. As collaboration is interpreted and defined by different authors, the fact remains that supply chain collaboration has an

unlimited and definite definition. In view of this, collaboration is best defined by the parties involved and is determined by what the parties seek to achieve. That notwithstanding, collaboration must be made between two or more organisation with the common purpose of reaping the required benefits.

In view of the above definitions highlighted by different researchers, the researcher of this study defines supply chain collaboration as a partnership formed by supply chain actors to enjoy a common benefit as a result of their engagement. This kind of collaborative partnership comes under the backdrop of adequate information sharing, trust, and constant cooperation. Even though supply chain collaboration is largely seen in the light of financial benefits to partners, however, the benefits gained by the parties far outweigh the financial reward as most of the advantages cannot be quantified. The long-term effect on the collaborative partners is enormous as risks and costs are shared to create a mutual win-win relationship.

2.3 Supply chain collaboration factors

For supply chain collaboration to happen, Wang *et al* (2016) indicated that there are key elements that need to be considered. Strategic alliances, information sharing, process coordination, technology exchange, organisational structure and human resource management are crucial enablers of supply chain collaboration.

Harrison and Van Koek (2008) and Singh *et al* (2018) posit that the aim of supply chain

management is to ensure that business processes are well planned from the raw material suppliers up to the final consumer in ensuring maximisation of consumer value. To ensure that the outstanding performance is achieved within the supply chain, Bowersox *et al* (2007) stated that there needs to be well-coordinated and managed efforts by all members.

No.	Enablers	Definition	Author
1	Information Sharing	The success of an organisation's supply chain will depend on effective communication and how well it is coordinated.	Singh <i>et al</i> (2018)
		Information sharing is a prerequisite for building trust among supply chain members as it helps in binding the chains together.	Cao and Zhang, (2011)
2	Strategic alliance	The ultimate aim of a supply chain is the ability to maintain relational stability.	Wu <i>et al</i> (2014) Wang <i>et al.</i> 2016
3	Technical exchange	Technical exchange is viewed as a powerful enabler in competitive capabilities in achieving supply chain collaboration	Fawcett <i>et al.</i> 2011
4	Organisational structure	To enable supply chain management, an organisation must position itself to take advantage of the benefits of supply chain collaboration.	Simatupang and Sridharan, 2002
5	Human resource management	Human resource management is the practice of managing people in the organisation.	Ou <i>et al</i> 2010
6	Cooperation	This is where collaborative partners share resources based on the pillars of the relationship.	Bidabadi <i>et al</i> 2016
7	Networking	Networking is the process of conceiving and sustaining a wide range of collaborative relationships with supply chain partners.	Barrat, 2004
8	Cultural gap	Organisational culture is where the behaviours and work routines are shaped and determined by the organisation's processes and procedures.	Bidabadi <i>et al</i> 2016
9	Coordination	This is where parallel or variable activities happen at higher levels of the organisation through a continuous flow of information.	Soosey and Hyland, 2016.

Table 2.1 Definition of factors

2.3.1 Explanation of factors of supply chain collaboration

Below presents the explanation of the factors of supply chain collaboration. It shows the viewpoint of other researchers on the factors that are associated with collaborative supply

chain.

2.3.1.1 Information sharing. Supply chain collaboration can thrive when there is visibility, and this could be achieved through effective information flow (Chopra and Sodhi, 2004). According to Raweewan and Ferrell (2018) and Henriott (1999) to build trust among the supply chain members, it ensures proper information flow. As stated by Zhenxin *et al* (2001), this helps in removing mistrusts and lack of confidence among the supply chain. It is, however, a crucial element that binds together the supply chain from end to end.

2.3.1.2 Strategic alliance. Wang *et al* (2016) argue that supply chain involves information flow, material flow and decision flow. These are covered by information management, process management, and strategic management (Strategic alliance, however, requires an effective combination of these variables to achieve supply chain collaboration). According to Tjemkes *et al* (2017) and Spekman and Sawhney (1990), a strategic alliance is viewed as an inter-firm long-term relationship between two or more companies to share resources, knowledge, and other capabilities with the aim of enhancing the competitive positions of each member. It is, however, important to note as mentioned by Lorange and Roos (1991) that that strategic alliances can be used to distribute new technologies, penetrate new markets, and gain greater market share, avoid government controls and to attain knowledge from big industry players.

2.3.1.3 Technical exchange. Despite huge investment in information technology, Kim and Chai (2017) and Fawcett *et al* (2011) posit that firms have failed to achieve the needed improvements required in supply chain performance. However, technical exchange in supply

chain collaboration is viewed as a powerful enabler in competitive capabilities in achieving organisational objectives. Information technology (IT) is a valuable resource but no longer a scarce resource. IT and its supporting resources are now available to organisations. But what makes it a unique enabler of a supplier chain as mentioned by Wu *et al* (2006) is its value creation abilities such as those found in coordinated and collaborative supply chain strategies. According to Richey *et al* (2009) technical exchange has changed supply chain practice and has obtained dramatic performance improvement in the supply chain.

2.3.1.4 Organisational Structure. The structure of an organisation is very crucial as it has an impact on its supply chain. According to Simatupang and Sridharan (2002), supply chain collaboration is differentiated by the structure of the organisation. That is, horizontal, vertical, or lateral. An organisation's ability to collaborate with other supply chain partners will largely depend on its flexibility and how structured it is in order to benefit from the advantages it offers.

2.3.1.5 Human Resource Management. Huo *et al* (2015) and Tracey (2005) viewed supply chain as an integrated business approach based on collaboration, not only does it go across the functional areas of an organisation, but it also goes across all the partners in the chain. Kumar (2003) mentioned that it is based on the collaborative approach that offers supply chain management its human dimension. Barnes and Liao (2012) also indicated that Human resource and supply chain had been treated separately as a field of study even though they are linked in almost all business environments. To ensure the success of supply chain collaboration, Cedeno *et al* (2015) are of the opinion that the human resource dimension

needs to be promoted fully. Many organisations spend lots of resources in developing their supply chain, but more attention and resources must equally be committed to human resource development. According to Ou *et al* (2010), due attention needs to be given to people who manage supply chain operations.

Indeed, the evidence indicates that supply chain collaboration needs to incorporate the enablers, as mentioned in 2.3.1 in order to achieve the required objectives. In this sense, few empirical studies have measured the above as supply chain enablers in achieving operational success of firms, although there are clear indications that these improve the performance of collaboration.

2.3.1.6 Cooperation. According to Bidabadi *et al* (2016), the level of cooperation goes beyond information sharing and interaction among the chain members. Once the members aim at achieving the same goal, resources such as finances, manpower, etc., are shared. The level of cooperation of the network partners can be based on two pillars that are defined in the framework of supply chain collaboration. These are the design and governance of activities in the supply chain, and the formation and maintenance of supply chain interactions.

2.3.1.7 Networking. Bidabadi *et al* (2016) stated that communication and information exchange is key to successful collaboration which benefits the parties involved in the relationship. It is, therefore, important to structure the purpose and form of information sharing process throughout the network. Barabasi (2003); Dorogovtsev and Mendes (2003) also mentioned that collaboration is derived from the common belief that network partners

are able to achieve objectives better together than would have been individually. To improve on performance and achieve the stated objectives, *Fu et al* (2012); Lassen & Vereecke (2012) argue that organisations must work effectively with partners in their supply network. This is because Gimenez and Tachizawa (2012) believe that supply chain is increasingly seen to compete, and the boundary of responsibility goes beyond individual organisations. Therefore Barratt (2004) suggested that organisations are required to conceive, produce, and sustain a wide range of network relationships with partners over a period of time).

2.3.1.8 Cultural gap. Kuada and Soren (2005) mentioned that every organisation has a culture, and the culture determines and shapes the behaviour and work routine. It, therefore, implies that the relationship among partners must take into consideration the cultural differences of the partners. According to Bidabadi *et al* (2016), the content of information sharing and execution must involve the organisational culture, and this must be managed to create value. As mentioned by Fawcett *et al* (2008), many organisations go through difficult times to attain a high level of collaboration due to organisational culture. A high level of managerial fortitude is usually required as culture changes slowly. Sheffi (2005) argued that an organisation's ability to be resilient is based on its culture. Constant information flow, employees' empowerment, knowledgeable management, and calculated risk-taking are some of the key elements that influence an organisation's resilience.

2.3.1.9 Coordination. Planning of parallel or variable activities happens at a higher level where a continuous flow of information happens through the use of information technology. Soosey and Hyland (2016) opined that coordination is critical to the sustenance of supply

collaboration as it requires a higher level of commitment, sharing of information, and trust.

2.4 Types of supply chain collaboration

According to Soosay and Hyland (2015) and Ellram and Cooper (1990), supply chain collaboration is considered a major factor in maintaining a supply chain's competitive position and is deemed an important research topic. It has received increased attention in the field of supply chain management with the number of articles published over the years. Soosay and Hyland (2015) and Ellram and Cooper (1990) indicated that supply chain being inter-organisational and inter-functional, are known to be more effective with coordinated and collaborative efforts among partners. This concept was first highlighted by Ellram and Cooper (1990) as a motivation for successful supply chain management, and, subsequently, there are many researchers exploring diverse perspectives to discern the characteristics, drivers, barriers, and outcomes of collaborative ventures between various supply chain partners. From the research findings published, such as the works of Ellram and Cooper (1990), it is widely accepted today that supply chain collaboration enables superior performance in firms due to the capitalisation of resources, capabilities, processes, and routines residing in partners firms.

As stated by Simatupang and Sridharan (2002), it is, therefore, important to review briefly the several types of supply chain collaboration. Collaboration is differentiated usually by its structure: vertical, horizontal, and lateral. Simatupang and Sridharan (2002) mentioned that vertical collaboration is where two or more companies share resources, performance

information, and responsibilities in order to satisfy relatively similar end customers. Examples of such vertical collaborative companies are manufacturers, distributors, and carriers. Horizontal collaboration is where two or more companies work together in sharing resources and private information. For example, by sharing information regarding joint distribution centres concerning two retailers. Simatupang and Sridharan (2002) further stated that lateral collaboration focuses on achieving more flexibility by way of combining capabilities through vertical and horizontal manners. It is a way of synchronising shippers and multi-organisations in an effective transportation network process. For example, lean logistics and transport dynamics.

According to Kumar and Banerjee (2012), collaboration is based on a mutual objective and is a self-interested process in which firms participate only when they deem the contribution will inure to their benefits and survival. Each member of the chain seeks to achieve individual benefits such as eliminating redundant functions, reducing transactions, achieving lower inventory, increasing responsiveness, and so forth. Nevertheless, Mentzer *et al* (2000) mentioned that the focus of a mutual objective should be on the outcome and experience of joint offers to end customers. Mentzer *et al* (2000) further argued that by sharing their resources and capabilities, chain members could exploit profit-making opportunities that they cannot create alone. According to Sahay and Maini (2002), collaboration is not only a sophisticated form of partnership by supply chain members but also increases an organisation's competitive advantage. It, therefore, requires trust and commitment as well as cooperation and willingness to share risks.

2.5 The scope of supply chain collaboration

A collaborative supply chain on the global scale, as indicated by Min et al (2019) and Mentzer (2001), requires high coordination flow of goods, services, and information as well as finances both internally and across borders of countries. The success of supply chains is dependent on the flow of information, manpower, materials, and capital equipment and how they interact. Manuj and Mentzer (2008) argue that to ensure profit maximisation in a multi-national environment, it is crucial to source products from locations that offer the best competitive prices, which gives the lowest total procurement cost. It is also important to consider locations where the manufacturing and assembling of products are made at the lowest cost, and that could be marketed in potentially high demand locations. Recent events have invariably demonstrated that the global supply chain is affected when there is a mishap. For example, events such as the shortage of carbon dioxide (CO₂) in the UK and the Europe region affected the supply of beer, fizzy drinks, chicken, etc. across Europe. The SARS epidemic, the September 11 terrorist attacks, and the hurricane in recent times have all contributed to the disruptions of supply chain operations globally. Manuj and Mentzer (2008) further state that it is important to consider the risk factors when managing supply chain across countries borders. This is because both the global supply chain and domestic supply chain operations are associated with challenges. It is, therefore, crucial to study and identify the different challenges associated with both in order to contrast the risks faced by the operations with regard to the supply chain objectives.

According to Hise (1995), the aim of every supply chain is to maximise profit. That is, to

locate the balance between productivity and profitability in the movement of goods and other materials across borders in a seamless and timely way. Schmidt and Wilhelm (2000) mention that the global supply chain takes into consideration the differences in culture, political landscape, economic background, and infrastructure as well as the competitive environment. Going further, Schmidt and Wilhelm (2000) state that the global supply chain does not occur without challenges. For instance, economic challenges always seem to be unavoidable. These could be price transfers, taxes, the rate of exchange and rates of duties, as well as inflationary rates that may pose a great challenge. Political challenges could be seen from the view of stable government and the rule of law. All these, as indicated by Schmidt and Wilhelm (2000), have cost implications. Despite the huge successes and gains associated with the global supply chain, there seems to be some level of uncertainties and potential delays. This then calls for effective collaboration, communication, and observation to validate and guarantee its success.

The above issues, as mentioned by Abrahamsson *et al* (2003), call for standard performance measurement that can be implemented to cater for the fluctuations in the currencies in individual countries and the inflation rates. It is then imperative to question why some organisations get involved in global supply chain operations looking at the complex and difficult nature of managing it. In the view of Harland *et al* (2003), it is obvious that the global supply chain offers cheaper access to labour, raw materials, financial opportunities, and a large market for products. Incentives like tax rebates and tax holidays are sometimes offered by different governments to global supply chain organisations to entice new companies into the country. Harland *et al* (2003) go further to state that the global supply

chain tends to offer incentives like transnational capital mobility, movement of people, large outsourcing platform, information, vast option of products and services. Other areas of benefit include taking advantage of economies of location. That is the level of productivity, taxes, and labour costs. The surge in e-business prospects and the rise in information technology are some of the advantages associated with the global supply chain.

Thomson *et al* (2007) argue that the increasingly rapid changes in the business environment, limited resources, and rising organisational interdependence are some of the features that describe the development of supply chain collaboration. Inter-organisational collaboration is the term mainly used by scholars and professionals to refer to the process that can appear as organisations relate with each other to generate a new organisational or social structure. Thomson *et al* (2007) posited that collaboration is evolving as a discrete focus of scholarly research with an extensive range of theoretical perspectives. Even though a wide range of conceptualisation of collaboration add up to the wealth of research, they frequently hinder the thoroughness and cumulativeness. Thomson *et al* (2007) argued that the divergent views held by scholars regarding the meaning of collaboration make it difficult to compare the findings across studies to determine whether what is being measured is indeed collaboration. Supply chain collaboration has been defined in various ways, and they basically fall under two main areas of conceptualisation, that is, the process focus and relationship focus. Sheu *et al* (2006) argued that supply chain collaboration is a business process that has two or more supply chain partners working together for a common objective. In his submission, Horvath (2001) argued that collaboration provides a great advantage for business partners, which is seen as the driving force behind every successful supply chain management. Whilst many

scholars hold different opinions about the definition of supply chain collaboration; some common features are quite evident.

Cao and Zhang (2015) state that over the past decade, organisations have been focusing on opportunities through collaboration outside their organisation with partners in order to remain efficient and responsive to the changing business environment. Sheu *et al* 2006; Cao and Zhang (2015) mentioned that organisations such as Hewlett-Packard, IBM, Dell, and Procter & Gamble entered into a long-term collaborative relationship with their partners and suppliers to reduce their cost of transactions in order to achieve greater competitive advantage. Cao and Zhang (2015) stated that collaborative relationships help organisations to share risks, access resources, reduce transaction costs, improve their profit share and gain a competitive advantage. In their argument, Matopoulos *et al* (2007) indicated that the performance of an organisation's supply chain hinges on its collaborative efforts with network partners. Gunasekaran *et al* (2001) mentioned further that researchers have argued for the need for collaboration due to the extensive benefit it offers. According to Min *et al* (2005), positive collaboration outcome includes enhancement to efficiency, effectiveness, and positioning of the markets for the supply chain partners. Matopoulos *et al* (2007) postulated that organisations need to remain competitive and stay in business through effective collaboration, stressing the need for long-term relationships with supply chain partners. Even though other supply chain initiatives still remain operational and effectively being explored by organisations, Ireland and Crum (2005) are of the view that supply chain collaboration still remains a crucial element in the effective performance of organisations. The ever-changing needs of customers and the increasing global demands of the supply chain

have necessitated researchers to consider collaboration as a crucial tool to turn attention to. Kumar and Banerjee (2012) noted that collaboration is usually built on mutual objectives. It is a self-interested process where companies partake when it is deemed to be beneficial to their survival. According to Kumar and Banerjee (2012), the companies seek to attain their individual welfare, such as removing redundant functions, decreasing transactions, achieving lower inventory levels, and increasing responsiveness, among others. However, Simatupang and Sridharan (2002) believe that the mutual objective of the collaboration should aim at satisfying the end customer through their joint offers. Members of the chain are able to exploit profit-making prospects that would have been impossible individually by sharing their resources and capabilities. Mentzer *et al* (2000) pointed out that collaboration is not only a sophisticated form of partnership by supply chain members but also increases an organisation's competitive advantage. It, therefore, requires trust and commitment as well as cooperation and willingness to share risks.

According to Frankel *et al* (2002) though several researchers have indicated their opinions regarding the subject area, however, there still remain gaps that need to be filled. In the attempt to explain the "how" and "why" of supply chain collaboration, a critical study was made on the efficiency consumer response (ECR) regarding the grocery industry. Whilst the researchers believed that ECR might not have had a positive impact on grocery retailers as it would have been envisaged, one great benefit was derived through the development of supplier and retailer relationships. Frankel *et al* (2002) further mentioned that qualitative studies regarding ECR and collaboration were conducted on fifteen organisations. It turned out that five success factors of collaboration came to the fore. These were sharing of

information, suitable measures and incentives, common aims and objectives, knowing the businesses of other actors in the chain, and readiness to innovate and transform. Simatupang and Sridharan (2005) also argued through their conceptual piece that collaboration must involve the sharing of information and synchronisation of decisions as well as aligning incentives among the supply chain partners. In a qualitative interview conducted by Min *et al* (2005), six supply chain collaboration antecedents were identified. Namely, strategic intent, internal alignments, relationship orientation, relationship-specific investment, the flow of information, and intense communication. According to Fawcett *et al* (2008), seven groups of antecedents to supply chain collaboration were identified through their literature review and qualitative interviews. These are management of people and development, measurement of supply chain performance, management of relationships and building of trust, rationalisation and simplification, role definition and supply chain mapping, management commitment and sharing of information, and integration of the system.

As mentioned by Lavie, 2006; Cao and Zhang (2011) current research study present a new viewpoint to supply chain collaboration's relationship with organisational performance. That is, the prevailing effects of collaborative advantages. They argued that collaborative advantages are defined as the strategic and operational improvements gained over competitors through supply chain partnerships.

2.6 Collaboration in the global economies

Collaborative supply chain on the global scale, as described by Mentzer (2001), requires high coordination flow of goods, services, and information as well as finances both internally and across borders of countries. The success of supply chains is dependent on the flow of information, manpower, materials, and capital equipment and how they interact. Manuj and Mentzer (2008) argue that to ensure profit maximisation in a multi-national environment, it is crucial to source products from locations that offer the best competitive prices, which gives the lowest total procurement cost. It is also important to consider locations where the manufacturing and assembling of products are made at the lowest cost, and that could be marketed in potentially high demand locations. Recent events have invariably demonstrated that the global supply chain is affected when there is a mishap. For example, events such as the shortage of carbon dioxide (CO₂) in the UK and the Europe region affected the supply of beer, fizzy drinks, chicken, etc. across Europe. The SARS epidemic, the September 11 terrorist attacks, and the hurricane in recent times have all contributed to the disruptions of supply chain operations globally. Manuj and Mentzer (2008) further state that it is important to consider the risk factors when managing supply chains across countries borders. This is because both the global supply chain and domestic supply chain operations are associated with challenges. It is, therefore, crucial to study and identify the different challenges associated with both in order to contrast the risks faced by the operations with regard to the supply chain objectives.

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profit. That is, to locate the balance between productivity and profitability in the movement of goods and other materials across borders in a seamless and timely way. Schmidt and Wilhelm (2000) mention that the global supply chain takes into consideration the differences in culture, political landscape, economic background, and infrastructure as well as the competitive environment. Going further, Schmidt and Wilhelm (2000) state that the global supply chain does not occur without challenges. For instance, economic challenges always seem to be unavoidable. These could be price transfers, taxes, the rate of exchange and duties rates, as well as inflationary rates that may pose a great challenge. Political challenges could be seen from the view of stable government and the rule of law. All these, as indicated by Schmidt and Wilhelm (2000), have cost implications. Despite the huge successes and gains associated with the global supply chain, there seems to be some level of uncertainties and potential delays. This then calls for effective collaboration, communication, and observation to validate and guarantee its success.

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chain tends to offer incentives like transnational capital mobility, movement of people, large outsourcing platform, information, vast option of products and services. Other areas of benefit include taking advantage of economies of location. That is the level of productivity, taxes, and labour costs. The surge in e-business prospects and the rise in information technology are some of the advantages associated with the global supply chain.

