EFFECT OF SUPPLY CHAIN MANAGEMENT IN DEALING WITH COMPLEXITY DRIVERS: A CASE STUDY OF JUBAILI AGROTEC

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ABSTRACT

The global pandemic of coronavirus, coupled with globalization, technological advancement, as well as the proliferation of products and services have led to expanded complicatedness within the channel networks of organizations globally and Nigerian firms are not exempted. This as a result inhibits the effective flow of goods and services within the distribution channel as planned. It is, therefore, becomes apparent for firms seeking to strengthen their competitiveness to effectively manage the complexity drivers through the adoption of supply chain management. This study examines the effect of supply chain management in dealing with complexity drivers in Jubiali Agrotec. The purpose of this study was to ascertain Supply Chain Activities (SCA), Supply Chain Management Tools (SCMT), Supply Chain Enabling Technologies (SCeT) can be used in dealing with the Complexity Drivers (CD). To solve the problem of this study, a quantitative approach was adopted through a cross-sectional research design. The study population comprises of 120 employees in Jubiali Agrotec, while 92 employees in the logistic department were randomly sampled using a stratified sampling approach. A self-administered structured electronic questionnaire was employed as the instrument of the study, and through the company's social network sites, 79 copies of online questionnaires were filled and retrieved. In analyzing the data, the Statistical Package for Social Sciences (SPSSV25) was utilized, and the result was presented through the descriptive statistics, frequencies tables, as well as percentages. Inferential statistics such as linear regression and correlation coefficient were adopted in testing the hypotheses formulated for the study. The result of the study reveals that SCA; SCMT and SCeT are stronger predictors of SCCD, it further depicted that SCA; SCMT, and SCeT are statistically significant in dealing with the SCCD. Given the findings, the study concluded that a well-implemented supply chain management dimensions can help manage those drivers necessitating complexity within a firm supply chain network. The study, therefore, recommended the need for a firm to have a robust supply chain management framework in place to help redress the complicatedness within the distribution channel.

Keywords: Supply Chain Management, Supply Chain Activities, Supply Chain Management Technologies, Supply Chain Enabling Technologies.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATION

CAS:	Complex Adaptive System
CPFR:	Collaborative Planning, Forecasting and Replenishment
ERP:	Enterprise Resource Planning
MSCCD:	Management of Supply Chain Complexity Drivers
NT:	Network Theory
RBV:	Resource Based View
SCC:	Supply Chain Complexity
SCEM:	Supply Chain Event Management
SCET:	Supply Chain Enabling Technology
SCM:	Supply Chain Management
SCMA:	Supply Chain Management Activities
SCMI:	Supply Chain Management Initiative
SCMT:	Supply Chain Management Tool
SCOR:	Supply Chain Operations Reference-Model
SPSS:	Statistical Package for Social Sciences
TOC:	Theory of Constraint
VMI:	Vendor Managed Inventory

CHAPTER ONE: INTRODUCTION

1.1 Introduction.

Supply chain management is a fundamental feature of the global economy and as most nations encountered the Covid-19 related lockdowns posed a massive disruption in the global supply chain networks, this has resulted in the concern about the current and the future of supply chains globally. This dissertation examines the role of supply chain management in dealing with the complexity drivers. The present chapter is a preamble to the general background to the study. This entails the issues and cogent reasons for investigating the topic. A brief purpose and objectives and methodology to accomplish the study were discussed. This was closely followed by an outline of the dissertation structure in a tabular arrangement.

1.2 Research Background

Supply Chain Management (SCM) is a framework that guarantees an effective flow of resources, services, activities, as well as information among people and organizations (Lu, 2011). As per the Supply Chain Council, it includes the whole effort engaged with creating and conveying finished merchandise from suppliers to customers (Larson, 1998). In this manner, SCM is not only those efforts tailored to effectively facilitate both the market interest across organizations, but it also covers the joint effort amid the network members aimed at ensuring the flow of the final products or services.