2.7 Collaboration in the developing economies

Deans *et al* (2018) and Bayliss *et al.* (2004) indicated that one of the critical backbones of many developing economies in the construction industry. The industry has a huge impact on society as the activities of the industry have a direct impact on almost everybody. According to Bidabadi *et al* (2016), the Irani construction industry has greatly been affected by collaboration through supply chain partners. This has been in the area of three main factors. That is, managerial, financial, and structural. Bidabadi *et al* (2016) stated that even though the application of collaboration is still in its inception stages, the success chalked so far has been tremendous. Aviv (2007) argued that collaboration has helped in effective forecasting to achieve forecast accuracy, reducing excessive inventory and the removal of the bullwhip effect. In their study, Bidabadi *et al* (2016) observed that activities that used to be performed at company levels previously have now been handed over to the supply chain. For example, supply and demand planning, procurement, and logistics, warehousing and inventory control, delivery, and customer care used to be handled outside the supply chain. Bidabadi *et al* (2016) further indicated that the construction industry had developed a hierarchical structure

that seeks to incorporate clients, general contractors, subcontractors, suppliers, and consumers. This structure had been designed to ensure the information flow from the top to the bottom. The design was put in place due to the fragmented nature of construction, communication, and coordination issues that used to grapple the industry in the recent past in its performance and productivity. In their study, Bidabadi *et al* (2016) used a hybrid multiple-criteria decision model that was grounded on 'analytical hierarchy process (AHP) and fuzzy technique to prioritise effective factors and positive results.' In achieving their results, fuzzy-AHP questionnaires were designed and presented to 36 experts in the construction supply chain.

According to Vessal (2009), the key elements used in collaboration in the Iranian construction industry are called joint venture, consortia, and other aspects of joint production, among others. Even though the collaborative concept is still in its foundation stage, great milestones have been made due to the approach adopted through the supply chain.

One other industry that has successfully implemented supply chain collaboration is the brewery industry in Nigeria. In their research, Igwe *et al* (2016) indicated that on-time delivery brought to the fore the contributions of supply chain partners in ensuring the effectiveness of supply chain collaboration. According to the empirical study explored by Igwe *et al* (2016), it was observed that the dimensions of supply chain collaboration and business performance within the brewery industry in Nigeria are thriving due to some factors. Information sharing was identified as a positive impact on the success of supply chain collaboration in the brewery industry. The gaps identified in the study was that there was

limited research done on collaboration based on the four main empirical constructs. That is, information sharing, dedicated investment, decision synchronisation, and incentive alignment. The study was based on the southern sector of the country, which did not form a better representation of the totality of the population used for the study in the brewery industry. Igwe *et al* (2016) further observed that the study was also restricted to the downstream supply chain and limited to the vertical supply chain without focusing on the horizontal supply chain as well.

Jones and Abernathy (2012) argue that one successful collaboration story is that of Dale-Tile (tile manufacturing company), Whirlpool (manufactures of home goods), and Transplace (a third-party logistics company). Dale-Tile needed to ship tiles from Mexico to the United States of America and was unable to do so without the help of Transplace. Transplace, as a shipping company, identified Whirlpool as a collaborative partner that was also shipping home goods to the same destination to have their goods consolidated with Dale-Tile. The benefit of combining weight and space was utilised in this instance. Whirlpool had a relatively low weight freight and could utilise a weight of about 20% in a full trailer container. Jones and Abernathy (2012) further indicated that this was largely due to the bulky nature of their appliances. With the collaborative partnership, Dale-tile took advantage of the 80% weight with their tiles. Transplace brought these two companies together, and this drastically reduced the cost of both companies as well as reducing the environmental impact. Dal-Tile and Whirlpool have seen a reduction of about 20-30% in their processes and resource costs. Whilst the above demonstrates a positive collaborative outcome, it must be noted, however, that not all collaborative partnerships are successful and positive. According to Sabath and

Fontanella (2002), there have been barriers to supply chain collaboration due to over-dependence on technology, customer/partners being treated in the same way, and lack of trust among partners.

2.8 Collaboration in other industries in Ghana

Even though supply chain collaboration has become a necessary evil in today's business environment, limited research study has been conducted in Ghana regarding collaboration in other industries. This section will focus on the few research studies that have been conducted in Ghana.

Winston *et al* (2020) evaluated supply chain collaboration among manager relating to how conflicts are handled in Ghana. In their study, they sought to identify the impact of conflict on collaborative relationships among supply chains. Their results led to support the theoretical proposition by Kumar and Nti (1988) that top level managers responses to conflict vary in terms of their assessed judgements about favourable processes and fairness of outcomes as predicted by the process and outcome discrepancy model. The research study focused in general how managers handle conflicts in relationships and is limited in scope as it does not relate to the gold mining industry in Ghana.

In their research, Asamoah *et al* (2011) sought to examine the pharmaceutical supply chain for artemisinin-based combination therapies (ACT) in Ghana. This is one of the drugs used in the treatment of malaria sickness. The study seeks to identify the network interactions

among the supply chain actors who are engaged in various activities to ensure the satisfaction of the final consumer. According to Omta *et al* (2001), an organisation forms a strategic alliance with network partners in order to satisfy the needs of its customers. Many researchers have stressed the network nature of supply chain management and recommended the analytical integration of supply chain management and the theory of networks. As a pharmaceutical industry, collaboration is the key to ensuring that essential drugs get to the right people at the right time. According to Asamoah *et al* (2011), supply chain collaboration is a sequence of events that includes procurement, manufacturing, distribution, waste management, together with transportation storage, and information sharing to ensure that customers' needs are satisfied at a profit. In other words, supply chain collaboration involves activities of upstream and downstream linkages in different processes that produce value in the form of products and services. The result of this study indicated that the actors in the collaborative relationship contributed to the success of drug delivery to the consumer. Asamoah *et al* (2011) indicate that collaborative networks showed a strong indication of actor interdependence and long-term relationships. However, it was established that one key enabler, that is, information technology, was found to be absent, leading to delays and interruptions in the supply chain network. Disruptions were found to be the key damaging factor to the chain as delays were also found to be happening more regularly.

Even though the study conducted by Asamoah *et al* (2011) contributes to the body of knowledge regarding supply chain collaboration in Ghana, it is limited in scope as it failed to address collaborative relationships in the gold mining industry of Ghana.

In a related research study conducted by Kuada and Sorensen (2005), the authors argue that inter-firm collaboration was rife and common between firms in industrialised and developing countries. The focus of their study was to assess the collaborative efforts of small firms in developing countries with that of bigger firms in industrialised countries. Further study by Kuada and Soren (2005) indicate that donor countries have a major role to play in nurturing and supporting relationships between organisations in developed and developing countries. The prospective partners stand to benefit from collaboration with each other. In their view, the motive for collaboration is basically economic, which includes the minimisation of costs and risks to augment competitive advantage as well as acquiring technical or technological skills from partners. In the case of cross-national collaborations, further reasons such as local market accessibility and knowledge, government requirements in terms of local business ownership, and gaining political advantage may be the underlying reasons for their formation.

The acquisition of technology and sharing of relevant information involves close collaboration between the partners. The motives for collaboration can be explained from a theoretical perspective. From a transactions-costs perspective, a collaboration by inter-firm is more justifiable economically when the cost involved is lower than what firms incur through market transactions. The possible cost of collaboration may include those that are associated with asymmetric information, neglect of partners in performing their activities, or utter deception and irresponsibility (Kuada and Soren, 2005). Scholars basing their argument on the resource-based view of organisations maintain that competitive organisations are constantly looking for resources to sustain and maintain their competitive urge. They

construct their 'dynamic capabilities' according to Eisenhardt and Martin (2000), by obtaining entry to the competencies in other organisations through collaboration and making sure that their own resources are concentrated on their core activities.

From the studies so far reported, researchers have only focused on collaboration in various industries, such as the agriculture sector, cocoa sector, transport, fishery, wood, and furniture, and the pharmaceutical as well as the food and beverage industries.

Unfortunately, however, the research studies conducted in Ghana so far have not covered the gold mining sector. This leaves the gold mining sector limited in literature regarding supply chain collaboration.

2.9 Collaboration in Ghana's gold mining industry

Considering the increasing demand for minerals, the gold mining industry needs to focus on global networking to find expertise and innovative way of sustaining the industry. For the past century, the mining industry has been used to the same old methods, combining both human and heavy machinery. But a more collaborative effort with effective networking is needed to keep up with the ever-changing business environment and the future needs of the industry.

Over the years, researchers have increasingly paid attention to collaboration in other sectors of the economy in Ghana. However, limited work has been done on supply chain

collaboration in the context of Ghana's mining industry.

Research studies conducted in line with supply chain collaboration in Ghana have been on small and medium size enterprises (Adomako, 2020). This sought to evaluate business and their performance in relation to supply chain collaboration. While other researchers such as Acquah *et al* (2021) examined the connection between culture and collaborative supply chain, Yamoah *et al.* (2020); Singh *et al* (2018); Dadzie *et al* (2015), directed their studies on different sectors of the economy; a departure from the gold mining sector.

The purpose of this study is to investigate the gap in the collaborative supply chain in the mining industry, to unearth the factors affecting collaboration in the mining sector and lay bare the results and recommendations. It is hoped that the outcome of this study will contribute immensely to the body of knowledge and theoretical perspective. It is also important to note that there will be a managerial implication associated with this study.

According to Baba *et al* (2021); Otchere *et al* (2013) and Mentzer *et al* (2000), organisation management stands to benefit from this study due to the visibility of the nature of relationship within the supply chain. Other areas of benefit to organisation management could be improved service delivery, reduced cycle times, increased information sharing, and turn attention to core competencies as well as taking competitive advantage of other supply chains.

2.10 Theoretical Approach

According to Hunt (1991), a theory is very crucial in advancing scientific understanding by forming a structure where phenomena can be predicted and explained. In ensuring that supply chain collaboration has made academic progress and can be measured as a matured discipline, Kuhn (1962) suggests that theory has to be propounded and developed.

This section of the research therefore provides a conceptual framework to aid in further investigation. The main aim is to develop a research tool that will help in realising a critical understanding of what is happening in Ghana's mining industry. According to Woodside *et al* (2005), this will offer researchers the opportunity to understand the meaning of the occurrence of relational strategies and the changes that happen in the industry.

2.10.1 Transaction Cost Economics

In the study of Barney (1991), Knudsen (2003); Park *et al* (2004); Verwaal and Hesselmanns (2004); Saeed *et al* (2005), it was observed that extant literature has come out with different perspectives in explaining supply chain collaboration. Some researchers have applied technical and economic perspectives, such as the theory of transaction cost and the resource-based theory. Their argument is that supply chain collaboration reduces the cost of transactions and needs asset-specific investment, which raises costs and commits partners. Therefore, Cao and Zhang (2012) observe that supply chain collaboration can decrease doubt and opportunism and lead to efficiency in the process and creates a competitive advantage. These two theories not only do inform diverse decisions, but they do also as well expound on the drivers of collaboration and integration.

Cao and Zhang (2011) further intimate that collaborative relationships enable organisations to share the risk, take advantage of complimentary capabilities and venture into new capabilities as well as taking advantage of potential ventures over competitors. Whilst supply chain collaboration is a multi-organisational venture, Ellram *et al* (2008) note that the organisation's decision to enter into such a venture must come with a high level of consensus. Based on this standpoint, the current study identifies its theoretical foundation on transaction cost economics (TCE) and relational view of inter-organisational exchange. The TCE, which is mostly associated with Williamson (1973) and according to Leiblein (2003) it has been one of the main theories used in analysing transaction risks and related contractual solutions. Williamson (1973) noted that the transaction cost economies (TCE) are a theoretical framework based on an organisation's decision to make a product, component, or service internally as against procuring that product, component, or service externally on the market. Transaction governance range has been identified through further study with market exchanges and vertical integration that represents two ends of the governance range. According to Nyaga *et al* (2010), this conceptualization makes way for a hybrid governance mechanism that permits extended relationships between organisations. The hybrid mechanism limits the cost of transactions and rigorously engages the chain partners and decreasing the cost of vertical integration. In their viewpoint, Cao and Zhang (2011) mention that collaboration enables organisations to reduce their costs through the integration process and relational factors whilst at the same time dodging internalizing activities that are outside the organisation's core competencies. Fawcett *et al* (2008) argue that organisations collaborate with each other because of the potential benefits and cost reduction they can have

over other economic alternatives. This is because of the capabilities assessed, the certainty of gaining resources due to the relationship, and the possibility of generating operational efficiencies. As supply chain collaboration has the potential to assist organisations to reduce their operational cost and improve performance, it is, therefore, logical for organisations to pursue this concept due to its positive impact. However, in their argument, Swink *et al* (2007) intimate that as with many other strategies, once the collaboration decision is made, the organisation needs to ensure that the benefits are enjoyed through concerted efforts by the partners. There are several contributions made in support of TCE. One is the attention TCE draws to high-performance economies as a result of contract diversity.

According to Wacker *et al* (2016), the TCE framework is good for inter-organisational exchange and outsourcing decisions in the mining industry. It is a framework that can assist the mining industry in determining which activities need to be kept in-house and which needs to be outsourced. Wacker *et al* (2016) observed that the TCE framework focuses on supplier governance mechanisms in order to satisfy contractual requirements and protect opportunism for their outsourcing undertakings. The mining industry relies on processes that integrate and maintain an established relationship with external partners in order to achieve its objective. Whilst some researchers view the TCE as an empirical success, others think differently. Williamson (1996) argues that the TCE is only applicable to most decision-making processes in an organisation when applied but has the tendency to unfavourably affect the organisation's performance. Like the mining industry in Ghana, decisions are basically taken with directors, shareholders, local communities, suppliers, and stakeholders in mind. Applying the TCE framework may be ideal based on the large scale of the industry.

According to Peteraf and Barney (2003); Ketokivi and Schroeder (2004), the financial performance of the mining industry is very crucial to the survival of the industry as well as its competitiveness. Many scholars such as Li *et al* (2014) have argued that initiatives such as collaborative planning, integration, and sharing of information contribute to the success of organisational partnerships. The advantage of utilizing the TCE is to leverage the mining industry's resources for competitive advantage and its financial performance. The supplier relationship to the mining industry is crucial as the survival of the industry hinges on the supplier partnership. Supplier management is important because component parts and spares are key drivers of the industry. Hence, to achieve a competitive advantage, good management of the supplier relationships must be upheld. Jiang *et al* (2007) observed that the mining industry's performance depends on the management of buyer-supplier relationships. Many scholars such as Wang and Wei (2007); Monczka *et al* (2011) have argued that buyer-supplier relationship success is based on two main areas. First, the chain partners can build a collaborative relationship in order to attain a competitive advantage by experiencing the lower cost of the transaction. Second, the partnership will allow the members to attain relationship-specific investments, prevent opportunistic activities, sharing required information, and getting involved in the value-added activities. The transaction cost economics has been identified as the primary theoretical viewpoint where governance of buyer-supplier relationship can be assessed. Rendfleisch and Heide (1997); Poppo and Zenger (2002); Liu *et al* (2009) posited that the governance mechanisms such as the contract and relational adaptation could be utilized in the determination of the structural arrangements that control the activities of the chain partners and assist buyer-supplier relationships.

Williamson (1975) noted that one other area of benefit using the TCE is the outsourcing functions in the mining industry. TCE will be a fit for purpose due to the questions it addresses regarding alternative forms of economics organisation. This is because the TCE impacts the managerial decision-making process with regards to outsourcing management.

However, according to Ghoshal and Moran (1996), the TCE model may have an adverse impact on the decision-making process in organisations regarding their performance. Even though several success stories are told by scholars regarding TCE, Ghoshal, and Moran (1996); Granovette (1986) maintained that these empirical stories might appear to be premature. Their argument is that the model has neglected the social and institutional aspects within which transactions occur. It is further observed that the TCE framework fails to consider the relationship between organisational characteristics and the choice of contract. Wever *et al* (2012) argued that the TCE model only considers a two-stage supply chain that is static and depicts chain members who could be forced to make trade-offs between reducing supply exposure or demand-side risk when transactions are symbiotic.

Though these are not conclusive, further models will be developed to determine the validity of the TCE application in the mining industry. Further research work by other researchers such as Rooks *et al* (2000) have started to address most of these issues, which look positive to explore. For instance, Rooks *et al* (2000) have assessed how transactions are rooted in social relations, whilst Oxley (1999) has linked the institutional aspect such as property rights regimes to the choice of contract.

The author will take into consideration these criticisms to challenge the outcome of the current work. This will help in determining the effectiveness or otherwise of the TCE framework.

Geyskens *et al* (2006) identified one key area of concern, which was to examine the relationship between the types of risks as supply chain partners may be involved in different types of transaction risks at the same time. According to Barney and Lee (2000), this may hinder supply chain partners in reducing their exposure to transaction risk where contradictory contractual solutions are needed to manage these risks. Williamson (2000) noted that although TCE may be explicitly conceptualized as an active framework, other researchers such as Zhoe *et al* (2008) see it as a static process due to the reduced exposure to transaction risk. Zhao *et al* (2008) further argued that another downside of the model is that it is transaction-specific that is based on an investment that cannot be redeployed to a different partner should the original relationship fail. This in itself can be detrimental to the application in the mining industry as the industry requires a continuous transaction with chain partners.

In conclusion, however, the author of this research will explore the TCE framework to ensure that there is a fair understanding of the model in relation to the mining industry. It is hoped that the model will assist other researchers and scholars to have a wider approach to assist in the reduction of transaction cost exposure.

2.10.2 Resource-Based Theory

One other framework worth considering by this researcher is the resource-based view (RBV). According to Barney (1991), this model focuses on the premise that firms within an industry may be varied with regards to the strategic resources that are in their control and that these resources may be immobile within the firm. Barney (1991); Cao & Zhang (2012) asserted that the resource-based view indicates that relation specific assets investment helps the partners to build a competitive advantage due to the exceptional, valuable, unsustainable, and hard to replicate nature. In the case of the mining industry, different firms are required to collaborate to ensure the achievement of their objectives. Discussion of the intended framework to be used will be explored to ascertain its feasibility and application. Defee *et al* (2010) mentioned that the RBV is a directed dyadic relationship between buyers and suppliers. Supply chain scholars in recent times have applied this as a theoretical foundation for their studies relating to supply chain integration and collaboration. Barney (1991) also indicated that the Resource-based view theory focuses on creating value and achieving greater performance through the supply chain. Srivastava *et al* (1999) proposed a framework that seeks to indicate that market-based capabilities are connected to an organisation's performance through the mediating concept of performance process that is based on the resource-based view of the organisation.

It is critical to indicate, as stated by Narasimhan and Kim (2002), that the most prevalent theories used by researchers in supply chain collaboration in recent times are the resource-based view and the transaction cost economies. Narasimhan and Kim (2002); Das *et al* (2006); Cao and Zhang (2011) argued that these two theories do not only come up with

different decisions, but they explain further the drivers of collaboration. The difference in their decision outcomes has not limited their application in line with each other in some collaboration literature. This further leaves the current researcher to explore how effective these two theories will fit into the study of collaboration in the mining industry. Various decision levels take place in the mining supply chain, and so the researcher will seek to examine the transaction cost economies and resource-based view to determine if which framework best fits to be adopted.

In their study, Fawcett *et al* (2008); Singh and Power (2009) mentioned that researchers consider the use of contingency theory, which is frequently used in collaboration literature. Lawrence and Lorsch (1967); Thompson (1967) mentioned that there is no theory that can be applied by researchers in all cases. However, there are no perfect means of establishing an organisation's supply chain.

Some researchers such as Blau *et al* (1964); Das and Teng (2002); Son *et al* (2005); Thomas and Ranganathan (2005) have considered the socio-political perspectives in explaining supply chain collaboration. That is, resource dependence theory and social exchange theory. Their argument is that there are so many resources that make some partners more powerful than others. Therefore, these powerful organisations take advantage of the less powerful ones by gaining greater parts of the benefits that invariably lead to conflicts and politics. This then leads to disintegration and complexities in the collaborative process.

The above argument holds where the supply relationship is not properly contracted. The

mining industry might find itself in such a situation where some partners see themselves as superior to others. As mentioned by Zhao *et al* (2011), it is therefore important that organisations invest in transaction-specific assets with partners that will boost commitment, decrease opportunistic activities whilst reducing the cost of transaction.

In their studies, Kumar *et al* (1998) Nonaka and Takeuchi (1995); Barringer and Harrison (2000); Zahra and George (2002); Verwaal and Hesselms (2004); Molhotra *et al* (2005) noted that the technical, economic, and socio-political perspectives are very valuable in the explanation of supply chain collaboration. However, they do not summarize the totality of the phenomenon. Other perspectives, such as the trust-based rationalism and the knowledge-based view, also add up to the understanding of the concept of collaboration. The trust-based rationalism stretches the technical-economic theories by assessing the non-contractual form of reasons for taking part in an exchange. Cao and Zhang (2012) argue that collaboration is ruled by implied social contracts that are based on social influence and trust. The learning and knowledge perspectives view SC collaboration as partner-facilitated market awareness creation and place importance on the process of innovation through the sharing of quality information and the use of inter-organisational systems. Malhotra *et al* (2005) maintained that through supply chain collaboration, organisations are able to absorb capacity by securing, understanding, converting, and utilizing real-time information among chain members and improving operational efficiency and creation of knowledge. As mentioned by Cao and Zhang (2012), supply chain collaboration is, however, an active system that allows the chain members to grow together. Through the combined creation of knowledge, organisations are able to obtain intellectual capital and maintain mutual benefit.

2.11 The collaboration framework

The focus of this research is on the mining industry and its suppliers. The diagram below depicts a supply chain collaboration structure that embraces two actors servicing the same end consumer. The elements displayed below are characteristics of a supply chain. The logistics provider (supplier) has the right to make decisions regarding the delivery of orders to the mining organisation. It is also the right of the logistics provider to obtain information and know the costs internally as well as revenue. The supplier, on the other hand, has the right to make certain decisions regarding production setting and deliveries, the right to information and internal costs as well as revenue. When it comes to the joint decision-making process, actors in the collaborative supply chain are connected through the fulfilment of orders, demand planning, sharing of information, and collective performance metrics. These are done for the mutual benefits of the supply chain actors with the intention of lowering costs whilst fulfilling customer demand. Through sharing of seamless information, the logistics provider and the supplier are able to effectively plan production capacity, lower the level of inventory, reduce frequent stock-outs, and provide efficient customer service.

Seamless information flow

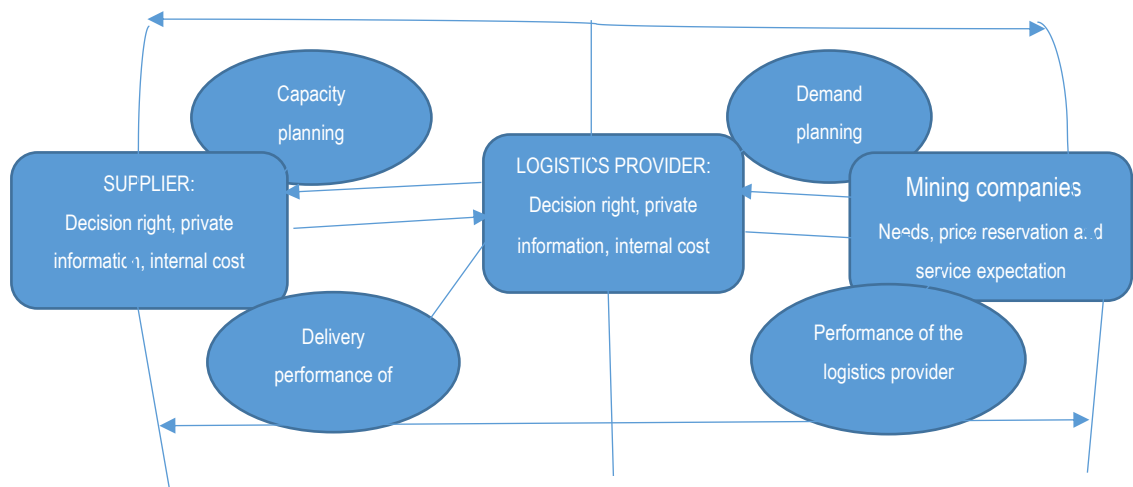


Figure 2.1 A simple structure of supply chain collaboration (Simatupang and Sridharan, 2005)

According to Simatupang and Sridharan (2005), five key features make up the basic collaborative supply chain framework, as depicted below in figure 2.1 (collaborative supply chain framework). The theoretical foundation and empirical evidence have been outlined to validate and authenticate this proposed framework. The five main features are information sharing, collaborative performance systems (CPS), incentive alignment, and synchronization of decisions as well as supply chain integrated process. These individual features sum up to be the enablers that expedite collaborative actions. The arrows in figure 2.1 (collaborative supply chain framework) capture the active nature of the mutual connections among multiple linking features of the framework. The diagram indicating the reciprocal approach demonstrates the effect of collaborative performance systems on information sharing, supply chain processes, alignment of incentive and synchronization of decision as well as how the impact of the features on others in helping to achieve collaborative performance. Milgrom

and Roberts (1995); Brickley *et al* (1995); Barue *et al* (1996) argue that the reciprocal approach shows that two-way communication is achievable through sharing of information and decision synchronization when accurate and relevant information is shared for effective decision making. The reciprocal approach is, therefore seen as the balancing activity in supply chain collaboration. This is crucial because it recognizes and creates an understanding of the enablers that help in collaborative actions. According to Milgrom and Roberts (1995); Brickley *et al* (1995); Barue *et al* (1996), this then clarifies the ever-existing challenges that are linked with the definition of collaboration due to the adoption of discourse by the reciprocal approach as a means of understanding the several features of collaboration that impact on the performance of organisation's supply chain.

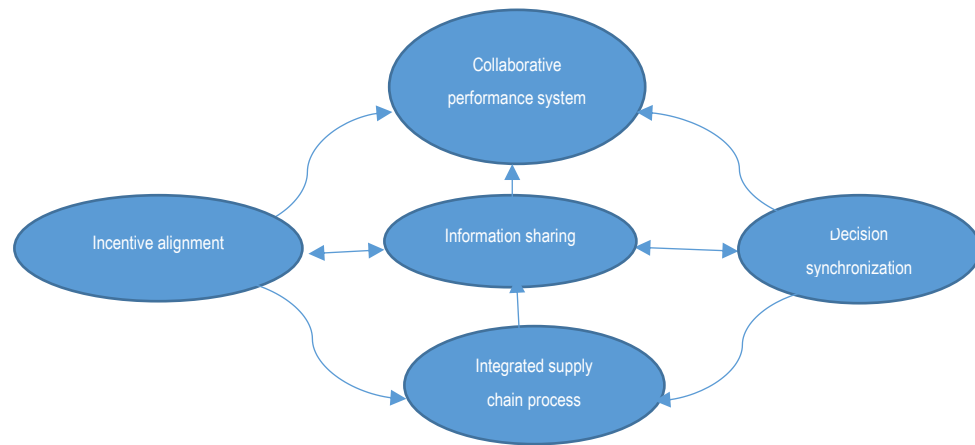


Figure 2.2 Collaborative supply chain theoretical framework (Simatupang and Sridharan, 2005)

Milgrom and Roberts (1995); Brickley *et al* (1995); Barue *et al* (1996) further state that the theoretical rationalization of the reciprocal approach is mirrored in the complimentary collaboration view. Those who hold this school of thought intimate that actions of

collaboration must be well-defined based on the interaction that exists among various features of attention. The actors in the chain must be in the position to synchronize and match up the five features. Having to change one feature will mean other features will need to be changed as well. For example, incentive alignment must be measured with performance metrics. Therefore, the definition of collaboration in line with the five features is crucial as it seizes the intricate, collaborative practice. This encompasses the various combined decisions that need to be made, the needed information for the decision-making process and control, performance metric, and the system of incentive that apportions costs and benefits as well as the processes of the integrated supply chain. Below explain the five features as depicted in figure 2.2.

The theoretical framework in figure 2.2 developed by Simatupang and Sridharan, 2005, will be tested on the field study to ascertain the level of collaboration in Ghana's gold mining sector.

2.11.1 Information sharing

Baba *et al* (2021); Deans *et al* (2018) and Simatupang and Sridharan (2002) defined information sharing as the process of accessing the private data of members by way of monitoring the processes products go through in the supply chain. Information to be accessed by collaboration members include acquisition of data, data storage, data processing, data representation, and data distribution. Other information available to the chain members is inventory status, order status, and cost data, as well as performance status. Decision-making process becomes easier when key performance metrics are readily accessible by members. This gives members the opportunity to have a bigger outlook of the situation at hand in order

to address the flow of product as well as planning for agile demand. Deans *et al* (2018) further argue that in order to ensure the effectiveness of information sharing in collaboration, there must be relevance, the accuracy of the information, reliability of the information, and timeliness of the information.

According to Baba *et al* (2021) and Simatupang and Sridharan (2002), connecting information sharing with other key features of the framework is vital in mixing other features in totality. Members are more interested in the value information sharing plays rather than having mere information. Davenport *et al* (2001) mention that the ultimate point of information sharing is to offer members the ability to use the information for good decision making and to take action based on the visibility of the information. The cardinal point to note here is that visibility must inform action, and also action becomes visible where members of the collaborative chain realize the fundamental principles that connect integrated information and the drivers of performance. Fisher (1997) indicate that information sharing, therefore, must enable synchronization of the decision through the provision of appropriate, well-timed, and accurate information that is needed for decision making with regards to supply chain planning and execution. Accurate information sharing enables supply chain members to respond quickly to customer demands as well as reducing order cycle times. Frequent stock-outs and order replenishments are then fulfilled through demand and inventory visibility.

2.11.2 Collaboration Performance System (CPS)

Kaplan and Cooper (1997) view collaboration performance system as the process of planning and executing performance metrics to direct supply chain members on how to advance total

performance. There are two main related points that the process seeks to determine. That is, those involved in determining the core objective must be identified. Also, the performance metrics must be specified with regard to the core objective. According to Mofokeng and Chinomona (2019) building a strong partnership by the collaborative members means that the core objective that mirrors the competitive factors could be attainable. The competitive factors that could be seen by the market may come in the form of client services, product pricing, product quality, supply chain costs, and customer responsiveness. These are the factors that are deemed to be the driving force for chain members with regards to their profitability, cash flow, and return on investment. According to Kaplan and Cooper (1997), members of the chain need diverse forms of performance metrics that go beyond the supply chain.

Herczeg *et al* (2018) and Simatupang and Sridharan (2004) suggested three cycles of dynamic learning that could assist the chain members in determining different levels of managerial collaborative performance. This could offer an opportunity for the improvement of the total performance. One of the dynamic learning cycles is the exception cycle. This is the collaborative process that is planned to ensure that customer demands are fulfilled in a responsive manner. This process has been planned to ensure that actual sales from any market alterations and interruptions are safeguarded. The aim of the exception cycle is to monitor triggering events, which include deadlines and status of inventory as well as demand conditions. Another exceptional cycle that is monitored is a diagnosis, which seeks to assess the reasons for malfunctions in the supply chain. Corrective actions like having processes performance reverted to a satisfactory level. The exceptional cycle process metrics usually

involve metrics that are connected with perfect order, inventory velocity, and delivery time.

Simatupang and Sridharan (2004) also mention one other dynamic learning cycle as the improvement cycle. This is the joint initiative that is made for continuous improvement. The main aim of this cycle is to identify improvement targets, have improvement plans framed up, and examine and carry out the right improvement alternatives. The simultaneous metrics for the improvement cycle involve accurate forecast, receptiveness, elasticity, and cash-to-cash cycle. The other dynamic learning cycle mentioned by Simatupang and Sridharan (2004) is the review cycle. This is the process where expectations and actual collaborative results are compared. As mentioned by Fredman (1999), this review cycle engages metrics like profitability, sales, and growth as well as inventory turns. With regards to the relationship with other features, the collaborative performance systems need information sharing, synchronization of decisions and alignment of incentives to be able to monitor and develop real performance.

2.11.3 Decision synchronization

According to Simatupang *et al* (2002), decision synchronization is the degree to which members of the collaborative chain are able to optimize profitability through the organisation, planning, and execution of critical decisions. Decision synchronization involves formulating a combined decision-making process where decision rights are rearranged in a bid to harmonize supply chain planning and execution to ensure that demand is matched up with supply. According to Soosay *et al* (2015), one of the ways to test the effectiveness of decision synchronization is how customer demands are fulfilled based on accurate response. Decision

synchronization could take the form of face-to-face discussions and forums.

One crucial element of decision synchronization is based on the fact that members have their reserved rights to diverse decisions and capabilities regarding supply chain operations. A chain member's decision will most often be based on one aspect, such as deciding on the order quantity and not on order delivery. In their argument, Lee *et al* (1997) intimate that chain members are bound to have conflicts regarding decision making that may be less optimal for the entire chain. In order to ensure a high level of performance, the chain members need to organize well on critical decision-making. Making a joint decision has a great impact on sales as well as inventory. Joint decision has the potential of increasing sales as well as reducing inventory levels. The joint decision making by the chain members may have an impact on sales, order forecasts, inventory levels, order replenishment, placing of orders, delivery, service quality, and pricing. A typical decision right is where the supplier has the decision right to decide the number of times order quantities have to be delivered to the retailer's distribution point with regards to vendor managed inventory. This system helps in the improvement of members' profitability because the supplier is able to match up supply with demand.

Relating decision synchronization with other features of the framework is imperative because it helps the chain members to organize their decisions well enough to achieve a total performance. Decision synchronization helps collaboration performance systems through the feedback it provides to achieve effective decisions through performance metrics. Lee *et al* (1997) affirm that decision synchronization helps information sharing to ascertain the type

of data that are appropriate to be collated and transmitted to the member making the decision. With regards to incentive alignment, decision synchronization helps to explain incentive alignment as to the right incentive schemes because other members of the chain hold divergent views regarding decision making. It is important to note further that decision synchronization enables members of the chain to embark on productive ventures relating to supply chain integrated processes such as order replenishment and transportation as well as customer service.

2.11.4 Incentive alignment

According to Simatupang and Sridharan (2002), incentive alignment is the process where chain members participate in cost-sharing, risks, and other related benefits. It is a process that encourages chain members to make decisions based on their mutual objectives with the aim of divulging private information in a true and honest manner. This involves the computation of risks, costs, and benefits. It also involves the formulation of incentive systems such as pay-for-performance and pay-for-efforts. The impact of incentive alignment is largely based on self-enforcement and compensation fairness. To have an incentive scheme that is effective will mean that the member of the chain aligns their decision individually with the mutual aim of having their total profits improved. Compensation fairness makes certain that incentive alignment inspires members of the chain to fairly share the loads and profits that result from the efforts of collaboration. To ensure the effectiveness of incentive alignment, members of the supply chain need to self-enforce the alignment of individual decisions to conform to the mutual aims in order to improve total profitability. Kaplan and Narayanan (2001) posit that web-based technology and expert systems, as well as activity-

based costing, can help in scores tracing, calculation, and displaying.

Simatupang *et al* (2002) mention that the theory underpinning incentive alignment suggests that a chain member's action may be directed at a mutual benefit for the entire members, and that action may be attractive and beneficial to individual chain members as well. Simatupang and Sridharan (200) maintain that there are several ways of designing a suitable incentive scheme. Pay-for-effort is the system that connects payments and efforts. This suggests that payment has the highest tendency to motivate an individual member to put in more efforts, which invariably recounts to some level of performance. Pay-to-performance is the system that connects payment to performance. This system suggests that compensating an individual based on his performance will inspire the individual chain member to realize a certain performance level. Equitable incentive is distributing fairly the load and benefits based on applying some level of collaborative efforts. There is an agreement by the chain member on the importance of the possible rewards that can be attained as a result of collaboration even though there is a need for the cost to be shared.

The linkage of other features with incentive alignment is important in inspiring members of the chain to align their activities to the mutual objectives of collaboration that has the possibility of helping individual profitability. Incentive alignment connects the scoreboard of performance from the collaborative performance systems to incentives. The clarity of the connection between performance and incentives, the more useful an incentive could inspire an expected behaviour. Sharing of information is crucial in demonstrating to the chain members that there is the availability of incentives. In line with decision synchronization,

incentive alignment offers incentives to inspire member of the chain in making crucial decisions that strengthen the expected performance level.

2.11.5 Integrated supply chain process (ISCP)

According to Croxton et al (2001), integrated supply chain process is the level at which supply chain members plan the supply chain process efficiency in order to reach end customers with products in a timely and lower-cost manner. The main aim of this process is to assist chain members to harmonize the order of integrated work activities that are needed in the delivery of the product to fulfil customers' needs. There must be flexibility in the supply chain process in order to ensure responsiveness based on customers' requirements and fulfilling the requirements at the minimum cost possible in relation to the supply capacity. Fisher (1997) mention that in order to create flexibility, the chain members need to reshape the system of distribution, the product, the production process, and the inventory management system to become cost-effective and flexible to equate supply with diverse conditions of customer requirement.

In line with other features, the integrated process focuses on helping the members of the chain to attain the key performance indicators (KPI) mentioned in the collaborative performance systems. Members of the chain align their decisions in order to build an effective supply chain process that is geared towards high performance and reliability. The integrated process activity costs and non-financial performance metrics are crucial ingredients for incentive alignment. The processes of integration offer information sharing visibility on process status that helps in identifying problems easily and finding quick solutions to them.

Given the collaborative supply chain framework, one would have thought that the general rule of this process should apply to all sectors as the supply chain function is assumed to be applicable to all industries. However, this framework will be examined to ascertain how best it fits into the gold mining industry in line with the reviewed literature. The literature review will offer the researcher the views of other researchers relating to supply chain collaboration and how they impact the current study.

2.12 Literature Gaps

According to Lambert *et al* (2004); Goffin *et al* (2006); Allred *et al* (2011); Nyaga *et al* (2010); Fawcett *et al* (2011); Cao and Zhang (2011), investigations into supply chain collaboration are not exhaustive. Even though many studies have been conducted in the area of empirical research papers as well as conceptual papers being published, these are not exhaustive enough to understand the topic of collaborative supply chain. Simatupang and Srinidharan (2005) observed that the initial notion of supply chain collaboration had been obscured by the simple fact that partnerships are needed all the time. Limited consideration has been given to the various characteristics that make up other areas of the collaborative supply chain. Against this backdrop, Mentzer *et al* (2000) are of the view that the various aspect of supply chain collaboration has been downplayed and this has created lots of gaps in the literature.

Firstly, the benefits associated with supply chain collaboration have been widely circulated

in various literature, yet the collaborative nature and attributes are not well known. Supply chain collaboration has been divided into several parts, focusing on different disciplines with a number of different factors. Research study in marketing and management has been based on commitment factors (Handfield and Bechtel (2002)), research in operations management has been based on information sharing, and inventory factors (Srinivasan *et al*, 1994), whilst researchers in information systems have focused on capabilities of information technology (Grover *et al*, 2002). As mentioned by Barringer and Harrison (2000), all these parts have hindered the comprehensive understanding of the concept of supply chain collaboration. According to Saeed (2004), initial studies on the topic of supply chain collaboration have failed to offer a comprehensive conceptualization of the topic, and this has limited the power to explain and assess the collaborative efforts. Consequently, a deeper understanding of collaborative characteristics is very critical.

Secondly, Cao and Zhang (2012), mentioned that researchers have focused more on process integration in the conceptualization of supply chain collaboration. That is goal congruence, synchronization of decision, alignment of incentives, and sharing of resources with limited concentration of collaborative communication and joint creation of knowledge. According to Tuten and Urban (2001), the failure of most collaborative supply chains is attributed to conflicts and misunderstanding among chain members. In their study, Malhotra *et al*, (2005) argued that good communication is the connecting element that binds supply chain members together. Additionally, it must be noted that long-term partnership is based on the sharing of good information and market knowledge that creates sustainable competitive advantage.

Thirdly, in conducting a research study on the antecedents that have an effect on supply chain

collaboration, earlier research centred on the use of inter-organisational systems without taking culture context into account (Holweg *et al.* 2005; Gopal and Gosain, 2010; Rai *et al.* 2012). Even though the utilization of inter-organisational system is important for the success of collaboration, McCartel *et al.*, (2005); Du *et al.*, (2011) maintained that it is equally important to consider simultaneously organisational culture as well. According to Du *et al.* (2011), many supply chain collaborations do not succeed because of the failure to recognize the complexity and incompatibility of organisational culture. Common mistrust creates a lot of difficulties for supply chain collaboration to function properly. For supply chain collaboration to succeed, a high level of inter-organisational system needs to be in place.

Trust, according to Paul and McDaniel (2004), is one determinant factor for the success of supply chain collaboration. Despite the ongoing discussions about trust in collaboration, there seem to be limited empirical studies that indicate that trust has a greater impact on inter-organisational system enabled supply chain collaboration. More so, there is limited operationalized trust as well as its related theory, such as outcomes of collaboration and performance, that impedes the empirical assessment of their relationships.

Finally, in examining the outcome of supply chain collaboration, Cao and Zhang (2012) observed that existing literature fails to discuss collaborative advantage of the benefits that collaboration can be achieved through joint competitive advantage in relation to the mining organisations.

Supply chain collaboration in Ghana has its limitations on industries such as the health,

agriculture, cocoa, pharmaceuticals, and medium scale business. The focus has been on these sectors with limited or no study addressing supply chain collaboration in the gold mining sector. In a study conducted by Adomako (2020), the focus of collaboration was on environmental collaboration with emphasis on sustainable innovation and its impact on small and medium scale enterprises (SMEs). Even though this study was in line with business enterprises, the gold mining cannot be said to be an SME as it a multinational business organisation.

In another study conducted by Acquah *et al* (2021), the researchers sought to identify the linkage between culture and collaboration through the use of mixed methods. The study Sought to evaluate the performance of organisations by leveraging the capabilities of suppliers and customers. Again, this was seen to be a departure from the gold mining industry.

Various research conducted in Ghana such as Yamoah *et al* (2020); Singh *et al* (2018); Dadzie *et al* (2015) and many others paid attention to other sectors of the economy rather than the gold mining industry.

It is evidently clear that limited literature exists with regards to supply chain collaboration in the mining industry in Ghana. Thus, the focus of this study on the gold mining supply chain collaboration makes it unique to fill the gap in literature.

2.13 Conclusion

Considering the limited study in supply chain collaboration in the area of gold mining and other industries in Ghana, it is important that further studies are done in this area. It is crucial that further research benefits from a combination of opinions of previous studies on supply chain collaboration. Thus, the current research study is expected to help build a clearer understanding of supply chain collaboration in the gold mining industry and also expand the body of knowledge besides filling the research gap.

The literature review of this research has presented supply chain collaboration and theories from various perspectives and the key factors that influence supply chain collaboration. Again, a presentation of supply chain collaboration from the global perspective was made. This was followed by a presentation in the light of developing economies, then that of Ghana and the key industry under review. Even though the gold mining industry is limited in terms of supply chain collaboration study, the research aims to fill the gap. The key factors that emerged out of the literature review will help formulate the survey questions. Thus, the research questionnaire in the next chapter is formulated based on the theoretical framework. In light of this, further empirical investigation has been planned and this will reflect in the research methodology.

The next chapter will present the research methodology which is mixed method research used for the study.

CHAPTER 3

METHODOLOGY

3.0 Introduction

The focus of this chapter will be to explore the research methodology, the research philosophy, the research approach, and strategy, as well as the rationalisation for adopting them. This research will discuss the research design, measurement, and analysis procedures.

The research design section will focus on the methods used, the basis of its usage/justification, and the data collection, as well as the sampling procedures employed.

The measurement section will focus on the operationalisation of the constructs. The analysis section will focus on the analysis techniques used in the evaluation of the research.

This research aims to identify the factors affecting supply chain collaboration in Ghana's mining industry. To satisfy the conditions of this research and to answer the critical questions about supply chain collaboration, the following objectives have specifically been highlighted.

- To develop an understanding of supply chain collaboration in the mining industry.
- To identify the underpinning theories of supply chain collaboration and its effects on Ghana's mining industry.
- To develop a conceptual framework for supply chain collaboration in Ghana's mining industry.