In recent times, firms are confronted with an expanded complexity resulting from the advancement of innovation, globalization, limited product life-cycle, the proliferation of merchandise and services, as well as the need for business sustainability (Serdarashan, 2009). Consequently, the global pandemic of Covid-19 has resulted in the disruption in the global supply chain across countries (Baldwin and Freeman, 2020). The term supply chain complexity (SCC) are those challenges that emerge amid parties of the inventory network during the creation and the movement of merchandise or service (Aelkera, Bauernhansl, and Ehmc, 2013). Researchers hypothesized that complexity could be due to the drivers from the firm's internal or external environment (Kavilal, Venkatesan, and Dadhaniya, 2014; Hashemietal, 2013). The internal driver complexity is within the firm operations (i.e. production processes), while the external driver is outside the firm's activity that poses a risk among the various channel members in the chain networks.

The need to adequately deal with those drivers prompting complexity within the inventory network to guarantee the performance of the distribution systems cannot be ignored. The ability to manage supply chain complexity is an added value in attaining a firm's competitive advantage (PricewaterhouseCoopers, 2013). Javorcik (2020); Baldwin and Evenett (2020) suggested that nationalization and the retrenchment of the supply chain may be an effective tool in managing difficulties in the supply chain during the global lockdown resulting from the global pandemic.

Kavilal et al., (2014) outline five approaches accessible for firms in managing the complexity drivers to include; recognizing, organizing, estimating, and disposition of irrelevant

complexity. Recognizing involves the acknowledgment of those drivers necessitating complexity inside the chain network; Prioritisation deals with the ranking of complexity drivers as per their impact; Estimating entails quantify these drivers based on their nature (i.e. dynamic or static multifaceted nature), and Controlling deals with the elimination of unnecessary drivers constituting complexity within the channel systems.

The integration of these approaches forms a system that ensures the smooth flow of items among the channel members. The significance of SCM as a strategy has for some time been perceived by logistic firms. Thus, organizations embrace SCM activities to keep up and improve their competitive position. Be that as it may, there is little proof as to how the SCM activities can deal with the complexity of the inventory network. Authors suggested that the inventory network is a sophisticated system (Mentzer et al. 2001; SerdarAsan and Tanyas, 2017) and it will be safe to assume that SCM is aimed at dealing with the complexity attribute in the chain network. This dissertation is aimed at providing new insight as to how SCM can be adopted to deal with the SC complexity drivers in Jubaili Agrotec limited.

1.3 Research Rationale

Logistics companies are faced with increasing complexity in their channel networks due to globalization, technological advancement, as well as the proliferation of products and services. Jubaili Agrotec is not an exception to these challenges, the global pandemic of COVID-19 has made it difficult for the firm to effectively distributes its merchandise across the channel networks as planned. This has affected the company's market performance as a result of the lack of product availability. Consequently, managing complexity in the company's supply is a bottleneck, studies have suggested that the ability to manage the complexity successfully will bring about the performance of the supply chain networks (PricewaterhouseCoopers, 2006; Koudal and Engel, 2007, Bozarth et al. 2009).

Much attention has focused on complexity research using different models (Sivadasan et al., 2006; Aelkera et al, 2013; Kavilal et al., 2014). For example, Aelkera, Bauernhansl, and Ehmc (2013) inspected how complexity in the supply chains can be managed through the usage of the Suitability of Complex Adaptive System (CAS) modeling which underlines the best practice to oversee supply chain complexity. Deshmukh et al. (1998), Sivadasan et al. (2002), Sivadasan et al. (2006), and Isik (2010) used the entropy-based to examine supply chain complexity management in the advance country. Relatively few studies have attempted to examine supply chain management and managing complexity driver in the chain networks in Turkey (SerdarAsan et al., 2017).