3.1 Research Methodology

Many researchers with varying explanations have espoused the definition of research. However, according to Snyder (2019) and Hussey and Hussey (1997), research must follow a systematic approach, have suitable data collection and analysis methods, and must focus on the problem correctly to be addressed. Kumar (2018) and Wisker (2008) mentioned research methodology as an orderly process where research questions are directed through the use of selected methods. The method to be used is mostly dependent on the discipline area of study by the research. As this research area is supply chain management, the research methodology will defer from a research area that focuses on chemistry that will be based on a hypothesis. According to Sekaran and Bougie (2001), research is structured, systematic, fact-based, critical, objective, and scientific investigation that focuses on a specific problem with the view to answering the research question or finding the solution to the problem. This definition seeks to align with the current research, which seeks to find a solution to the issue under investigation, which is specifically relating to the mining industry in Ghana.

Nayak & Singh, (2021) and Croft (1998) argued that a research methodology is a tactical approach with a set of action plans aimed at designing a process to shape up the choice and use of precise methods to arrive at the desired result. Buzza and Vandibe (2009) also stated that research methodology is an outline that guides researchers specifically on how to carry out a research study from its inception to the end. Creswell (2012) further argued that the research method is a data collection process, analysing and interpreting of data by a researcher during work. As stated by Bryman and Bell (2011), the research method is

associated with diverse kinds of research design and strategy.

Even though authors have varied views regarding research methodology, the underlying concept is to adopt a method that works for particular research based on the aims of the study. In line with the current research, the appropriate method will be adopted to achieve the desired results.

3.2 Research Process

In the process of carrying out research, Fisher & Bloomfield (2019) indicated there are available alternative methods open to the researcher to choose from: quantitative, qualitative, and mixed methods research (MMR). Saunders *et al.* (2000) proposed a diagram as a guide for researchers in their research decision-making process.

The researcher used the research ‘Onion’ as a guide through the study as an illustration of the method of data collection to be used in investigating the research process.

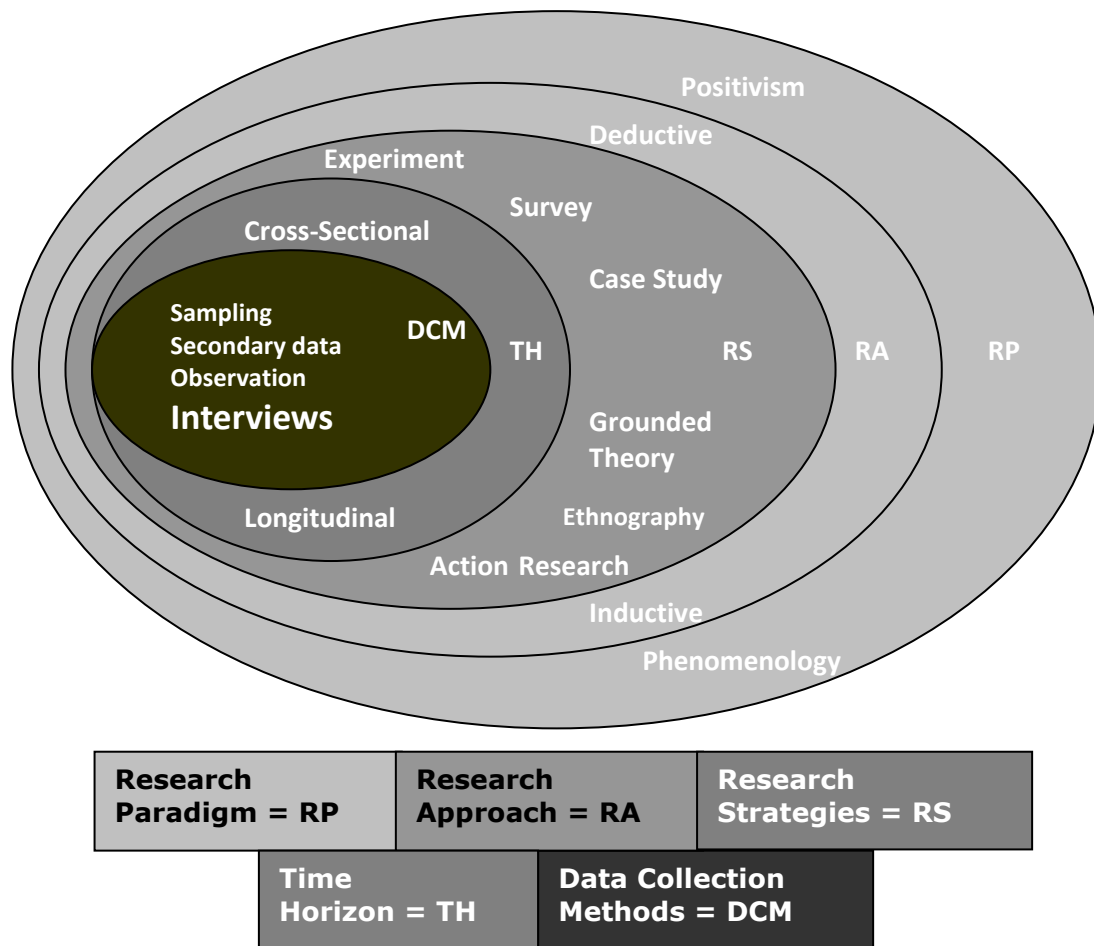


Fig.3.1 Research Process 'Onion' (source: Saunders *et al.* 2007)

3.3 Research Philosophy

Several arguments have been raised regarding research methods in the field of social sciences. These arguments are, however, crucial as indicated by Fisher & Bloomfield (2019) because they are premised on the notion of research design, and so sweeping them under the carpet may have a detrimental effect on the quality and outcome of the research. Bhattacharjee (2012) and Collis and Hussey (2003) posit that even though distinctions have

been drawn between positivist and social constructionist, there has been clear cut dissenting views between research regarding the interest in specific methods that fall in line with these two opinions. Social science research tends to encompass compromises between these positions. Bhattacharjee (2012) and Collis and Hussey (2003) further mention that the field of management research has supported these two central positions.

Table 3.1: Summary of Research Paradigms (Philosophies)

Positivistic Paradigm	Phenomenological (Interpretivism) Paradigm
Quantitative	Qualitative
Objective	Subjectivist
Scientific	Humanistic
Experimentalist	Interpretivist

Khaldi, K. (2017) and Collis and Husey (2009) maintain that in examining the research approaches and understanding them as not being divided, it is essential to understand the assumptions relating to each of the methods to ensure that the appropriate choice is made. The following table depicts the underlying supposition behind the five paradigms – ontological, epistemological, axiological, rhetorical, and methodological.

Table 3.2: Assumption of the two main Paradigms (Source: Hussey & Hussey, 1997)

Assumption	Questions	Quantitative (Positivism)	Qualitative (Phenomenological)
Ontological	What is the nature of reality?	Reality is objective and singular, apart from the researcher	Reality is subjective and multiple, as seen by participants in a study
Epistemological	What is the relationship of the researcher on the topic of research?	The researcher is independent of the topic being researched	The researcher interacts with the subject being studied
Axiological	What is the role of the values?	The researcher is value-free and unbiased	The researcher recognizes that value-laden and biased
Rhetorical	What is the language of research	The researcher uses formal language based on defined impersonal voice, accepted quantitative words	The researcher writes in an informal style and uses personal voice, accepted qualitative words, terms, and definitions.
Methodological	What is the process of research	The method of research is a deductive study of cause and effect with a static design. Research is context-free. Generalisation leads to forecast, explanation, and understating.	The process is inductive — the study of natural, simultaneous shaping of factors with a developing design.

Source: Collis and Hussey (2009)

According to Fisher & Bloomfield (2019) and Amaratunga (2002), these two approaches have their strengths and weaknesses. However, the researcher of this study considers the mixed methods paradigm as the most suitable research philosophy.

3.3.1 Justification for selecting the Mixed Method Research Approach

The research design was initially made to reflect quantitative study, where questionnaire was developed and presented to a targeted sample based on the panel data extract. Thus, the analysis of the quantitative data results was inclusive. Hence, the result was triangulated by using a qualitative phase by seeking the opinions of key stakeholders from the original

sample size.

According to Myers (2011) qualitative research largely helps researchers to comprehend “why” and “how” people behave in a certain manner. As information can be extracted from various means, Cresswell & Clark, (2011) argued that one of the important means is to attain insights directly from stakeholders through the use of in-depth interviews. Indeed, Myers (2011) asserted that interviews are a common method to recognise the wider context of a phenomenon and to ascertain what motivates and pushes stakeholders to behave in certain manner.

In line with the argument by Cresswell & Clark (2011), the researcher proceeded further to extract information to understand the ‘why’ and ‘how’.

Richards *et al* (2019) further asserted that the most common mixed methods research approach is sequentially designed that quantitative research is firstly conducted followed by qualitative or vice versa.

Consequently, as this study found some of the findings in the quantitative study to be inconclusive, the researcher felt the need to collect further data through the use of in-depth, semi structured interviews within the selected sample from the targeted population in the quantitative phase of the study to arrive at a meaningful result.

This falls in line with the study of Kelle (2020) who observed that the adoption of mixed

method approach can assist in finding unobserved heterogeneity in quantitative data and previously unidentified explanatory variables and mis-specified models. In other words, qualitative research results can assist in explaining incomprehensible statistical results.

3.3.1.1 Logical positivism – this philosophy is concerned with the use of quantitative methods and experiments to examine the hypothesis.

3.3.1.2 Social constructionism – Easterby-Smith *et al.* (2004) mention that this philosophy is mainly concerned with the use of qualitative methods in understanding inductively human experience. The social constructionism approach attempts to comprehend and describe a phenomenon instead of looking for external reasons. In their position, Saunders *et al.* (2007) indicated that this approach is inductive as the researcher is collecting data and analysed based on the theory developed.

3.4 Research Approach

McKim, (2017) mentioned that the combination of quantitative and qualitative methods of data collection and analysis in one study known as mixed method is not new to social sciences. Maxwell, (2016) indicated that these approaches can answer different questions individually but combining them offers more in-depth findings to the research study. Some mixed methods research (MMR) studies undertaken by researchers such as Lynds' Middletown studies (Lynd & Lynd, 1929, 1937) and the Hawthorne Studies (Mayo, 1993);

Roethlisberger & Dickson, 1964) are considered to be very prominent. Examples include studies by Biddle & Schafft (2015); Denscombe, (2008) and Hunter & Brewer, (2003).

The last few decades have seen social scientists considering mixed methods research as a unique research approach despite the long tradition of using separate methods. McKim, (2017) stated that advocates of MMR claim that combining quantitative methods (survey and questionnaires) and qualitative methods (interviews and ethnographical studies) should be seen as unique research methodology and carefully evaluate the practicality of such a blending in relation to some philosophical arguments about scientific paradigms and pragmatism.

The main purpose of this literature is that mixed method research not only represents a fascinating and promising new method but also presents some questions about its status as a research paradigm. This consequently finds its grounding in the current research study of identifying the factors of supply chain collaboration in Ghana's gold mining industry.

Furthermore, Ghiara (2020) argues that the blending of quantitative and qualitative methods involves a novel approach that should be seen as a new research paradigm. The uniqueness of the mixed methods research is the possibility to blend different paradigm in the same research study. While some researchers describe mixed method research as a new paradigm, others view mixed method research as not only blending different methods but also combining different research paradigm. Ghiara (2020) intimates that this has been justified by observing that although in some cases MMR studies mix just methods, there are more

complicated circumstances where MMR studies are characterised by a blend of diverse ontological and epistemological assumptions. The notion that mixed method research combine paradigms has become a topical issues in recent times. Some researchers have observed that the dominance of one method in mixed method research can be detected from the situation where a paradigm is strongly presented in a study. Many researchers have applauded the part played by combining several paradigms and have had discussions on the reason for this combination of paradigms. The combination of the paradigm, according to Greene (2006) is viewed as the main difference between mixed method and multimethod studies. Greene (2006) however, encourages other researchers to take advantage of this different perspectives and integrate them into their mixed method research studies. She believes that it is through the deviation and dissension that mixed method researchers can evaluate and create an understanding of what has been taken for granted. This argument for MMR was supported by McKim (2017) who opined that research questions can be studied from different ways such as ontology and epistemology.

In view of the foregoing argument, mixed method research is deemed appropriate for this study as it combines both quantitative and qualitative approaches. It is therefore noteworthy that this study adopted quantitative and qualitative method where qualitative method was used to validate the quantitative approach.

3.5 Research design

The focus of the research design is to turn research questions and objectives into a research

project. The emphasis here is on the research strategy, choice, and the time horizons. Figure 3.2 indicates the framework of the research strategy embraced by this study.

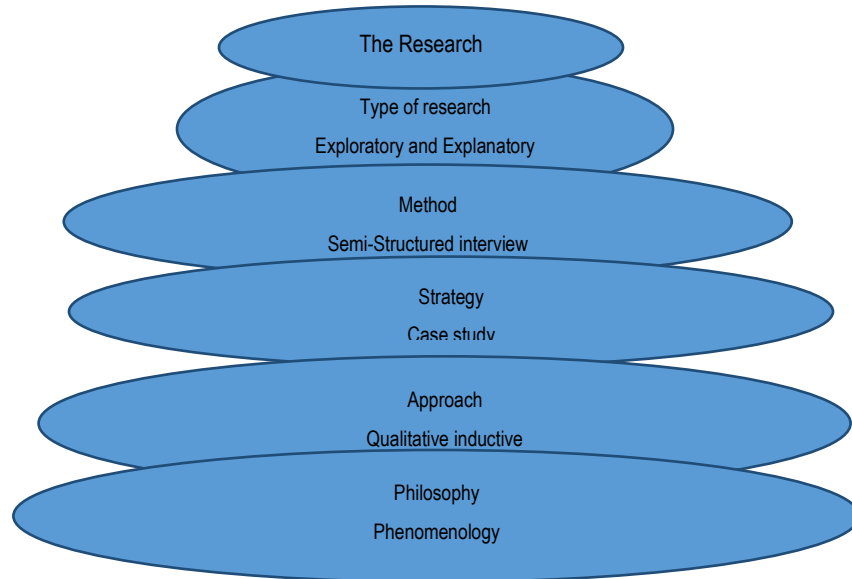


Figure 3.2: Research Strategy Framework

Source: Saunders *et al.* (2007)

3.6 Research strategy

Yin (2009) identifies five research strategies in social science. These are surveys, experiments, histories, archival analysis, and case studies. The type of strategy to be adopted, according to Widdersheim (2018), is dependent on the research question that is asked, the level to which a researcher has control over the real behavioural activity and the level of focusing on current events as against historical facts.

According to Yin Bueger & Gadinger (2018) and (2003) case study has been defined as an empirical inquest that seeks to examine into details a current phenomenon that is within a real-life situation, most importantly within the boundaries of phenomenon and context which are not evident. In their study, Van de Velde *et al.* (2004) mention that a case study strategy is well suitable where the objective of the research study is to engage in an in-depth study of an event within its natural context. This current researcher has employed the case study strategy because it is believed to be appropriate and also will provide the understanding for the investigation of the factors that affect supply chain collaboration in the gold mining industry in Ghana. According to Widdersheim (2018) and Yin (2003), the case study will be suitable in explaining the “how” and “why” questions and also offer the researcher the ability to know what happened and why it happened. Yin (2003) further intimates that the case study strategy is suitable and recommended where the researcher has no control over the events, and the emphasis is on current events.

The current researcher is seeking to investigate current events which the researcher has no control over. Hence, the case study strategy is deemed appropriate for the study. Robson (2002) concluded that the case study is multipurpose because it could be used to discover the level of the relationship among individuals, communities, social groups, and events of all kinds.

3.7 Justification for case study strategy

According to Gray (2017), case studies are more focused, specific and can be used in

discovering a lot more themes and topics from a variety of contexts, organisations, and people. Eisenhardt (1989) mentioned that a case study is a research strategy that emphasises securing understanding of the current issues within the single setting. As Tight (2010) puts it, case study strategy concentrates on the comprehensive analysis of a smaller section of interest and focuses on a precise perspective.

In this study, multiple case studies will be considered. This will offer an extended exploration of theoretical evolution and research questions. Widdersheim (2018) and Eisenhardt & Graebner (2007) mention that the case study creates a more compelling theory that is grounded in different empirical evidence. As mentioned by Perry (1994), the case study to be identified and selected is at the discretion of the investigator, and he solely determines the number of qualitative research studies to be undertaken. The development of the questionnaire is based on the literature reviewed, and the researcher is expecting to identify the factors of supply chain collaboration in the industry. Respondents targeted for this study are senior officers in the field of supply chain with relevance experience who can speak to the subject under review. Semi-structured interview will be conducted to validate the survey questionnaire.

3.8 Questionnaire Outlay

The design of the research questionnaire was based on the literature review and the research questions. The survey questionnaire, as attached in Appendix A, consists of thirty-four (36) questions. The breakdown of the sections is as follows.

Part I: Company background information

Part II: Collaboration partners

Part III Trust among collaborative partners

Part I: this section recounts the demographic characteristics of the responding organisations.

The information covers questions 1 to 9. This comprises data on the name of the organisations, the positions of respondents, gender, number of years worked, number of department workforce, organisational strength, type of organisation and an annual turnover of the organisation.

Part II: this section focuses on the collaboration partners. This covers questions 10 to 22.

Questions in this section seek to gather information on keys suppliers, relationship between collaborative partners, factors of collaboration trust in the collaborative relationship and the organisational structure.

Part III: this section deals with the drivers of supply chain collaboration. This section covers questions from 23 to 36. The questions asked sought to collect information on what drives the collaborative relationship among the partners, the period of the collaborative relationship and the enablers of supply chain collaboration. It also gathers information on the strength and quality of collaborative partners as well as the relationship between suppliers and the partners.

The literature on supply chain collaboration assumes that organisations need to look at the long-term effects of their partnership as against the effect on their performance in terms of

cost and efficiency.

3.8.1 Sample

The sample of gold mining companies was drawn from the list of Ghana Chamber of mines official gold producing companies in Ghana (Ghana Chamber of mines affiliate members, mining division 2019). In total, there were 12 major gold producing companies with 4 of the companies owning and operating two separate mining sites each. In terms of separate entities, the total number of gold companies was 12. To maximize the sample size, all the twelve mining companies were targeted with only one of the mining organisations declining to take part in the study. In total, 11 mining companies were used for the study.

Questionnaires were sent out to the mining companies to be completed. 8 out of the 11 mining entities participated in the survey with four of the organisations not participating. The reason being that even though they are separate entities, they share a common supply chain operation and so there could be duplication of data in the survey questionnaires.

A total number of 300 survey questionnaires were rolled out with 151 responses returned. Based on the total number of 151 questionnaires returned, 101 were completed with reasonable responses. These were found acceptable and usable for the research. The number of rejected questionnaires were 50, and these rejections were because some were incomplete, some refused to respond to the core questions asked and others returned with comments that “I cannot provide sensitive organisation information”. The rate of response is considered as

a fair representation of the study of the mining companies in Ghana.

This study recognised the bias in the collection of data and so respondents targeted were persons with adequate knowledge and with reliable information (Lai & Cheng, 2004) in mining supply chain operations. The criteria for the selection of respondents were based on their position and decision levels in their respective organisations. Top management, senior managers, assistant managers, and senior officers were selected for the study based on their experiences and knowledge.

3.9 Interviews

Interviews were conducted on some of the mining organisations, and this was focused on top-level management. The researcher was able to interview four supply chain managers as the rest of the top-level managers were not available due to a busy schedule. Two of the top-level managers were of the view that the answers provided in the survey questionnaire were enough to be used for the study. The focus of the interview was to explore further the opinions expressed in the survey. It was also conducted to validate the points made by the respondents and to better understand some of the answers provided.

Questions were asked to cover the factors of supply chain collaboration. The interviewees were asked the same questions even though some declined to answer some of the question. These were marked as blank in the analysis to capture the interviewees' decline to answer. Using thematic analysis, the interview was analysed based on the common themes identified

by the researcher.

Interview questions were submitted to the interviewees after explaining to them the purpose of the interview. The duration of the Interviews was between 30 to 60 minutes each which offered the researcher qualitative data that entailed detailed verbal descriptions. The verbal interaction demonstrated to be an invaluable element of the research as interviewees sighted specific examples to explain further their points.

From the different companies interviewed, the researcher gained an in-depth understanding and built a rich opinion of the different factors of supply chain collaboration in the gold mining industry, therefore offering construct validity. Interviews were conducted in the offices of the various mining organisations at dates and times agreed on by the interviewees. These were held in the course of the weekday with enough cooperation and support from the interviewees.

3.10 Non-Response Bias

According to Bonifaxce *et al* (2017) and Sax *et al.* (2003), non-response is the situation where people refuse to return questionnaires based on their opinion, being different from those who return their questionnaires. Asch *et al.* (1997) opined that identifying bias is difficult. However, measuring response rate is quite easy. The response rate for a survey is an indirect sign of the degree of non-respondent bias. McGovern *et al* (2018) and Asch *et al.* (1997) further indicated that the difference between the answers of non-respondents and respondents

is the non-response. Non-response can be in two forms - total non-response or unit non-response. Total non-response is where the individual does not return the questionnaire whilst the unit non-response is the situation where the respondent returns the questionnaire incomplete. This research study considers total non-response as there were few issues of unit non-response.

3.11 Validity and reliability Analysis

The measurement of errors on the theoretical relationships could be affected if the reliability and validity of the study are not assessed. According to Hopkins (2017) and Forza (2002), reliability and validity that are attributed to the secondary data are functions of the process with which the data was gathered. Sourcing and gathering secondary data require a detailed assessment of validity and reliability analysis. According to Saunders *et al* (2009), it is simple to assess with a clear clarification of the instrument used for the data gathering.

Surucu and Maslakci (2020) mentioned that reliability in quantitative study describes how a particular procedure, such as research questionnaires, can generate similar results in several instances, assuming nothing else changes. Validity is the extent of representation and measuring accuracy. Two categories can be identified when measuring validity. These are internal and external validity. Surucu and Maslakci (2020) went further to state that internal validity considers the reasons for study outcome, the validity construct and criterion related validity. External validity deals with the study results which could be considered if they can be generalised beyond a particular study context.

Reliability and validity in research study are important because they ensure the achievement of data quality. The quality of data improves the quality of inferences whilst the research findings which are based on quality of data generates quality conclusions.

3.12 Analysing the questionnaire and the interview data set.

SPSS version 25 was employed by the researcher to analyse the survey questionnaire whilst thematic analysis was employed in the analysis of the interviews. The use of SPSS not only does it present as one of the most popular analysis tools, but it is also versatile in its use as it can present different types of analysis. According to Arkkelin, (2014) the SPSS software is consistently being update and improved and this gives researchers the opportunity to have reliable data analysis.

The survey questionnaire has been attached as an appendix A with the interview questions as appendix B.

3.13 Implication of the research findings

The impact of the findings is very important as it helps in the research results. This is because the findings will determine the differences and correlation of literature and the happenings on the field in terms of theory and practice. The objective of this study was to explore the factors that affect collaboration in the gold mining industry of Ghana. In this regard, the researcher collected data on the field and analysed to determine if the findings correspond

with the literature review. The implication of the finding will show if data collected is a true representation of extant literature. If it is positive or otherwise, reasons must be sought as to why it is so.

The selection of the topic has an implication on the gold mining industry in Ghana. The gold mining industry must work closely with suppliers to understand the issues relating to collaboration in the supply chain. The findings show the concerns raised by the respondents in bid to collaborate with their supply chain partners. These are the issues the gold mining industry find critical when selecting their collaborative partners. The comments from the supply chain managers from the gold mining industry affirmed that the industry takes those finding very seriously and for its collaborative network to work, they must be on the same page on the factors identified during the field study.

Thus, the study will help practice, theory, and policy. It will also help subsequent research study in the field of gold mining supply chain collaboration.

3.14 Summary

This chapter has presented the research methodology used in the study. The objective of this chapter is to use the data collected from the field study to answer the research questions identified earlier in this chapter and to explore the dimensions of collaborative supply chain through the identification of the factors that affect supply chain collaboration in the gold mining industry in Ghana.

The research design adopted in this study attempts to examine the objective knowledge and experiences of supply chain collaboration in the gold mining industry.

Mixed method research was adopted in the study. The essence of triangulating the data through the use of quantitative and qualitative methods was to ensure rigor and reliability. This was done to answer the research questions. The presentation of the methodology in this study was based on the data gathered from the gold mining companies in Ghana through the survey questionnaire and the interviews. The total targeted population was from the list of functional gold mining companies from the Ghana Chamber of Mines.

The next chapter will present the results of the research.

CHAPTER 4

RESEARCH RESULTS

4.0 Introduction

Chapter four recounts the rate of responses, the results of findings and analysis of data.

This research was undertaken to examine the factors of supply chain collaboration in Ghana's mining industry. An extensive literature review was conducted to gain more insight into understanding the theories whilst survey by questionnaire was undertaken to determine the factors of supply chain collaboration and their practice in the mining organisations. This was to determine the limitations and how they improve organisational performance.

As argued by Burns and Grove (2003) survey by questionnaire is appropriate because it seeks to examine the collaborative relationship and organisational performance. The research was conducted extensively using survey questionnaire as supply chain collaboration has been opened to empirical study in recent times due to very few researchers venturing into it.

Though supply chain collaboration has received lots of attention from researchers, supply chain collaboration relating to the mining industry has barely been explored. There has not been any empirical research that investigates the drivers of supply chain collaboration in the mining industry and its impact on the performance of the mining organisations. In line with the argument by Ellinger *et al*, 2012; Kotzab *et al*, 2012, this research undertakes an exploratory approach to examine the drivers of supply chain collaboration in the mining industry. Collection of data was undertaken to answer the research questions and to examine the connection between the constructs identified in the conceptual model in chapter 2. As

opined by Robison (2012), in order to ensure that error was minimized and to improve the results, the appropriate survey design, data administration and analyses were taken.

4.1 Respondents company background

This section represents information gathered on the background of respondents' companies. These include the main business activities, organisation strength, positions of respondents, and production capacity (organisation's volume of production per annum).

Criteria	Per cent
Position in company	
General manager	2
Commercial manager	6.9
Supply chain manager	8.9
Supply chain superintendent	5.9
Supply chain supervisor	12.9
Procurement supervisor	15.8
Supply chain officer	19.8
Logistics officer	12.9
Warehouse supervisor	12.9
Others	6.9
Total	100
Years worked (work experience)	
1-5	30.2
6-11	40.6
12-17	19.8
18-23	6.3
24-40	3.1
Total	100
Organisations main business	
Mining	73.3
Logistics provider	26.7
Total	100
The volume of production per annum (metric tonnes)	
150000	2
151000 – 300000	24
301000 – 500000	31
Cannot tell	43
Total	100

Table 4.1 Respondents background profile

4.1.1 Position of respondents

Table 4.1 depicts the positions of respondents for the survey. About 20% of the respondents were made up of supply chain officers. 15% were procurement supervisors, supply chain

supervisors, logistics officers, respectively and warehouse supervisors made up about 12% of the respondents for the survey. Supply chain superintendents who are assistant managers were about 6%, commercial managers 2% and general managers 2%. Others comprised of planners, contract administrators/officers, warehouse managers and other seniors staff registered about 7% each of the total respondents for the survey. The target respondents for this study were the middle-level personnel that comprised of supply chain officers, procurement supervisors and logistics officers of the mining companies. These officers were targeted because they are directly involved in the day-to-day operations of the mining supply chain. Therefore, the results gathered were satisfactory because they met the researcher's requirements of the target respondents.

4.1.2 Work Experience of Employees

Table 4.1 represents the number of years worked by the respondents. About 40% of the respondents worked with the mining organisation between six to eleven years. 30% of the respondent had worked between one to five years, whilst 20% had been with the mining organisation between twelve to seventeen years. About 6% and 3% had worked with the mining organisation between eighteen and twenty-three and twenty-four and forty years, respectively. The number of years worked by respondents had a direct impact on the answers to the questionnaire as their level of experience was crucial to the results expected. The data in table 4.1 suggested that the respondents had significant experience and played a major role in decision making in the supply chain operation. Therefore, they were able to offer an

adequate understanding of their respective mining organisations.

4.1.3 Business activities of respondents' company

Table 4.1 shows the type of business engaged in by the respondent organisations. The main business of the respondent organisation is gold mining, and this takes about 73% whilst about 27% covers logistics companies that service the gold mining organisations for the study.

4.1.4 Annual volume of production (metric tonnes)

The results of the organisation's annual volume of production in table 4.1 show that 2% falls with 150000, 24% falls within 151,000 and 300,000, 31% produces between 301,000 and 500,000 and 43% could not indicate the annual production volumes of their respective organisations. This indicated the complex nature of the organisation in terms of the production levels as respondents did not have an idea of the annual volume of production.

4.2 Collaboration partners

This section presents information about the collaboration partners of the respondent company for this study. Feedback of respondents' views on how they perceive collaboration with their supply chain partners is further analysed in this section. Table 4.2 depicts the percentages and totals for respondents' views.

Key suppliers of supply chain	
Mantrac	1
Mining Engineering	2
Sandvik	22.8
Paterson Simons	9.9
FLSmith	8.9
Engineers and Planners	12.9
Absolute Africa	15.8
Others	26.7
Total	100
Key stakeholder	
Sandvik	22.8
Servaco PPS	14.9
Mantrac Gh	32.7
Metso minerals	14.9
Others	14.9
Total	100
Long term relation	
Servaco PPS	3
Coin De Mire	8.9
BCM	17.8
Weir Minerals	14.9
Bolore Logistics	3
Sandvik	25.7
Other	26.7
Total	100
Mutual relationship with suppliers	
Yes	83.2
No	5.9
Somewhat	9.9
Not sure	1
Total	100
Most important factors in collaborative partners	
Coordination	33.7
Information sharing	34.7
Good pricing	24.8
Strategic alliance	4
Cooperation	1
Responses and visibility	2
Total	100
Total	100

Table 4.2 Collaborative partners

4.2.1 Key suppliers of supply chain

Table 4.2 shows the key suppliers to the respondent mining companies. These key suppliers vary from one respondent company to the other because these are independent entities (mining organisations) and have preferences based on their site base, equipment used and gold milling machinery. According to the table, 'others' had the highest percentage of 26.7 because each individual respondent company has its criteria in choosing its key supply chain suppliers.

It is worth mentioning that the origin and headquarters of the mining company have a strong choice for its suppliers, key stakeholders and who they form long term relationships with. For instance, a mining company with an Australian origin will have its key suppliers from Australia and not South Africa and vice versa. As the mining organisations have their own culture, their headquarters or origin has a lot more to do with the kind of suppliers they deal with. This is largely based on their comfortability with the types of products suppliers.

4.2.2 Key stakeholders

The respondent companies presented a fair idea of who their key stakeholders were. While 32.7% indicted Mantrac Ghana as their key stakeholder, 22.8% indicated Sandvik, Servaco was 14.9%, Metso was 14.9%, and Others also indicated 14.9% as their key stakeholders.

4.2.3 Long term relationship

Table 4.2 shows that 26.7% of ‘others’ suppliers had a long-term relationship with the respondent mining companies. 25.7% with Sandvik, 17.8% with BCM, 14.9% with Weir Mineral and 8.9% with Coin De Mire. This indicated that the respondents had a long-term relationship with various independent suppliers. This relationship goes beyond one year, which respondents deemed long enough to maintain a lasting relationship with the mining industry. It was gathered that due to the nature of the mining organisations, forming a long-term relationship must be strategic and beneficial to the mining organisation.

4.2.4 Mutual relationship with suppliers

Table 4.2 illustrates the mutual relationship that exists between the mining organisations and suppliers. According to the data analysed, 83.2% indicated that mutual relationship exists between their organisation and its suppliers. 5.9% indicated that there was no mutual relation, 9.9% indicated somewhat relationship exists as 1% was not sure of any existing mutual relationship.

4.2.5 Most important factors in collaborative relationship

Table 4.2 describes the respondents’ views on the most important factors of supply chain collaboration. 4% of the respondents indicated that coordination was the most important factor when it comes to supply chain collaboration in the mining sector. Whereas 50% believed information sharing was crucial, 36% suggested good pricing was the most important factor. 5% of the respondents indicated that strategic alliance was most important, 2% indicated cooperation and 3% indicated responses and visibility were the most important

factors in supply chain collaboration in the mining sector.

4.2.6 Drivers of supply chain collaboration

This section presents a descriptive statistic of responses to part III of the survey questionnaire where respondents views were gathered with respect to the drivers of supply chain collaboration in the mining industry. These were further analysed in the next section. Table 4.3 presents feedback from respondents' questions on the variables that impact the drivers of supply chain collaboration in Ghana's mining industry.

Information sharing	
Strongly agree	19.8
Agree	53.5
Neither agree nor disagree	19.8
Disagree	3
Strongly disagree	3
Not applicable	1
Total (unit)	100
Strategic alliance	
Strongly agree	27.7
Agree	48.5
Neither agree nor disagree	17.8
Disagree	2
Strongly disagree	1
Not applicable	3
Total (%)	100

Table 4.3 Drivers of supply chain collaboration

4.2.7 Information sharing

Table 4.3 indicates information sharing with suppliers and the respondent mining

organisations. 19.8% strongly agreed that there was indeed information sharing between their respective mines and suppliers. 53.5% agreed, 19.8% neither agreed nor disagreed, 31 disagreed, 3% strongly disagreed whilst 1% indicated information sharing is not applicable between them and their suppliers.

4.2.8 Strategic alliance

According to table 4.3, strategic alliance captured the responses from respondents regarding their alliance with suppliers. Whilst 27.7% strongly agreed to the strategic alliance, 48.5 only agreed. 17.8% neither agreed nor disagreed, 2% disagreed, 1% strongly disagreed, and 3% indicated strategic alliance was not applicable to them and their suppliers.

Human resource management

Yes	52.5
No	17.8
Somewhat	25.7
Not sure	4
Total (%)	100

Cooperation

Yes	61.4
No	17.8
Somewhat	15.8
Not sure	5
Total	100

Networking

Yes	73.3
No	7.9
Somewhat	15.8
Not sure	3
Total	100

Cultural gap

Yes	77
No	11
Somewhat	11
Not sure	1
Total	100

Organisational structure

Vertical	66.7
Horizontal	33.3
Total (%)	100

Table 4.4 Additional drivers of supply chain collaboration

4.2.10 Human resource management

Table 4.4 depicts responses from the respondent regarding human resource management and supply chain collaboration with their supplier. 52.5% indicated ‘Yes’ as human resource

management presence in the supply chain collaboration, 17.8% indicated 'No', 25% indicated 'somewhat' and 4% were not sure.

4.2.11 Cooperation

Table 4.4 captures the level of cooperation between suppliers and the respondent organisations. Whilst 61.4% indicated 'Yes' as there is a cooperation between their organisations and suppliers, 17.8% said 'No'. 15.8% indicated 'somewhat', and 5% indicated 'not sure'.

4.2.12 Networking

Table 4.4 represents the level of networking between suppliers and respondent organisations. 73.3% indicated that there was a level of cooperation between their organisations and suppliers. 7.9% indicated 'No', 15.8% indicated 'somewhat' and 3% said they were 'not sure'.

4.2.13 Cultural gap

Table 4.4 describes the cultural gap between suppliers and the respondent mining organisations. 77% of respondents indicated 'yes' to the question posed, 11% said 'no', 11% indicated 'somewhat' and 1% indicated they were not sure.

4.2.14 Organisational structure

Table 4.4 shows the organisational structure of the mining organisations. Whilst 66.7% indicated the structure as a vertical one, 33.3% indicated it was a horizontal organisational

structure.

4.3 Survey Results

Statistical analysis was performed using SPSS for windows. This was used in capturing the data from the responses gathered from the survey questionnaire. The SPSS software helps in the computation of data gathered from the study in terms of frequency, mean and standard deviation. The software also helps in analysing statically the correlation between the research theme classifications that seek to test the differences within the respondent organisations.

4.3.1 Normality Assessment

Prior to the statistical analysis, it was crucial to test the distribution characteristics of the data to ascertain if the variables were generally distributed. According to Pallant (2010), this is done to ascertain that the scores distribution on the independent variable is normal. This was, however, determined to be normal through the use of SPSS. According to Gravetter and Wallnau (2004), usually "normal" is used to refer to the symmetrical bell-shaped curve that has the highest scores frequency in the middle with the end having lesser frequencies. The postulation of distribution of normal in a data set can be explored in diverse ways, but the most used method in the usage of SPSS is the Analyse and Explore menu. The Explore technique is mostly used because of the simultaneous use of statistics and graphs.

4.3.2 Reliability

Saunders *et al* (2009) argued that reliability is the degree to which data collection techniques or the procedure for data analysis produces consistent results. As this study adopted the scaled

responses, it is imperative that the reliability of the scales is examined. As a form of internal instrument consistency, reliability tests were undertaken. According to Sekaran and Boougie (2013), reliability examines how consistent and stable a measuring instrument is in relation to the variables or theory it is measuring. It considers the degree to which, without bias, how the measurement establishes consistency through time and the various items in the instrument. Stability of measure is the tendency for a measure to remain unchanged over a period despite tests conditions that are uncontrollable. This study did not consider the test because of resources and time constraints.

4.4 Interview results

Tables 4.5 to 4.8 depict interview results obtained from interviewees from their respective mining organisations. In order to anonymize the organisations interviewed, the organisations were named as company A, B, C and D.

The same questions were presented to the companies and the focus was top level managers who were targeted to confirm or contest views gathered during the survey. The interview questions were drawn based on the literature and the survey to collaborate what was identified on the study.

Even though the field study sought to identify with what is in extant literature, there were significant observations. As supply chain collaboration functions cuts across all industries, the mining supply chain collaboration however, differs in its understanding of collaborative relationships. It is important to note that the mining industry operates within a community

and their suppliers need to consider these communities as part of their relationship. As indicated by some of the supply chain managers during the interview, damaging the relationship with the communities is very difficult to repair. As a result of that suppliers are inducted and made to observe the regulations regarding community engagement at all times. According to the supply managers, suppliers sign off documents as part of their qualifying criteria prior to their business relationship with the mining organisations.

The respective supply chain managers interviewed shared similar views but their collaborative relationship with suppliers was seen to be different from what extant literature depicts. Extant literature on supply chain collaboration focuses on the construction, retail, manufacturing, and pharmaceutical industries other than the mining industry. This makes the mining supply chain collaboration a unique one.

Questions	Company A
<p>Why does your organisation form a collaborative relationship with its suppliers?</p>	<p>A). Priority. SC is a network of activities from which you need one another in order to have the organisation's operations going. There is the need to create a relationship with the supplier that could result in focusing on the one who gives value for money. Need a supplier that can be engaged in the business activities and can be assured of continuous business supply.</p> <p>B). Gives comfort where other customers are struggling to secure supply from them, my organisation can still benefit from continuous supply -</p> <p>C). It helps me to let the system operate efficiently and effectively, and that can amount to cost reduction, avoidance of nil stock. The supplier will look at my volumes and can in the future or another time tilt towards me and give me better services as compared to other mining companies.</p>
<p>How does your organisation select suppliers to collaborate with? What is the basis for collaboration with your suppliers?</p>	<p>a). Quality b). Availability c). Honesty</p> <p>We don't look at one aspect alone. What you listed is part of what we base on, including what I just highlighted. There are some suppliers who are loyal and may look for things that are not their core business, but due to their relationship with us, they may find ways and means in supplying the items we request for.</p>
<p>Based on your total supplier base, what percentage of your suppliers do you have collaborative relationship with?</p>	<p>a). Percentage-wise, it will be difficult to say but can say we can do that based on the category of suppliers we have. b). Base on the strategic suppliers we can say about 40%</p>

Based on the SC collaboration factors presented, which of them applies to your organisation as most important?	Information sharing is very critical in every business operation. We take the information seriously as it is the life wire of our operations. However, price, quality and lead time are key to the survival of our operations. Cooperation, networking and strategic alliance are equally crucial ingredients needed for collaboration to succeed.
Is your collaboration relationship always successful, and what makes it successful or otherwise?	Sometimes it does, and sometimes it doesn't. I will say there are so many things we look at. Sometimes the community relationship. We have certain vendors or a section of products we are supposed to buy from particular vendors. For example, in weeding, we will want to develop the community to the extent that the mine will be seen as giving the local suppliers some form of business. So we collaborate with them to develop them, but in the end, some of them fail us. We have been able to develop a community contractor who is able to compete with other contractors coming outside the community.
What other advantages do you gain from these collaborative partners -development, cost-effective in	a). A commitment of loyalty b). Looking or keeping each other's back - security c). Project the image of the company
Are there any mitigating factors put in place by your organisation should the collaborative relation go wrong?	Every organisation has its ethics. The collaborative entities that we deal with are not treated differently from our goals and rules. We make sure that we go by the rules and ensure that our suppliers are ethical so as we. Before any supplier is enlisted, we take their documentations through due diligence and ensure that no dodgy suppliers are used
In your estimation, what do you consider as an unsuccessful collaboration?	a). Sometimes you are successful other times, and you are not. Sometimes we feel the market is volatile and so we receive unsuccessful feedbacks. b). Sometimes we have to pay upfront to suppliers which tends to harm our operations and makes our collaborations unsuccessful.

Table 4.5. Company A interview response

The supply chain manager from company A was able to elaborate further when the interview questions were presented to him. He stressed on the fact that supply chain collaboration should add value to an organisations business activities. He observed that deepening their relationship with suppliers placed his organisation on a level where quality of goods, lead time management and product pricing were important among the key factors identified as the factors of supply chain collaboration. He indicated collaborating with suppliers means having each other's back. Additionally, collaborating suppliers means extends to their communities as their key stakeholders. The supply chain manager elaborated further on what constitute collaboration failure which he indicated that supply chain collaboration cannot always be

successful because of the volatility of the market.

Questions	Company B
Why does your organisation form a collaborative relationship with its suppliers?	To have a win-win situation that helps to know the suppliers and their challenges. At the end of the day, the benefit comes back to you (the mining company)
How does your organisation select suppliers to collaborate with? What is the basis for collaboration with your suppliers?	It depends on the nature of the product and the services they are provided. We look at their technical competencies, references to which other mining companies they have worked with before. Quality and price cannot be left out. Price is not always what we look at but the quality and the technical competence. Until recently, the local content law was passed, and so local suppliers need to be developed. Even where they do not have the competencies, they are required to be helped due to the law.
Based on your total supplier base, what is the percentage of your suppliers do you have collaborative relationship with?	a). We look at the top 10 suppliers in terms of spend. There are suppliers we rate on a monthly basis. b). Procure to pay system. The amount spent on the suppliers are not huge but because we use them more often.
Does your organisation invest in infrastructure and people to help in collaborative relationship?	Declined to answer
Is there any performance measurement system that your organisation use to determine the collaborative relationship? Why – if yes or no?	Yes
Do you see collaboration with your partners as a suitable way of saving cost?	Yes
Based on the SC collaboration factors presented, which of them applies to your organisation as most important?	Pricing and quality are the crucial elements we focus on because the mining business is a capital intensive one, and so these drive our business very much. We are inclined to information sharing, cooperation, networking and strategic partnership to help us succeed. Crucial among these is a consolidation of our orders and suppliers' ability to agree to our payment plan.
How do you see your collaborative relationship in terms of win-win and win-lose?	It's a win-win because once we are happy and they are happy in terms of the services they provide us and are meeting our needs and they are being happy with our payment system and the job we give to them, it's a win-win situation.
Companies often use collaboration as a way to fill in gaps in their own capabilities. Is your estimation does your company see this happening	Yes, we were doing owner mining, and we recently changed to contract mining. With owner mining, every five years, things have to change. Now the business model is that we employ contractors to mine, and this is a way of bridging the gap. We do outsource our core activities as they seem to have more competencies, so they

and why?	come to fill in the gap.
Does your organisation invest in infrastructure and people to help in the collaborative relationship?	Yes, it does. It's a way of supporting when we identify that they lack it. For example, we are able to buy a fleet of machines for the contractors and spread the repayment over a period of time. Due to the raining season, we recently bought de-watering pumps for our contractor and payment is made over time, and the benefit comes to us.
Do you see your organisation entering into a long-term collaboration relationship with its partners?	Yes, because we have a long-term contract with our supplier.
Are there any mitigating factors put in place by your organisation should the collaborative relation go wrong?	Yes, KPI's, we do have service level agreement that is being monitored by managers daily to ensure that reports are generated to know the performance of contractors.
In your estimation, what do you consider as an unsuccessful collaboration?	As indicated earlier.