To the best of the author's knowledge, nothing has been done in a developing country like Nigeria on SCM in managing complexity drivers of the chain networks. It is as a result that the current dissertation has been motivated to fill the gap in knowledge to exploring how SCM can be utilized to manage the internal, external, and interfacial complexity of Jubaili Agrotec Limited.

1.4 Research Objectives and Methodology

This research is set out to examine the effect of supply chain management in dealing with complexity drivers in Jubaili Agrotec Limited. Despite the increasing complexity the Nigerian

firms face in their channel networks, no academic research has been done to examine how these issues can be managed in Nigeria. Hence, this dissertation will provide new insight into SCM and the management of complexity drivers in the chain network within the Nigerian context. These objectives are what the author set out to investigate:

i. To ascertain the influence of supply chain activities in dealing with the complexity drivers in Jubaili Agrotec

ii. To investigate the influence of supply chain management tools in dealing with the complexity drivers in Jubaili Agrotec

iii. To establish the influence of supply chain enabling technologies in dealing with the complexity drivers in Jubaili Agrotec

For this study to be accomplished, this current dissertation will employ a quantitative methodology and a self-administered electronic questionnaire as the research instrument to solicit respondent's views on the influence of SCM activities in dealing with the complexity drivers in Jubaili Agrotec. As well as inferential statistics using multiple regression to analyze the degree of an association between the study variables.

1.5 Background of Jubaili Agrotec

Jubaili Agrotec ltd is one of the notable firms operating in the agricultural sector. It was established in the year 2002 which deals with agricultural products such as Pesticides, Insecticides, Herbicides, Feed additives, and among others. To effectively coordinate its network chain, it established its headquarters in four key geographical areas in Nigeria (Kano, Ibadan, FCT, and Lagos). Jubaili Agrotec's first branch was established in Kano, which is the Capital of the North that covers around 60 percent of the agricultural produce in Nigeria. Jubaili Agrotec's second branch was established in Ibadan in the year 2004 to manage the distribution of the South of Nigeria. 6 years after, its third brand was established in Federal Capital Abuja to manage the distribution in the middle belt of Nigeria. Its expansion didn't stop, in 2011 another branch was established in Lagos to cover the distribution network chain in the Southwestern geopolitical zone of Nigeria.

Table 1: ***Research Structure***

CHAPTERS	CONTENTS
Introduction	This chapter is a background to the study which uncovered the issues of supply chain management and complexity drivers. This was linked to the need for the research, research objectives, research methodology, and method of data analysis to be utilized. This was followed closely with the historical review of the company of the study. Lastly, it outlined the structure of the dissertation.
Literature Review	This section is a literature review of theories, the concept of the constructs of the study, and empirical analysis of related studies. The author succinctly reviewed theories of supply chain management and complexity drivers. Also, the choice of selecting a particular theory as the theoretical framework was justified. The gap in the literature reviewed was also uncovered.
Research Questions & Hypotheses	This chapter specified the three research questions that guide the study. Four alternatives hypotheses were formulated based on the construct of the study and comprehensive review of literature
Research Methodology	This section is a development of research methodology as outlined by Saunders's Research Onion concept The author chose the suitable methodological approach having compared the benefits and shortcoming of every available method A survey methodology and inferential statistics were utilized based on prior studies. A self-administered electronic questionnaire was employed, explaining the reliability, validity, and ethical consideration of the chosen methodology.
Analysis and Findings	This chapter presents the result of the descriptive statistics of the study variables and regression results of the hypotheses.
Discussion	This chapter covers the discussion of findings and was linked to previous research works.
Conclusion and Recommendation	This chapter covers the conclusion drawn from the findings, recommendations, and suggestions for future research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter is a review of the literature of academic journals on Supply Chain Management Initiatives (SCMI), Supply Chain Activities (SCMA), Supply Chain Management Tools (SCMT), Supply Chain Enabling Technologies (SCMT) and Management of Supply Chain Complexity Drivers (MSCCD). This chapter will first review relevant theories, as well as the concept relating to the study variables and the relevance of the theories to the current study. This section will also uncover the gap in the literature.