Table 4.6. Company B interview response

The supplier manager from company B was particularly interested in a win-win relationship. When asked further, he indicated that supplier selection and management is carefully done to ensure that they get the best out of their suppliers. This, he indicated that there is a monthly review of their suppliers to ensure they are performing according to the laid down policies. When asked about the factors affecting supply chain collaboration, he indicated that pricing and quality of the goods they procure are important to the mine. However, their business thrives with effective information sharing and proper payment systems as without that they cannot have a good collaborative relationship. Furthermore, the supply chain manager stated that long term relationship with their partners seeks to help their business. KPI's and service agreements are put in place to ensure that suppliers' performance are always up to the standard.

Question	Company C
Why does your organisation form a collaborative relationship with its suppliers?	They are the major customers that we work with. The nature of work we do, we need people who understand the needs of our job. We do understand the needs of the mining companies, and we always come ahead of competitors.
How do you see your collaborative relationship in terms of win-win and win-lose?	In all situations, it must be a win-win, but that's not the case with the mining company. In most cases they want to take advantage and come ahead of you but that notwithstanding we always try to come to a compromise and be on the same page.
Do you see collaboration with your partners as a suitable way of saving cost?	Yes, because in a situation of handling a project, if we are able to collaborate very well ahead of time, we are able to save a lot of costs. That is when we are able to collaborate very well with the mining company to ensure the needed documentation and processes are done effectively.
Based on your total supplier base, what is the percentage of your suppliers do you have collaborative relationship with?	a). We look at the top 10 suppliers in terms of spend. There are suppliers we rate on a monthly basis. b). Procure to pay system. The amount spent on the suppliers are not huge but because we use them more often.
Does your organisation invest in infrastructure and people to help in collaborative relationship?	Declined to answer
Is there any performance measurement system that your organisation use to determine the collaborative relationship? Why – if yes or no?	Yes
Do you see your organisation entering into a long-term collaboration relationship with its partners?	Yes, that is what we are yearning for. But because we are not the only company in the business so sometimes, we face competition, but that has been our wish, and we are still pushing to have a long-term collaboration with them.
Based on the SC collaboration factors presented, which of them applies to your organisation as most important?	We see our suppliers as partners, and they must help us when we are in need, most especially when we need to adjust our payment systems to suit our situation. We take community engagement very seriously. Our suppliers must respect and value our community.
Do you see your organisation entering into a long-term collaboration relationship with its partners?	Yes
Are there any mitigating factors put in place by your organisation should the collaborative relation go wrong?	Yes, we do, but for every business we need to have other plans in place so that where something goes wrong, or face competition and business goes down, we turn to the alternatives.
In your estimation, what do you consider as an unsuccessful collaboration	Declined

Table 4.7. Company C interview response

According to the supply chain manager from company C, the nature of their business requires that their suppliers understand them to ensure that they stay ahead of competition. He

indicated that the policy of their mining company is to ensure a win-win supplier relationship. He believes that a well-structured supply chain collaboration drives down costs and ensures efficiency. The manager further indicated that they assess their supply partners monthly to ensure that they are getting value for money as a result of their relationship. He mentioned that suppliers are seen as their partners and that having a payment system that works for them all is what they always seek in their long-term relationship.

Questions	Company D
Why does your organisation form a collaborative relationship with its suppliers?	a). We collaborate with suppliers based on our own interest, and suppliers will also do so in their own interest. b). Every minute counts in mining and collaborating with suppliers is key because the supplier is able to deliver products at a time you so needed. So collaborating with them gives you the ability to secure key items when you run out of them. c). Collaborate to maintain operational sustainability.
How does your organisation select suppliers to collaborate with? What is the basis for collaboration with your suppliers?	a). Usually, we do the competitive tendering process to ensure that the suppliers meet our basic requirements. b). We look at the capability of suppliers , c). The social standing of the suppliers. d). Safety standards of suppliers e). Timeliness of the suppliers' delivery to us f). Cost having a competitive cost g). Quality So, we look at which of the suppliers is able to fulfil these, and we select them to do business with.
Based on your total supplier base, what is the percentage of your suppliers do you have collaborative relationship with?	a). We have a good number of suppliers categorised as our key suppliers who represent about 20% who supplier 80% of our goods. b). The 80% of our suppliers contribute as adhoc suppliers – these are the transactionary suppliers who supply us with the smaller spent items but are frequent.
Does your organisation invest in infrastructure and people to help in the collaborative relationship?	a). Yes. We have a whole unit that works closely with our suppliers. The unit works with our strategic suppliers and transactionary suppliers to ensure that we know their abilities and offer training where necessary. b). The only thing we wish to do is constantly monitoring these suppliers to ensure whatever they supply to us is produced on high safety standard
Is there any performance measurement system that your organisation use to determine the collaborative relationship? Why – if yes or no?	No, we do not have that in place at the moment.
Do you see collaboration with your partners as a suitable way of saving cost?	Yes, from time to time, they do get the idea to come to us, and we accommodate their ideas to improve our business and performance, and that drive our cost down. We focus on continuous improvement.
Do you see your organisation entering into a long-term	Yes

collaboration relationship with its partners?	
Based on the SC collaboration factors presented, which of them applies to your organisation as most important?	Every successful organisation thrives on good information. But we see trust and openness as strategic for us because if you do business with us, you must be able to be transparent. We base largely on the supplier's ability to deliver our shipments in bulk quantities to save us cost. The cost has been an issue to us most, especially when we are in gold price crisis. Competitive pricing from suppliers with good lead times is very important to us as well.
Are there any mitigating factors put in place by your organisation should the collaborative relation go wrong?	Every contract that we sign we try to have a termination clause that helps us in times when the contract goes wrong, we terminate or continue where it is favourable.
In your estimation, what you consider a successful collaboration?	a). A successful collaboration is being able to maintain our relationship with our suppliers. b). On the other hand, if we realise that there are challenges in terms of quality, safety, etc., and it compromises our business, it becomes a disadvantage and termination will have to be enforced. Therefore, making our collaboration unsuccessful.

4.8. Company D interview response

The supply chain manager from company D indicated that working with suppliers must be done to ensure each other's interest is protected. According to him, collaborating with supply partners is crucial to ensure that key supplies are delivered to the mine site on site and at the right price as every minute counts. In order to ensure that they get the best suppliers; the company goes into competitive tendering process to ensure that the suppliers meet their basic requirements. On the question of the supply chain collaboration factors, the manager indicated that information sharing, openness and trust is key to secure a business deal with the company. He further indicated that having a successful collaboration is to maintain a good relationship with their supply partners.

The above tables captured in detail the views shared by the supply chain managers interviewed on the company's premises. The interview conducted identified further views held by the supply managers that were not mentioned during the survey questionnaire. Typical was the idea of an unsuccessful collaboration. Even though some of the supply chain

managers declined to comment on that, others were critical to the idea of some suppliers having to lose out when things are done differently from the laid down policies and procedures.

To avoid duplication, the interview topped at 4 companies as almost all the mining companies provided close to the same answers. The reason was deduced from the fact that the mining supply chain looked similar in nature. Asked why it was so, the researcher was informed that the supply chain managers have a forum at the Ghana Chamber of Mines where they meet every quarter. The forum seeks to share ideas on how to secure the best deals from their supply chain partners and meet government regulations, among others.

4.5 Conclusion

This chapter has presented the results of the questionnaire and interviews conducted in the mining organisations. The interviews conducted provided valuable insight into the factors that drive supply chain collaboration in the mining industry. The views provided by the top managers were crucial because they survey questionnaire could not capture those views. These views go to cement further the answers secured during the filed study. It therefore highlights in detail what supply chain collaboration means to the mining organisations and how they feel about their supply partners.

The validity and reliability were enhanced using the various sources of data during the analysis. The analysis presented demonstrates the views of the supply chain professionals who took part in the study. These professionals were carefully selected based on their length

of services in the mining business to ensure the best answers relative to the study were secured.

The researcher feels confident that the results presented regarding the factors that drive supply chain collaboration in the mining industry are unique because they seem to have been less reported in the studies identified in the literature review. This is so because most of the supply chain collaborations are in other sectors. The focus of supply chain in mining is usually on sustainability and other topical issues. The factors identified present supply chain collaboration in the gold mining industry as a unique one. Even though not all supply chain managers from the various gold mining companies were engaged in the interview process, the views gathered formed a true representation of what happens in the gold mining industry in Ghana.

Discussion of these results and other findings will be made in chapter 5. An evaluation of the results of this research will be made with the previous research studies that have been addressed in the literature review chapter.

CHAPTER 5

RESEARCH DISCUSSION

5.0 Introduction

This chapter presents a discussion on the findings and focuses on the aim and the related objective of the study. In fulfilling the aim and objectives of the study, and to answer the research questions, the results of the factors of supply chain collaboration in the preceding chapter are now discussed with the implications also discussed.

The discussion chapter of this study will cover the following main sections: the first section will discuss the factors affecting supply chain collaboration in the mining industry with respect to the literature. The second section will address the possible theoretical explanations. The third section will address the research methodology and the findings. The final section will address the limitations of the study and review the questions raised and to ascertain if the gaps highlighted in the literature review have been connected. This will be followed by the indication of originality and contribution to knowledge identified by the study recommendation for further studies.

5.1 Company background

This study identified the eleven mining companies in Ghana that were operational and had an annual production of not less than 150,000 metric tonnes. The total number of operating

mining companies were twelve. One of the mining companies turned down the researcher's request to participate in the survey as they could not secure approval from top management. These mining companies have been enlisted in the Ghana Chamber of mines website as registered operating large-scale mining companies under 'Represented Members Level A' (Ghana Chamber of Mines website, 2020). Having the eleven mining companies for this study formed a true reflection of the total number of mining companies based in Ghana. The author was satisfied in using eleven out of twelve because a true representation of the total mining organisations of the total population is achieved.

One of the characteristics in selecting respondents was the positions of the respondents. This was key to the study because the position of respondents offered an assessment according to the mining industry standards of the level of information that could be divulged. Senior officers from the rank of the middle level to management and executive levels were targeted. This had a great influence on the results of the study. According to Gray (2017), the level of respondents creates reliability and consistency of answers provided by the respondents.

The years of working experience attained by the respondents were crucial to the study because the number of years worked indicated the in-depth response given regarding the collaborative relationship their organisation has with its partners. This has a direct impact on the result as inexperience supply chain professionals might not be able to offer the needed answers required for the study.

5.2 Factors affecting supply chain collaboration and collaborative partners

According to Wang *et al* (2016), supply chain collaboration can happen when the collaborative partners are seen to be on the same page with regards to the key factors. These factors were reviewed in the literature in section 2.3 and formed the basis of the data collected and analysed.

5.2.1 Information sharing

Analysis of data from the mining companies indicated that information sharing was seemingly an essential part of forming a collaborative relationship. The idea of mining companies considering collaborative opportunities is largely based on information sharing. This is because when the whole partnership process is evaluated, due diligence needs to be given to the level of information that can be shared or withheld for the partnership to succeed.

The study showed that it was upon this premise that shared values and potentials were considered to determine the collaborative relationship was worth the risk. As the key element in the supply chain, all the mining companies and the logistics organisations interviewed were of the strong opinion that information sharing could not be overemphasised. Making available some key data and sensitive facts make it easier to relate well in terms of profit margins, logistics figures and costs. The finding agrees with Raweewan and Ferrel (2018), who argue that information sharing is the lifeblood, heartbeat, and foundation of supply chain collaboration.

According to the supply chain manager from “company B”, information sharing is undoubtedly important. Whilst there are other elements that contribute to a collaborative partnership succeeding, failing, or producing unsatisfactory outcomes, the supply chain manager from ‘Company B’ further suggested that information sharing is arguably the most vital. This confirms the argument by Zhenxin *et al* (2001) who indicated that for SCC to thrive, information flow must be the pinnacle of it and circulating effective information among the partners removes doubts and mistrust which also takes away the lack of confidence.

It was further adduced that information sharing has an impact on the operational cost of the mining organisations and the logistics companies. This was found to be true because it affirmed the assertion by Barbara *et al.* (2012) that collaborative distribution promises substantial cost savings and carbon emissions falls.

One position made by one of the supply chain managers contradicted the others. The manager was of the view that information sharing is not always favourable when it is of a sensitive nature and when competitors are involved. This came out to affirm the assumption made by Wang *et al* (2014) that some partners have been reluctant to get involved in any activity that requires sharing shipping data with competitors, especially when there are trust issues. The contradiction was also identified with Jeng (2015), who states that collaborations debatably have the highest level of failure rates of the various supply chain management practice that are presently being applied; with part of the problem being lack of trust among the

collaboration partners.

Even though information sharing was crucial to the success of the mining supply chain, it was, however, confirmed that trust issues could impact negatively on information sharing. Data collected and analysed in table 4.8 clearly suggested that one critical reason for failure is lack of trust and the fear of partners turning into competitors. Information sharing, as suggested by the supply manager from ‘company D’, must be handled in a way to avoid mistrust and in a sensitive manner by senior-level personnel to ensure confidentiality.

According to the supply chain, managers trust is critical when dealing with partners and must be one of the first ingredients to ensure successful collaboration. This will be discussed in section 5.3.

5.2.2 Strategic alliance

Organisations that compete in today’s business environment develop a strategic alliance with partners for diverse reasons and strategic goals. Todeva and Knoke (2005) opine that engaging in these strategic and several alliances with partners have a high tendency of yielding positives results in terms of acquisition of resources and creating synergies. A huge effort is needed to create, develop, and maintain a successful alliance.

Data gathered and analysed in table 4.6 pointed to the fact that strategic alliance was key to the survival of supply chain collaboration in the mining sector. As indicated by “company B”, a strategic alliance with suppliers positioning their business in a win-win situation. It was further observed that “company B” financed the purchase of expensive machinery for one of

its critical suppliers because the supplier did not have the financial capability to make the purchase for that machine needed for an operational job for “company B”. Even though there will be repayment of the machinery purchased, “company B” going to the aid of the supplier proved the collaborative relationship both companies share. This view falls in line with Todeva and Knoke (2005) who believe that strategic alliance comes with positive outcomes such as the creation of synergies and resource acquisition.

The researcher identified that strategic alliance creates operational sustainability between the mining companies and the suppliers. An assertion was made by “company C” where the supply chain manager indicated that “there is operational sustainability because of our alliance with XYZ supplier”. The SC manager explained further that the supplier could supply items that are outside their supply range. In most instances, their alliance with that the supplier has proved beneficial because critical spares have been delivered at crucial stages in their operations. The SC manager viewed the relationship with suppliers as strategic because they benefit in critical times of operational downtimes. Even though there are issues with their relationship, the SC manager indicated that their alliance has proved to be beneficial, which by far outweighs the negatives. In line with the assertion by Todeva and Knoke (2005), even though there are unresolved issues regarding the strategic alliance, literature affirms the fact that forming a strategic alliance and maintaining such collaborative relationship have confirmed its success. Todeva and Knoke (2005) go further to indicate that not only does strategic alliance require careful planning and the choice of partner at the beginning to be successful, but also clever relation management ensures lasting survival and success.

In an interview with the supply superintendent from “company D”, he indicated that most business conflicts are usually resolved when alliances are formed, because ‘suppliers are seen as stakeholders of their business’. This affirmed the argument by Sambasivan *et al* (2011) who mention that adequate degree of strategic alliance results in aids in collaborative partners to overcome conflict situations and unanticipated problems and increase the chances of the alliance’ success.

The field study indicated that development and maintenance of the alliance needed more efforts to build and develop by the partners. In answering questions relating to a strategic alliance, the manager from “company D” signposted that maintaining a strategic alliance with supply partners requires a greater effort. This assertion falls in line with literature where Parkhe (1993) posits that forming, developing, and sustaining a successful alliance is a daunting task.

On the other hand, the manager from “company C” acknowledged the positive effect strategic alliance has on his company; however, he believed it is usually associated with issues. This assertion was found to be in line with Bamford *et al* (2003), who argue that strategic alliances face complications and experience difficulties because the partners fail to advance an effective process for joint decision making. He further indicated that there are issues with strategic alliances in most cases due to partners most often trying to relate efforts to rewards. This claim was in line with the assertion by Parkh (1993), who state that to sustain strategic alliance, partners need to understand the factors that impact the outcomes of strategic alliance.

5.2.3 Cooperation

Crucial is cooperation to supply chain collaboration where its impact is greatly felt on the level of cooperation between the collaborative partners. Data analysed in table 4.6 indicated that the level of cooperation determines the level of a collaborative relationship. According to the supply chain manager from “company B,” the mining company can only form a strong collaborative relationship with its suppliers when there is existing cooperation. This was found to be in line with literature by Fynes *et al* (2005) and Liu and Wang (2011), who states that the idea behind cooperation is to achieve a mutual benefit for the supply chain collaboration partners.

Analysing the data further, it was observed from all the eleven mining organisations that the level of cooperation between the mining companies and their collaborative partners was crucial to the success of the supply chain performance. The level of cooperation leads to an enhanced supply chain performance in the mining industry. The level of uncertainty is also reduced because of the cooperation by the SCC partners. In line with the argument by Wadhwa *et al* (2008), lack of cooperation will mean that the system will not function and perform at its peak. This is because it would breed miscommunication, mistrust, and lead to the bullwhip effect (Christopher 2005).

The idea of cooperation was prominent in the data because the gold mining companies see it as the core of their success in terms of logistics, procurement, inventory, and warehousing. According to “company A”, their cooperation with their critical suppliers starts from the

point where the quotation is approved to the point where the order placed. In the estimation of the mining company in question, their suppliers must have an open book as that determines the level of trust, they both share.

“Supplier cooperation is key to winning the next contract or order”. This was the opening statement made by the supply chain manager at “Company B”. In his argument, the supply chain manager indicated that one of the key strategies adopted in his department is to ensure that the strategic supply chain is done through effective cooperation between the company’s critical vertical suppliers. The level of cooperation reflects in their order sourcing, expediting of the goods in transit, tracking of the goods in transit to the mine site and inventory management. The level of cooperation means that at each stage in the procurement process, there should be openness and trust.

These views were held by other mining companies that participated in the survey. Nevertheless, in order to validate the answers provided in the survey, an interview with the supply chain manager in “Company D” confirmed the assertion by Ding *et al* (2011) that cooperation among partners becomes effective when the profit and benefit are adequately shared. In this regard, cooperation between partners plays a crucial aspect in the business process and organisation integration of the supply chain.

5.2.4 Technical exchange

According to the supply chain manager from “company A”, their system has no direct interface with their collaborative partners because they use an entirely different ERP system.

He reiterated the fact that having a common exchange of IT system would have been a novelty but was quick to underscore its importance due to their level of operation. This assertion by the SCM from “company A” seemed far from the argument by Cai *et al* (2013) who state that technical exchange enhances supply chain performance and creates value.

“Company B” admitted to having a system that allows them to access their key partner’s inventory management system and not the entire IT system. The SCM indicated that part of their inventory system is managed by the partner and so they can monitor the inventory levels to determine the stocks that are depleting fast and when to replenish stocks where necessary. He further indicated that the exchange of the system offers them the ability to plan works and operations during plant shutdowns. This is because they can determine by the touch of a button what will be required for plant shutdown, compare the system with actuals and call for more stock to avoid stockouts. One crucial part of the technical exchange, as he further stated, was that lead time and transit time to the mine site are measured and factored into the logistics operations. As a result, they are almost always on schedule. The manager further indicated that when they measure their operation now with previous performance, the current supply chain performance attests to the fact that the situation of having a system interface with collaboration partners has yielded positive results. Even though not the entire IT system can be interfaced, it is much better than before.

In line with the literature, Ferdows (2006), and Inch *et al* (2008) posit that recent research has recognised the positive impact of technical exchange on development and performance in collaborative supply chain. “*Trust is key when sharing domain or system interface with*

our suppliers". This statement made by the SCM from "company C" falls in line with the assertion made by Levin and Cross (2004) who argue that suppliers will readily share their system with partners where there is trust.

In contrast, the SCM from "company D" was of the view that opening a company's system up with partners is one of the difficult decisions to take. He further stated that in a business environment where trust issues and competition are rife, critical analysis needs to be undertaken before such action could take place. He was swift to add that they have not yet made the decision to share systems with partners for now and that they may consider that in the future. This finding is inconsistent with extant literature by *Insch et al.* (2008) that suggest technical exchange as key to supply chain collaboration performance.

5.2.5 Organisational structure

The analysis of result in table 4.5 brings to the fore how vertical, and horizontal organisational structure impact the supply chain collaboration. The mining companies with vertical organisational structure had decision making coming from the top to the bottom. As the SCM from "company A" indicated, the decision to collaborate with suppliers was influenced by management. In that regard, the line managers are tasked with the responsibility to ensure that relationship with customers benefits the mining company to a larger extent. The SCM further stated that their values, beliefs, and principles are upheld to ensure that there is a win-win business with collaboration partners.