2.2 Review of Theories on Supply Chain Management (SCM) and Management of Supply Chain Complexity Drivers (MSCCD)

This section is a critical review of relevant theories and models on supply chain management initiatives and the management of complexity drivers. The author will utilize the most suitable theories having compared other theories.

2.2.1 Theories On Supply Chain Management

Several key organizational theories have often been used to inform an investigation of supply chain operations, and studies were done on SCM. Researchers have utilized one or two theories in explaining their argument and study findings (Hartmann and Moeller, 2014; Vanpoucke, Vereecke, and Wetzels, 2014).

i. Resource-Based View (RBV)

The resource-based view (RBV) clarifies how a firm deploys and combines its tangible and intangible resources in the quest of attaining a competitive advantage (Priem and Swink, 2012). Firms are seen as an assortment of Idiosyncratic resources (Penrose, 1959), expansion on the RBV has raised attention towards the disposition of the firm's resources and positioning (Wernerfelt, 1984) as a source of competitive advantage (Lavie, 2006). In such a manner, Barney (1991 p11) recognized "value, rarity, imperfect imitability and imperfect substitutability" as the basic qualities of a firm's resources to create boundaries and upper hand (refers to as 'competitive advantage').

As featured by Lavie (2006), the conventional RBV accepted that possession and control of resources (human, material, and capital) are the property of an enterprise. However, this appears differently about network chain, procurement, or outsourcing, wherein exploiting partner's capacities to make up for the firm's internal competency hindrance or to concentrate on center capabilities is essential. Subsequently, Lavie (2006) noted that the 'restrictive resource' presumption of the conventional RBV may deprive its application to partners collaboration wherein shared and non-shared assets are effectively coordinated to attain competitive advantage.

Researchers have applied the theory RBV to SCM using structural analysis (for example; de Oliveira Wilk and Fensterseifer, 2003; Miller and Ross, 2003) and as a source of sustained competitive advantage of the network chain (Barratt and Oke, 2007; Lewis, 2000; Pandza, Horsburgh, Gorton and Polajnar, 2003). RBV has been supported by most of SCM decision

when reacting to vulnerabilities and dynamism of the business environment, as well as organizations partnering with each other to benefit scare resource through combined efforts (Halldórsson et al., 2007). This is especially evident in circumstances where rare resources or serious rivalry cause an enterprise to understand that depending just on the internal resource is not enough to attain an upper hand (Jap, 2001).

Meanwhile, Priem and Butler (2001) contend that RBV cannot be validated empirically because of its redundant nature (tautology). The authors further concluded that, by decreasing the theory to the characteristics of rare and valuable, the theory gets repetitive, as the connection between a firm's resources and sustained competitive advantage is said to be common (Priem and Butler, 2001, p. 28). Lockett and Thompson (2001) also discussed other factors that constrained researchers to neglect empirical validation of the RBV, they contend that large and homogenous samples are favored to approve a theory. Therefore, the RBV does not completely fit the current study because of its difficulties concerning empirical validation.

ii. Network Theory

The network theory (NT) gives a more extensive perspective on the enterprise-collaboration within a network place. The NT outline network environment dynamism and perceives the impact of enterprise-to-enterprise connections on a company's business operations (Halldórsson et al., 2007). By stressing the thought of strong and weak ties, the NT expresses that a network resource view helps the management to build up a more sensible appraisal of individual partner's resources and their importance for the enterprise. Collaboration between enterprises is propelled by resource accession as well as coordination, and these are adopted in the present business condition (Fawcett, Allred, Magnan and Ogden, 2009; Fayezi, Zutshi and O'Loughlin, 2010).