The SCM from "company B indicated that their organisational structure is fashioned to

incorporate the corporate structure where there is flexibility in its design. The SCM further indicated it is done to improve the cost structure and savings performance of the organisation. As a result of this, unit managers, supply chain manager and supply chain officers are involved in the organisational structure. This falls in line with literature by Johnson and Leender (2001), who expressed their views on organisational culture to be pivotal in collaborative relationships.

According to the supply chain manager from “company C”, even though their organisation recognises the importance of organisational culture, their structure is measured in a way to benefit their stakeholders primarily. He acknowledged the fact that organisational structure has a great impact on its supply chain activities; however, theirs has a lesser impact on supply chain collaborative partners. The SCM further stated that organisational structure changes are due to be undertaken to ensure supply chain activities become a central part of the business performance and growth. This, he stated, will help improve financial results.

Organisational structure as an enabler to supply chain collaboration was by “company D” seen differently by the respondents. As a follow-up interview on that, it was observed that predictable and unpredictable demand environment impacts the supply chain function and its collaborative partners. According to the SCM, in a predictable environment with viability supply chain process, the financial performance of the mine is improved. The supply chain manager further indicated that this had been the focus of its supply chain and its collaborative partners. This falls in line with extant literature by Germain *et al* (2008) that suggest that the financial performance of an organisation improves when the supply chain variability process

is affected by a predictable environment.

5.2.6 Cultural gap

“We take culture seriously as it defines who we are and how we regard our supply chain partners”. This was the opening statement made by the SCM from “company A”. the SCM believed that knowing the culture of an organisation, its stakeholders and partners is one step ahead of being ready to do good business. According to the SCM, before they engage with any supply chain partner, cultural differences is part of their questionnaire in order to get things right from the onset. The SCM further indicated that the culture gap enables them to plan their supply chain because of the time differences and sensitivity of certain terms and acronyms in drafting contracts. The same issue was raised by the supply chain managers from “company B” and “company C”.

The SCM from “company B”, indicated that they deal with partners whose time zones are different and so there is always one member of the team who is on standby to raise emergency orders and take queries from such partners. This is to ensure that there is no break in the supply chain.

The supply chain manager for “company C” indicated that culture is important in today’s business environment because of cross border trade. This assertion falls in line with literature by Hult *et al* (2002) that suggest that culture is sensitive and extends across borders with supply chain partners.

According to the supply chain manager from “company D”, even though their company respects the culture of their trading partners, they do not focus on culture as a means of forging supply partnerships. He further stated that once a supply satisfies their organisational supply policy and regulations, they are ready to do business. He was, however, quick to add that their company has specific countries it buys from and that they do not entertain delays and situations that may impact their business. When asked to explain further, he indicated that times zones and languages apart from English of certain countries does not allow them to deal with them.

5.3 Trust among collaborative Partners

According to the data analysed in table 4.5, trust among the collaborative partners was one of the major issues. The supply chain manager from “company A” stressed the need to have trusted partners who will help their business rather than engaging with shady suppliers who will only look after their interests. The manager further stated that the supply chain department had instituted a policy of open book where margins are agreed on. This, he said, was to ensure that no partner takes advantage of each other. According to him, his organisation has made the policy in a way that suppliers are able to approach them to discuss transactions when it turns out to be a “bad deal”. The SC manager further stated that this is part of their strategic alliance and partnership with suppliers. As a result of this, the company organises a yearly supplier forum where issues, concerns, challenges, and successes are discussed to better develop their collaborative partnership. This resonates with literature by Myhr and Spekman (2005) who opined that for supply chain partners to deliberately agree to

collaborate, trust must be the driving power to maximize joint performance outcomes.

The supply chain manager from “company B” stated that trust is important in dealing with collaborative partners. He indicated that as part of their supplier set up, due diligence undertaken to register suppliers into their database seeks to enforce trustworthiness. He stated that it had been clearly spelt out in their supplier set up a policy that any act of mistrust will treat their contract with suppliers null and void.

According to the supply chain manager in “company C”, collaborative partnership is a connecting dot of higher levels of specialization that comes with a growing need for integration within the overall supply chain. Supply chain collaboration brings out the specialities of partners that satisfy the partners in the end.

In a related comment, the head of supply chain in “company D” did not mince words in declaring trust as a key ingredient to every successful collaboration which supply chain cannot be ruled out. However, he indicated that it is one of the failures in today’s supply chain collaboration. Where partners are supposed to be collaborating together, competition creeps into the relationship to destroy it. The supply chain manager was of the view that their relationship with partners can develop further when trust issues are structured well to avoid conflict. He was of the view that trust is a crucial asset of the organisation because suppliers will be engaged if they possess an excellent track record but most importantly if they can be trusted. He further indicated that trust as a brand asset must be managed well because of the numerous stakeholders they deal with. In his closing remarks, he indicated that trust cannot

be bought or forced on suppliers and so it the responsibility of the organisation to work hard to earn it.

5.4 Originality - Collaboration factors identified in the field study.

As part of the research findings, the following were identified as factors that influence the collaborative partnership of the mining industry. These factors were, however, not identified in the literature reviewed for this study. These factors form the key part of the original contribution to this study.

5.4.1 Pricing of products and services

One of the critical issues almost all the supply chain managers highlighted was the pricing of products and services which were identified as one of the major factors that could do or undo relationships in the mining industry. The reason being the mining industry in most cases go through challenging cycles, over time, and so when gold prices drop, they expect their supply partners to drop their prices and their profit margins. Even though almost all the mining organisations adopted a similar strategy during the dip in prices of gold, some of the companies took more drastic actions in salvaging their balance sheet.

According to the supply chain managers from “company A”, the year 2018 was a challenging year for the mining industry. The drop in the world price of gold impacted negatively on their operations to the extent of their inventory levels being affected. One of the cost areas

management turned to was their supply partners. The aim was to cut down on excesses and to reduce inventory level. The supply chain manager further stated that their major supply partners were contacted to reduce their margins and mark up on the products and service to 15%. Some of the supply partners did whilst others did not because they felt it would impact negatively on their business. This made their company to take a decision to cut off all their partners who did not stand with them during their challenging moments. According to the supply chain manager, they take collaborative partnership very seriously and that challenging moment determine who your real partners are.

The supply chain manager from “company D”, shared a similar view but added that their management decided to go a step further by concentrating on the 20% of their suppliers with high highest spend to offer a discount in their pricing. According to their supply chain manager, this had a great impact on their financial position as against their regular 80% of supplier with a minimum spend. These findings are original as they have not been found in the literature reviewed for this study.

5.4.2 Variable payment system

According to mining organisations employed in this study, it was identified that the general payment system they applied for their suppliers as part of the terms of conditions was between 30 to 45 days. This is the period within which payments must be paid on invoices presented for goods and services delivered to the mining organisations. As part of the findings, collaborative partners were required to review their payment terms/system during

challenging times where gold prices drop. Instead of 30 to 45 days of invoice payments, partners are requested to extend the payment days to 60 and 90 days depending on the invoice amount.

According to the supply chain manager for “company B”, their partners were informed of the company’s challenging times and were requested to offer 90 days credit. This brought relief to the mining company because they were able to turn around their cash flows before paying their partners.

According to the supply chain manager from “company C”, they expect their collaborative partners to stand with them during challenging times. He hinted that it had become one of their strategies to turn to their partners for assistance during such times. He further indicated that as part of the extension of the credit days, they request some of their partners to finance the payment of products and services. He made mention of the term ‘upfront or advance payment’, where suppliers made payments on behalf of the mining company and later invoice for the bill to be settled. Instances where this usually take place is where duties on shipments are to be paid. In the usual sense, the mining company will make an advance payment, but during such challenging times, their partners are asked to finance the bill and later get paid. He further stated that in some instances, these bills are settled with a percentage mark up.

The other supply chain managers shared similar views as this was a form of relief to them during such challenging times. This point made by the supply chain manager has not been identified in the literature reviewed for this study.

5.4.3 Share of company value/community engagement

One of the factors that were identified during this study was the sharing of company values by partners of the mining organisations. It was clear from almost all the mining companies interviewed that sharing of their values is critical to the survival of the collaborative relationship.

The supply chain manager from “company B” made it clear that the mining organisation owes the community they live and work in a duty of care to the environment and the community people. As a result, their corporate social responsibility is to ensure that all their trading partners respect that value. He made it clear that one of the key suppliers they held high had to be terminated because of a lack of respect for the community. This, he explained that the said partner disregarded safety signs and spilled fuel on the road leading to the mine site and failed to report the spillage or to clean it up. His assertion was that issues of that nature trigger the community to revolt against the mining organisation because it is the mining organisation that engages the third-party contractors or the trading partners.

The supply chain manager from “company C” made a similar statement that the community is one of the key stakeholders of the mining organisations, and as a result, they hold their communities very high. Any collaborative partner that fails to respect their values will rather be sanctioned instead of being sanctioned by the community leadership. He further indicated that the company’s value incorporates the community and that must be abided by all their

partners. The supply chain manager from “company C” indicated that their supply policy has a bit of community engagement within that needs to be signed off by their trading partners. As explained by the various supply chain managers, sharing of the mining organisations’ value is critical to the survival of their partnership with the supply chain partners.

The supply chain manager from “company D” shared the same sentiments and further added that their partners must be part of their community engagement to ensure a win-win business. These findings have not been found in the literature reviewed for this study.

5.4.4 Consolidation of orders

Consolidation of orders as explained by the supply manager from “company B”, is the process where all their shipments are gathered or grouped by one partner in the warehouse and later shipped to the mine. He indicated that the company takes a strong view on this process as partners are required to take on certain responsibilities to safeguard their relationship. According to the supply manager, the collaborative partner needs to check items against the purchase orders and packing lists to ensure that the right items are consolidated or gathered because payments of invoices to items deliveries start when items are confirmed received by the consolidating partner. The challenge, as he further stated, was that when the wrong items are received and shipped, the mining organisation is not able to go back for its money as the warranty duration period might have elapsed.

The supply chain manager from “company c”, hinted that the idea of consolidation starts

from their logistics partners who gather all their cleared items from the port and products from local suppliers and delivered to the mining site. He stated that even though they pay for the consolidation of items, the partners take care of the warehousing, packing, and sorting charges. This, he said, gives the mining company time to prepare for the receipt of products into the mining warehouse.

On his view of consolidation, the supply chain manager from “company D”, mentioned that his company has a logistics officer who has been assigned to the duty of consolidation. The logistics officer liaises with the supply partners to determine which items are ready for delivery to the mine site, and he gives the green light on what will be delivered to the mining warehouse. It was identified that consolidation was one key element the mining organisations take into consideration in choosing a partner, especially in the area of logistics. These findings have not been found in the literature reviewed for this study.

5.4.5 Open book policy

The supply chain manager from “Company D” mentioned that today’s business environment requires collaboration, and that can only happen when there is open book policy among partners. He indicated that there must be fairness between the suppliers and the mining organisation as they are all working for profit. Open book policy sometimes means profit-sharing and, in some cases, sharing of losses too. He believes that open book goes beyond trust as there could be trust, but there could be no openness.

According to the supply chain manager from “company C”, before their partnership could thrive, there must be a situation where each partner could be open without hiding their mark up and percentage on each item, they deliver to the mine site. He indicated that this is what collaboration is about as collaboration must be favourable to all partners and not one-sided.

The supply chain manager from “company A” agreed to the open book policy but was quick to add that such a policy must be critically looked at to ensure transparency. He further indicated that it upon this basis that struggling partners are sometimes assisted by the mining organisation.

Even though open book policy is not a new concept in the field of supply chain management, it is, however, a new concept in the field of the mining supply chain. Open book, as mentioned by Mouritsen *et al.* (2001) and Kulmala *et al.* (2002), has always been associated with cost disclosure and negotiations between suppliers and buyers.

It is also important to point out that open book policy has been mentioned in some total quality management literature. Notably, Kidwell & Scherer (2001) discussed open book policy in their research as collaborative people-centred activity that aims at continuous improvement.

However, its identification in the field of mining supply chain during the researcher’s field study makes it unique to the industry on the data collected.

5.5 Conceptual Framework of supply chain collaboration in Ghana's gold mining industry

Collaboration is all about the gold mining organisations and their suppliers working together beyond the concept of the normal commercial relationship. This relationship is a departure from the point of discreteness that causes spot market trades to the point of relational exchange. That is, to create a role where the relationship of the gold mining organisations and their respective suppliers are no longer narrowly defined with regards to the transfer of ownership of goods and services.

Collaboration has indeed been seen as an enterprise by partners who recognise that working and operating solo is insufficient to resolving commercial and transactional problems. This assertion falls in place with Wagner *et al.* (2002) who opined that organisations working alone are not sufficient enough in solving common trade problems and achieving the desired goals.

Existing literature seeks to discuss collaboration in the context of manufacturing and other service industry with a limited study on the mining industry, especially in developing countries like Ghana where shipping, warehousing, and port operations for imports, are large influencers. This framework, as depicted in figure 5.1, shows where the gold mining industry in Ghana stands with regards to its view on supply chain collaboration. The mining supply chain collaboration goes beyond the traditional supply chain collaboration. The mining

supply chain collaboration looks beyond the factors highlighted in section 5.2. Hence the new framework has been developed by the author as a result of the findings made from this study.

The factors highlighted in red in the framework indicate the original factors identified by the research from the field study. These have been incorporated with the factors identified in literature to form the current framework.

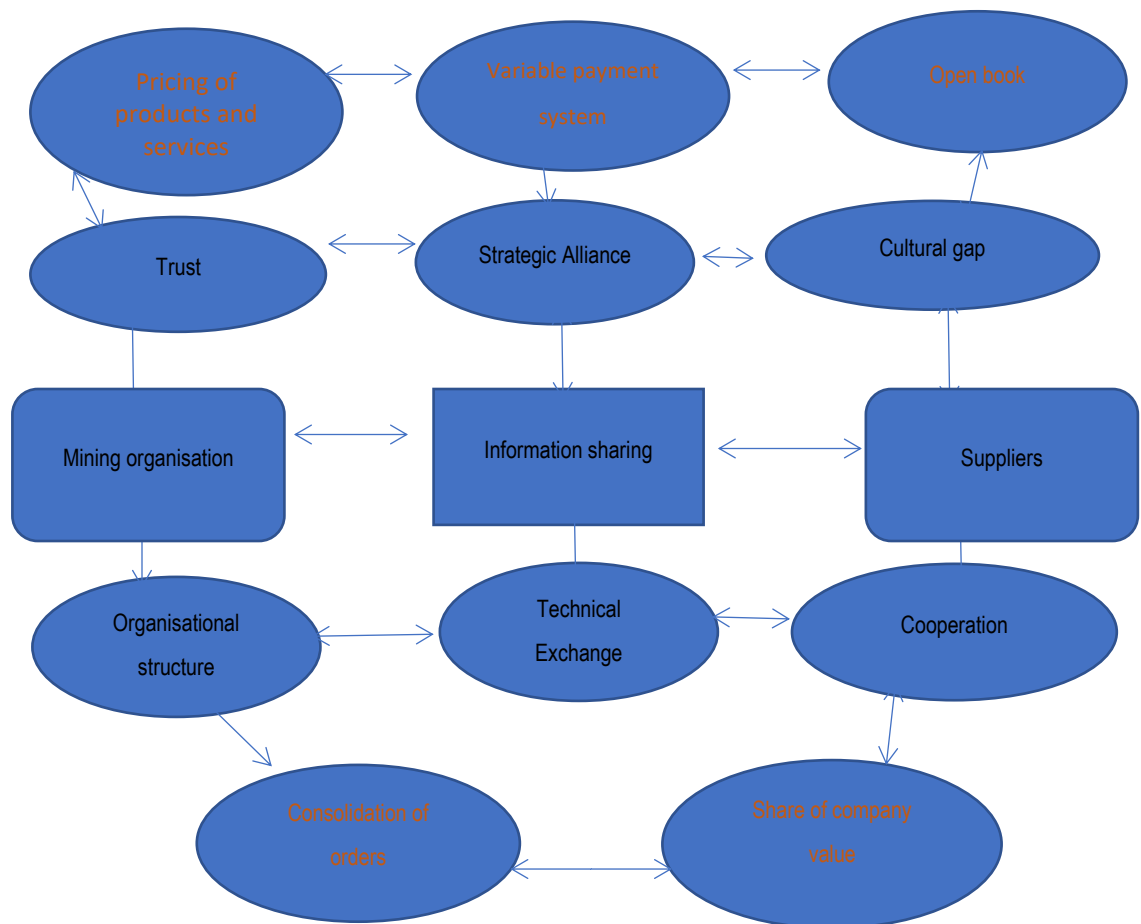


Fig. 5.1 Conceptual framework of SSC in Ghana's mining industry
(Source: Author of this research study)

The ultimate aim of the supply chain collaboration framework is to ensure satisfactory service delivery performance, reduction in operational cost and excessive inventory holding as well as improving service delivery in Ghana's gold mining industry.

With information sharing as the connection link between the mining organisation and the suppliers, the other factors serve as crucial ingredients to achieving the overall objectives of the collaborative relationship. These factors, as arrowed in the framework in fig 5.1, with no particular reference to their position, are connected to ensuring that the mining organisations get value for money in their supply chain.

Becker *et al* (2004) believe that as a prerequisite for the existence of collaborative supply chain, the partners must be actively engaged in working together, coordinating activities which go beyond the organisations in ensuring that customers' orders are fulfilled and satisfied.

The conceptual framework in Figure 5.1, developed by the author, sees trust, strategic alliance, cultural gap, organisation structure, technical exchange, and cooperation as key to the survival of collaborative relationship between the mining industry and its suppliers. Crucial are these factors that eliminating one from the factors may create a deficiency in the relationship. These factors were suggested, among other factors such as lead time, quality of goods and services, prompt payments and advancement payments, among others.

However, it turned out that the mining industry has migrated from the regular notion of product availability, product quality, etc. and now dwelling on essential factors that sustain operational transactions. These factors are critical to the mining industry because they serve as a driving force in their supply chain collaboration. Hence, their inclusion in the framework makes supply chain collaboration a critical aspect of the industry's supply chain operation.

The factors are the pricing of products and services, payment terms/systems, share of company values/community engagement, consolidation, and open book policy. Therefore, the key objective for opting for this framework was the long-term effect relationship that business to business may enjoy according to the research findings. This may be subject to test by future researchers.

The design of the initial theoretical framework in fig 2.1 had information sharing as the central part of the collaboration framework. The theoretical framework highlighted the collaborative performance system, decision synchronisation, integrated supply chain process and incentive alignment as key factors. These factors seemed to be interrelated because the absence of one factor may mean the break in the flow of the collaborative framework.

The new conceptual framework in fig. 5.1 has no particular reference to the positioning of the factors with regards to the arrows.

The preceding section, 5.5.1 presents how the conceptual framework was designed.

5.5.1 Design of the conceptual framework

The pillar of the new framework in fig 5.1 is related to the operation of supply chain collaboration activities which consist of seven elements. The primary element is information sharing which is the core in connecting the collaborative partners. The findings of this study bring to the fore that the survival of every business enterprise depends largely on the quality of information that is shared. This was echoed by one of the supply chain managers during the interview.

Obviously, these elements form the basis of the conceptual framework that drives supply chain collaboration in Ghana's mining industry. Trust is a crucial ingredient, without which the foundation of the relation is flawed from the onset. As indicated by one of the supply managers in the findings, a relationship that is not built on trust is already dead before it gets started. It behoves the mining supply chain partners to build and develop their trust in order to sustain their collaborative relationship.

Strategic alliance, as an element of collaboration, is needed to solidify the relationship between the mining organisations and their suppliers. Technical exchange is one crucial element which exposes the technological capacity of the mining supply chain partners. The plethora of supply chain activities comprise the width of collaboration. The mining organisations need to determine the extent of the technical exchange they share and collaborate on.

Though there is trust and cooperation, showing the level of the close relationship that exists between the partners (Sahay, 2003), there must be some boundaries to ensure data protection and confidentiality. The organisational structure and the organisational culture are deciding factors in deepening the collaborative relationship between the mining industry and its suppliers. The distinction of organisational culture and cultural gap, which has been common in supply chain literature, represents the depth of collaborative relationship among partners. This resonates with the opinions by Chopra and Meindl, (2001) and Fawcett and Magnan, (2002). The combination of these elements shows the intensity of a collaborative relationship between the mining industry in Ghana and its suppliers.

The current framework in Fig 5.1 complements the initial supply chain collaboration framework in the literature review in section 2.11. That framework in fig 2.1 has information sharing at the centre of collaboration performance, incentive alignment, decision synchronisation and the integrated supply chain. Even though these are collaboration elements in the supply chain, the elements do not represent the core values of the mining supply chain in Ghana.

It must, however, be mentioned, in line with the findings, that establishing and developing a collaborative relationship is just not enough if the relationship is not well nurtured and maintained. Maintaining the framework of relationship comes with complications as the elements may not be readily accepted by potential collaborators. Actors in the supply chain collaborations need to consider these factors to ensure it sits well with their organisational structure and culture before embarking on such a venture.

5.6 Research gaps

The problems identified in the literature have been addressed through the discussion of the research findings. One critical gap identified was in relation to technical exchange. Even though the mining organisations understand the importance of exchanging systems with supply partners, trust issues are one major concern limiting that collaboration. This, however, impacts on performance negatively and makes collaboration inconsistent with literature.