The NT gives due consideration to the conformity between an enterprise that is intending to form a collaboration or partnership (Halldórsson et al., 2007). This requires the strategic compatibility between the actors, activities, and resources that formed the essential network segments (Harland, 1996). Also, the theory helps examine the reliability and life-span of the business relationship between two organizations (Gadde and Håkansson, 2001). By adopting a network strategy, an enterprise can structure their supply chains to achieve solid connections to create dependability, and weak connections to ensure adaptability to deal with their responsiveness. The NT is also significant for the innovativeness of the chain networks to bring about knowledge-sharing, knowledge-management, as well as network chain expansion (Miles and Snow, 2007).

Having compared both theories (RBV and NT) in terms of their strength and weakness, the network theory was considered is more suitable for the current dissertation on the ground that properly implemented supply chain management initiative (i.e. supply chain activities, supply chain management tools, and supply chain enabling technologies) will perhaps help to eliminate complexities of the entire chain networks. Thus, the study is anchored on the Network Theory.

2.2.2 Theories On Supply Chain Complexity Drivers

iii. Theory of Constraint (TC)

The center thought in Theory of Constraints (TOC) accept that each framework, for example, an enterprise has one or more constraints that mitigate the framework from attaining the set goals as planned and subsequently this constraint defines the performance outcome of the framework (Noreen et al., 1995). A constraint is described as what deprives an enterprise of growth. Subsequently, the organization's inability to deal with this constraint will bring about a lack of productivity. The application of the TOC to the supply chain management underlines that constraint/weak supply chain network can constrain the adequacy and productivity of the whole inventory network chain. This suggests that an inventory network will lead to failure at its weakest connection.

The TOC, "DRUM" is seen as the firm's production capacity that rings a bell for the whole inventory network. The "BUFFER" represents the quantity of the stock held by the provider for buying time required to recuperate from the foreseen interruptions happening in the upstream inventory network. While the "rope" represents the connection from the upstream to downstream chain network, in which the percentage of the ultimate sales and distribution doesn't surpass the supplier's output ability (Noreen et al., 1995).

Dettmer (1997) sketched out five TOC as the identification of the most vulnerable connection (constraint) within the inventory network chain; deciding on the action to make to get a large portion of the most vulnerable connection with a minimal cost; coordinating the entire of the inventory network to guarantee the weakest connection perform effectively; adopting key activities to permanently eliminate the constraint, and consistently investigate new constraint to enhance the performance of the supply chain.

The application of the TOC to the complexity of the supply chain, a slowdown in a firm's production process and the delay in the conveyance of material inputs from upstream provider required for manufacturing markets demand, will increase the lead-time ("lead-time" means the differences between the startup time and completion of the production process) for the downstream producer and distributor and afterward bring about item deficiencies at the retail outlets. These merchandise deficiencies would not permit the retailer to fulfill the customer's requirement and thus worsen buyer services.

The quality of an inventory network connection can direct the adequacy and productivity of the inventory chain partners, as well as the achievement of the network chain. This suggests that partners of the inventory network ought to reveal their weak connections and prevent fluctuation in supply chain capacity and performance in other to maximize the supply chain links. And one of the best methods to accomplishing these capacities and performance of the supply chain networks is by applying the TOC to SCM. Therefore, the theory of constraint fit the current study when managing the complexity drivers. Thus it will be selected.

2.3 Defining Supply Chain Management

Mentzer, DeWitt, Keebler, Min, Nix, Smith, and Zacharia (2001) portrays a supply chain as an advanced design of business organization engaged with the creation and the conveyance of products or services coupled with related expense and information. Larson (1998)

characterized supply chain management as an exertion tailored towards the creation and conveyance of completed products from a provider to another provider, as well as a client to another client. The management of the inventory network is a framework and strategies utilized in coordinating the flow of merchandise or services inside and across supply chain organization to realize cost reduction, improved consumer satisfaction, and the achievement of an enterprise competitive advantage (Cooper and Ellram, 1993; Mentzer et al., 2001).