Opening up an organisation's technological system is like a gamble where it cannot be determined what information could be accessed and what would be used with the retrieved information. This makes it difficult for the mining companies to open their system up to partners as sensitive information regarding shareholders, stakeholders, and directors can easily fall into the wrong hands. Hence, the idea of technical exchange can be an illusion when it comes to the mining industry,

Literature reviewed had a deficit in discussing the other factors affecting supply chain collaboration. The factors:

1. Pricing of goods and services
2. Variation payment system
3. Share of company value
4. Consolidation of orders
5. Open book policy

seem to be missing in supply chain management literature. It is, however, important that this study has brought to the fore some factors in bridging the gap in the literature.

Limited literature on supply chain collaboration in the mining industry and almost none in sub-Saharan Africa has now been bridged by this study as most research studies has been conducted outside this region and on other mineral commodities.

One of the gaps in the literature relates to an existing research study that seeks to consider supply chain collaboration in other fields of study instead of collaborative supply chain in the mining industry context. The findings of this study have thus contributed to reducing the gap.

The next criticism of the literature was the deficit regarding the empirical investigation of the factors affecting supply chain collaboration in the mining industry. This study has considered such limitations by embracing a qualitative method and exploring the phenomenon in detail. The research findings from the current study are deemed to significantly contribute to broader literature. The enablers highlighted in the literature include the five factors in section 5.4 that are not stated in the literature review, particularly in the context of the mining industry. These factors are:

1. pricing of products and services
2. variation payment system
3. consolidation of orders
4. share of company values and

5. open book policy.

Finally, this research examined the enablers of supply chain collaboration in the mining industry by adopting the qualitative method of study. Most of the existing literature engaged the use of the quantitative dataset, which invariably eliminates the experience of people. However, this study has engaged qualitative dataset that covered the involvement of participants, the design of the approach, implementation, and experience within the mining industry of Ghana.

Even though the quantitative approach is arguably another way of arriving at the same result, however, the qualitative approach presents participants' engagement and offers a true reflection of the descriptive phenomenon as against measurement through statistical data.

5.7 Conclusion

This chapter has offered discussions of the findings, starting with the introduction, background of the organisations, factors affecting supply chain collaboration and the framework of supply chain collaboration. It is obvious that these factors presented are key to the sustaining the collaborative relationship with supply chain partners. The chapter has also presented the research gaps that could be filled by further research.

Originality and contribution to existing knowledge have been covered, therefore filling gaps in the existing literature. A presentation has been made on the limitation of the study and recommendations made for further studies.

CHAPTER 6

CONCLUSION

6.0 Introduction

The researcher, having examined the phenomenon of supply chain collaboration through the conduct of survey questionnaires and interviews, with the aim of investigating supply chain collaboration, opted to focus on the gold mining industry in Ghana.

To ensure high quality of research findings that conform with practice and the University standard, the researcher adopted the appropriate methodology with which the aim and objectives of the research were achieved, having answered the research questions.

Considering the research nature, the qualitative approach was deemed to be apt as provided in section 3.3. Therefore, the justification offered in section 3.3.1 was deemed to be appropriate for this research. As a means of collecting data, a survey questionnaire was adopted for this study with follow up interviews to validate the answers offered through the questionnaire. It was important that the researcher considered the nature of work the participants were involved in. It was identified that participants preferred to answer survey questionnaires and to respond to shorter interview questions to lengthy interview sessions. This was done to triangulate the data collection.

The researcher was guided by a literature review related to the methodology adopted to aid in the selection of the most suitable approaches. This helped in achieving the aim and

objectives of the research and also ensured that the data collection offered an in-depth understanding of the topic under review. A number of findings were found, and these were compared with the theory through an interactive process. This helped in the development of new findings in this area and the development of the conceptual collaborative framework in fig 5.1.

The challenge with literature regarding supply chain collaboration is that it is prescriptive in nature with a managerial intent which has no direct focus on the gold mining industry in Africa and particularly in Ghana. Exhaustive empirical studies are therefore needed to examine the factors that affect the implementation of supply chain collaboration in Ghana's mining industry and the factors that affect suppliers of the mining industry.

6.1 The Aim, Objectives, and Answering the Research Questions

The aim and objectives of the study were achieved as the research questions were answered. The aim of the research was to develop a framework for supply chain collaboration in Ghana's gold mining industry. The aim has eventually been achieved successfully through the fulfilment of the research objectives. This aim was achieved through the development of the conceptual collaborative framework in fig 5.1. This initial framework in fig 2.1, which was identified based on the literature reviewed by the researcher, helped in the development of the new framework in fig 5.1. The new framework in fig 5.1 establishes the relationship of the mining organisations with its suppliers through the crucial factors identified in the course of the study.

Mixed method approach was adopted to gain a deeper understanding of the factors affecting supply chain collaboration in Ghana's mining industry. This, therefore, strengthens the importance of social science research, the purpose of research and the choice of theoretical and methodological approaches. There was a commitment to comprehend the factors of supply chain collaboration in the mining industry in the context of the environment, social, economic, and political as well as a cultural sphere through the link between the researcher and the researched. There was an obvious interconnected approach to the theory and empirical investigation adopted by the researcher. Hence, the research objectives have been achieved.

The following are the research objectives:

1. To develop an understanding of supply chain collaboration in the mining industry.

This was achieved because the researcher offered an understanding of supply chain collaboration in sections 2.5, 2.6, 2.7, 2.8 and 2.9 from the global perspective, through to the developing economies and collaboration in other industries as well as collaboration in Ghana's mining industry. This was to provide an idea of the state of collaboration and how it has progressed. With a clear understanding of the state of collaboration in Ghana, the researcher was able to position the mining supply chain as not being a beneficiary of collaboration as limited status has been conducted on the industry so far.

2. To identify the underpinning theories of supply chain collaboration and its effects on Ghana's mining industry.

The objective of underpinning theories SCC was achieved through the identification of other

theories in sections such as transaction cost economics and resource-based theory in section 2,10. The researcher identified these theories to advance the scientific understanding by forming a structure where the phenomenon of supply chain collaboration could be explained.

3. To identify the factors affecting supply chain collaboration in Ghana's gold mining industry.

The literature review highlighted and examined previous studies by other researchers on the factors affecting supply chain collaboration. The investigation of the factors affecting supply chain collaboration in Ghana's gold mining industry has been achieved with other new factors identified. It is, therefore, critical to mention that many of the factors referred to in the literature were confirmed to be applicable to the industry studied. Therefore, the research objectives have been duly achieved successfully, as highlighted here and stated in section 1.3.

6.3 Originality and contribution to knowledge

This research has examined the mining industry in Ghana because previous research reflects other sectors such as health, manufacturing, and services industries. Even though there have been studies in collaboration regarding supply chain in other areas such as sustainability, green supply chain, etc., there seem to be no studies conducted on the supply chain collaboration in Ghana's mining industry.

To the best of the knowledge of the researcher, this is the first study that examines the factors affecting supply chain collaboration in Ghana's mining industry. The originality of this study is to provide an in-depth understanding of the factors affecting supply chain collaboration in

the mining industry in Ghana, which are listed in section 5.4. The research findings will strengthen the existing literature on supply chain collaboration, which in no doubt is a crucial topical issue particularly not only for Ghana's mining supply chain but also for the global mining supply chain in general, giving their function. It is, therefore, hoped that this study would offer the grounds for the development of scientific research in this pursuit.

Existing literature has not offered enough understanding of the factors affecting supply chain collaboration in the mining industry. Understanding of the factors has been offered in sections 5.2, 5.3 and 5.4. These factors reflect the mining industry as opposed to the general viewpoints made in the literature. The intention of this study was meant to provide contributions to both academic and practice. Due to the dearth of research into supply chain collaboration in Ghana's mining industry, this study gives a better appreciation of such a perspective for the future.

The framework developed in fig 5.1 forms part of the originality of the study. This contributes to knowledge as the framework is the first of its kind to be developed in relationship to the mining supply chain.

This study has, most importantly, offered an insight into the mining industry of Ghana, which further creates an understanding of the similarities between other countries and industries in terms of supply chain collaboration. The initial contribution to knowledge as highlighted in section 5.4 is to fill the gap in the literature and to expand knowledge of supply chain collaboration related factors regarding the mining industry in Ghana which plays a critical

role in the nation's development.

The benefit to academia is to offer practical data on Ghana and its mining industry. The researcher does not assert that his data epitomizes the fact, or the analysis is objective. Nonetheless, the data were drawn from the mining organisations which scholarly output was considered useful enough to be hallowed in the social sciences. This research work offers data and analysis of supply chain collaboration in Ghana's mining industry that needs to be made available to social science research globally.

This research study has uncovered similarities in the enablers of supply chain collaboration that stand to contribute to knowledge by the study itself, having been discovered in the case study organisations.

The research findings have some vital implications for top management and managers of the mining industry to consider, as follows;

- i. The findings of this study can guide top-level management to envisage the possible loopholes when planning to develop supply chain collaborative relationship with their supply partners.
- ii. Collaborative relationship required adequate planning and implementation if it will be successful. Due consideration of the philosophical aspect of the mining organisation, coupled with organisational structure, cooperation, strategic alliance, and information flow among others between the partners to help it succeed.

- iii. To implement supply chain collaboration in the mining industry in the future, top-level management could use the research findings to identify potential impediments to the process before it starts.
- iv. The research study could assist managers to discover the enablers of supply chain collaboration to assist the organisations to overcome the limitations to implementing SCC.

6.4 limitations of the study

To answer the research questions and to achieve the aim and objectives of the research, the necessary efforts were made to collect data of a higher quality standard by best practices and the University of Bolton's standards by validating the survey questionnaires with interviews of supply chain managers from the various mining companies.

According to Yen (2009), researchers are constrained by the limitations placed on them, and this study is not exempt. Controlling all the influences that were possible to affect the quality of the study was impossible in this research as some were intrinsic with the organisations whilst others happened during the research. It is, therefore, crucial to acknowledge and echo the constraints of the research method.

- i. Absence of literature on supply chain collaboration in the mining industry was one of the major limitations.
- ii. Lack of data from suppliers was identified as one of the limiting factors.

- iii. Data collected by the researcher were likely not to be free from bias because some of the respondents could consult each other prior to completing the survey. There could also be the likelihood of memory lapses, interpretation errors and recording errors. All these limitations were taken into consideration during the collection of data and analysis. The researcher made all efforts to avoid bias in the data collection and ensured that the analysis was done with an appropriate tool of SPSS version 25, as indicated in section 4.3.
- iv. There was a potential bias whilst conducting the interview because the researcher has worked with one of the organisations. As a result of this, the researcher piloted the interview questions. This made it possible for the researcher to reduce the possibility of bias by being neutral during the conduct of the interviews and using standard questions. Most importantly, triangulating the findings were crucial in reducing bias, as discussed in section 4.3.
- v. During the interview, the researcher was given a limited time to conduct the interview as respondents were said to be busy with operational issues. Therefore, enough time was not afforded the researcher to ask leading questions.
- vi. Some survey questionnaires were not returned as some of the respondents were either on annual leave or not ready to answer the questions. The researcher took into consideration this limitation and made sure that the number of questionnaires secured formed a representation of the total population to help in the analysis.
- vii. The concerns with the validity of the empirical study into supply chain collaboration in the mining industry lie in the reliability of data, sources of data and the methods of

data collection. Most of the studies concerning supply chain collaboration are in manufacturing and service industries. The problem here is the limited existing data regarding collaboration in the mining industry.

viii. In making the above observations, it is conceded that:

1. While other mining company sites have similar SCC policies and practices, implementing them may differ from sites to sites by using different methods.
2. Some variables may have an impact on the performance of the organisations. These may include, change in management, the financial position of the organisation and performance of the organisation.

6.5 Recommendations for further studies

One critical direction for this research study could be to test the findings in the supply chain partners of the mining organisations used for the study. This would extend the current study scope and contribute to a broader generalisation, thus partly resolving the present limitations of the study.

- i. In view of this, further research could be conducted to discover the issues affecting supply chain collaboration with the suppliers of the mining organisations. This would assist in drawing comparisons between the mining industry and its suppliers in terms of practice.

- ii. Further studies could be conducted on suppliers to understand their side of the collaboration with the mining industry. This will offer a view of the totality of supply chain collaboration in the mining industry and its supply partners.
- iii. Replicating this study is possible in similar industries in different countries to be able to draw a comparative analysis and to accelerate the development of a wider insight into the issues that have been examined. The differences and similarities in the organisations and other factors could allow further clarification of the effects of the
- iv. attributes of the mining organisations across different countries. Study in the context of similar companies in different countries would help test the validity of the findings and the conclusions attained by the current study.
- v. The current study cannot resolve all the ramifications of the issues raised. As a result, further studies could be conducted to examine into details other issues relating to supplier development, collaboration in terms of sustainability and green supply chain.
- vi. Further studies could be conducted on the ramifications and methods that were used by the mining industry in dealing with their supply chain partners and the examination of the barriers to collaboration and how to surmount them.
- vii. Another area of interest in research is barriers to supply chain collaboration in the mining industry. It could be further extended to performance measurement in terms of collaboration and sustainability.
- viii. Finally, the current studies focus on the factors affecting supply chain collaboration in Ghana's mining industry. It would be exciting and useful to learn of

further studies of supply chain collaboration in the oil and gas industry in Ghana as the oil and gas industry serves as one of the key income generators of the country.

6.6 Conclusion

The main aim of this research study was to develop a conceptual framework of supply chain collaboration in Ghana's mining industry. Additionally, the factors that affect supply chain collaboration in Ghana's mining industry were identified. Five factors were identified and discussed in this thesis. These were presented in section 5.4 as the original contribution to knowledge. The impact of this study is to add to the body of knowledge and offer a corporate competitiveness when the study is implemented in the gold mining supply chain.

Extensive literature was undertaken to discuss supply chain collaboration in other industries from developed to emerging economies. As collaborative relation in the gold mining industry has not received much attention, this current study will add to the body of knowledge and the limited study conducted so far on gold mining supply chain. As supply chain collaboration in the gold mining industry grows in depth and size, coordination, and integration of operations with suppliers and partners need to be aroused. Collaborative partnerships with suppliers must be heightened to increase the benefits for the partners.

This study presented critical components of the literature and the evolving ideas, and viewpoints that have been developed. The next stage is to examine in detail the themes and to consider the current research and ideas. A great number of areas present scope for further research. For instance, exploring the best practices in terms of supply chain collaboration and

the implementation of concepts that are essential for mining organisations.

That notwithstanding, there are debates going on regarding the appropriate collaboration factors and their implication for business success. Having answered the research questions and the significance of answering them, it is believed that the aim and objectives of the research have been achieved. The limitation of the current study and the need for further research have been presented.

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Appendix A:

Survey questionnaire

Supply Chain Collaboration Survey

Research Topic: Conceptual framework for supply chain collaboration in Ghana's mining industry.

Survey Instructions: Please try to answer all questions. Choose answers that best describe your situation and experience. This survey comprises of three parts. Part I asks for basic background/demographic information. Part II asks questions designed to identify your collaboration partners/suppliers. To ensure confidentiality, you may use initials to name your partners/contacts. In Part III of the survey, you will be asked questions relating to trust, enablers of Supply Chain Collaboration and the relationship with your suppliers/partners.

Part I. Demographic Information Please provide the following background and demographic information. Answer the questions by circling the letter of choice.

1. Please indicate your position in the company.

General Manager Commercial Manager Supply chain Manager

Supply chain Superintendent Supply chain Supervisor Procurement
Supervisor

Supply chain Officer Logistics Officer Warehouse Supervisor Warehouse
Officer

Other, please specify....

2. Gender:

A. Male B. Female

3. Age group

(A) 21 – 25 (B). 26 – 35 (C). 36 – 45 (D). 46 – 55 (E). 56 – 65 (F). 65 and above

4. Work Experience: Please indicate the amount of experience you possess in your current position. Include previous work experience if that position involved similar duties and responsibilities.

5. Organisation strength: Please indicate the number of employees in your company.

(A). Less than 99 (B). 100– 199 (C). 200 – 299 (D). 300 – 399 (E). 400 and above

6. Department strength: Please indicate the number of employees in your department or function

(A). Less than 4 (B). 5– 9 (C). 10 – 14 (D). 15 – 19 (E). 20 and above

7. Please indicate the number of years your company has been established.

Less than 5 years 5 - 10 years 11 - 20 years More than 20 years

8. Please indicate your company's main business/businesses (Tick more than one if applicable).

Mining Supplier Transport/Logistics Provider Other

9. What is your volume of production per annum?

(A). Less than 150,000oz (B). About 150,000oz (C). More than 150,000oz (D). Cannot tell

Part II. Collaboration partners

10. Over the past 12 months, who are you key suppliers/partners that contribute to the success of your supply chain?

11. Over the past 12 months, who are the key suppliers/stakeholders in your work environment that

help your supply chain to overcome problems?

12. For the contact(s) identified above, please indicate which of them has a long-term relationship with your company.

13. Based on the above question, is the relationship with your suppliers mutual?

(A). Yes (B). No (C). Somewhat (D). Not sure

14. Based on the collaborative relationship with your suppliers/partners, do you consider trust as key ingredient to your relationship?

(A). Yes (B). No (C). Somewhat (D). Not sure

15. What do you consider as the most important factor(s) in selecting a collaborative partner? Please choose one or more as best suits you:

A. Coordination (parallel or variable activities between you and your suppliers)

B. Information sharing (effective communication)

C. Good pricing (offering competitive pricing to your company)

D. Strategic alliance (maintaining relational stability)

E. Cooperation (sharing of resources based on the pillars of the relationship)

F. Responses and visibility (proactive and availability)

G. Others, please specify.....

16. Cooperation. The level of cooperation goes beyond information sharing and interaction among chain members. Does your supply chain/organisation share financial, manpower, etc resources with your supply partners?

(A). Yes (B). No (C). Somewhat (D). Not sure

17. Networking is the process of conceiving and sustaining a wide range of collaborative relationships. In your estimation, does your supply chain/company have laid down procedure in terms

of how to sustain business relationship with its suppliers/partners?

(A). Yes (B). No (C). Somewhat (D). Not sure

18. Human resource management – Many organisations spend lots of resources in developing their supply chain. Does your organisation commit resources into the development of supply chain professionals?

(A). Yes (B). No (C). Somewhat (D). Not sure

19. Cultural gap – every organisation has a culture and the culture determines and shapes the behaviour and work routine. Does your supply chain/company take into consideration the cultural differences of their partners when dealing with suppliers/partners?

(A). Yes (B). No (C). Somewhat (D). Not sure

20. In your estimation, how do you value the relationship between your supply chain/organisation and your key suppliers?

(A). Critical Partner (B). Normal supplier relationship (C). Emergency supplier
(D). One off supplier

21. How many years have you been in a collaborative relationship with your suppliers?

(A). 0 – 1years (B). 2 – 4years (C). 5 – 7years (D). 8 years and above

22. Organisational structure has great impact on supply chains – how would you classify your organisational structure to be?

(A). Vertical structure (B). Horizontal structure (C). Lateral structure (D). Not sure

The following questions relate to strength/quality of the relationship between your company and your suppliers/partners.

To what extent do you agree or disagree with the following statements where:

5 – Strongly agree | 4 – Agree | 3 – Neither agree nor disagree | 2 – Disagree | 1-Strongly disagree | 0 – Not applicable

23. Strategic alliance is viewed as inter-firm long-term relationship between companies to share common resources. Our company shares resources with our partners/suppliers?

5 4 3 2 1 0

24. Our suppliers/partners are honest with us in business dealings.

5 4 3 2 1 0

25. We intend to continue the relationship with our suppliers/partners for a long term.

5 4 3 2 1 0

26. We intend to strengthen our relationship with our suppliers/partners.

5 4 3 2 1 0

27. Both sides in the relationship make decisions that are mutually beneficial.

5 4 3 2 1 0

28. Our company and our suppliers/partners have similar goals and objectives.

5 4 3 2 1 0

29. Our company and our suppliers/partners have similar views towards information sharing.

5 4 3 2 1 0

30. Our company and our supplier/partners have similar views towards interorganisational relationship.

5 4 3 2 1 0

31. Our top management team considers relationships with trading suppliers/partners to be important

to enhance supply chain performance.

5 4 3 2 1 0

32. Our top management team considers information sharing with trading suppliers/partners as important to enhance supply chain performance.

5 4 3 2 1 0

33. Our top management team considers managerial ties with the top executives of our supplier/partner companies to be important to enhance supply chain performance.

5 4 3 2 1 0

34. The company/supplier we deal with shares our overall goals.

5 4 3 2 1 0

35. This company attempts to be honest and truthful in the information they provide.

5 4 3 2 1 0

36. Please provide any other comment where

necessary.....

THANK YOU FOR TAKING PART IN THIS SURVEY

Appendix: B

Interview questions

Conceptual framework for supply chain collaborations in Ghana's mining industry

Interview Questions

Interview sample: General manager, Commercial manager, Supply chain manager, supply chain supervisor, Logistics supervisor, senior supply chain officers.

1. Why does your organisation form a collaborative relationship with its suppliers?
2. How does your organisation implement collaborative relationship with its suppliers?
3. How does your organisation select suppliers to collaborate with? What is the basis for collaboration with your suppliers?
4. Based on your total supplier base, what percentage of your suppliers do you have collaborative relationship with?
5. How do you see your collaborative relationship in terms of win-win and win-lose?
6. Does your company share benefits with its collaborative partners?
7. Is your collaboration relationship always successful and what makes it successful or otherwise?

8. Companies often use collaboration as a way to fill in gaps in their own capabilities. Is your estimation does your company see this happening and why?
9. Does your organisation invest in infrastructure and people to help in the collaborative relationship?
10. Is there any performance measurement system that your organisation use to determine the collaborative relationship? Why – if yes or no?
11. Do you see collaboration with your partners as a suitable way of saving cost?
12. Do you see your organisation entering into a long-term collaboration relationship with its partners?
13. Are there any mitigating factors put in place by your organisation should the collaborative relation go wrong?
14. In your estimation, what you consider as a successful collaboration?