A comprehensive meaning of supply chain as per Gibson, Mentzer, and Cook (2005), incorporates "the planning and management of all activities involved in sourcing and procurement, conversion, demand creation and fulfillment, and all Logistics Management activities. In this way, it additionally incorporates coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. Generally, Supply Chain Management integrates supply and demand management within and across companies" (Gibson, Mentzer, and Cook, 2005, p. 22).

Based on the definitions, supply chain management (SCM) is the expansive scope of exercises required to plan, control, and execute the flow of merchandise from raw materials-to-conversion-to-dissemination in the most efficient manner conceivable. SCM incorporates the coordinated arranging and execution of procedures required to advance the progression of materials, data, and capital in capacities that extensively incorporate demand arrangement, sourcing, creation, stock, and inventory management. Organizations utilize both business procedures and specific programming in these undertakings to attain an upper hand (i.e. competitive advantage). Supply chain management is a complex endeavor that depends on each party (for example suppliers of raw materials, manufacturers, distributors, retail locations). Along these lines, efficient inventory network management likewise requires joint effort and management of uncertainty to ensure compatibility among all channel networks. The next discussion is on the benefits and relevance of supply chain management.

2.4 Benefits and Importance of Supply Chain Management

Inventory network management produces several benefits, for example, a firm's efficiency, cost reduction, profit maximization, as well as expanded cooperation with supply chain networks. SCM empowers an entity to more readily oversee client's demands, convey the perfect measure of stock, manage disturbances, reduce expenses and satisfy client’s needs in the best manner conceivable (SerdarAsan and Tanyas, 2017). These benefits can be accomplished through the adoption of viable procedures and proper software to deal with the increasing complexity of the present supply chains. SCM is not only beneficial to both the firm and its clients, but the management of inventory network exercises can also improve client support when properly implemented, can likewise guarantee consumer satisfaction by making the necessary merchandise accessible at the right location and at the perfect time (Rouse, 2010).

Priem and Butler (2001) noted that effective SCM enables enterprises in creating and improving the client's loyalty by expanding client level of satisfaction. SCM likewise gives a significant benefit to organizations by diminishing operating expenses. SCM activities can help diminish the cost of procurement, manufacturing, as well as the absolute inventory network by bringing down expenses to improve a firm's financial situation (Lockett and Thompson, 2001).

Besides, adopting inventory network management best practices can limit abuse use fixed resources, for example, the establishment of Jubaili Agrotec branches in four key geographical zones (Kano, Ibadan, Abuja, and Lagos) have been tailored to ensure the smooth flow of its product and services as well as reducing the additional cost of building branches in the entire 36 states of the federation.

It will be safe to say that SCM can help guarantee human endurance by improving the social health system, shielding individuals from atmospheric conditions, and the human race. This is because individuals depend on supply chains to convey necessities items like food, water, medical products, etc. The SCM is additionally imperative to the conveyance of electricity to our homes and business environment. Besides, a typical component of most poor countries is the absence of a supply chain system, resulting in the absence of infrastructures like good roads and transportation systems to permit the smooth flow of goods and services at a reduced cost. The next discussion is on the supply chain complexity drivers.

2.5 Supply Chain Complexity Drivers.

There is no general meaning of complexity as the term applies to various disciplines, for example, networking, science, social science, management sciences, and others. Therefore, defining complexity is a mind-boggling task as the term itself. Supply chain complexity can be traced back to the scholastic writing of Wilding (1998), the writer is known to have propounded the 'Supply Chain Complexity Triangle', which is the blend of three independent drivers of the supply chain complexity. The primary driver is the demand amplification or the bullwhip effect; the subsequent driver is the parallel interactions, while the last driver is the deterministic chaos (Wilding, 1998).

Correspondingly, a multi-dimensional idea of supply chain complexity was proposed by Vachon and Klassen (2002) in particular: 1) numerousness, 2) interconnectivity and 3) systems unpredictability. These were later streamlined to two measurements to be specific 1) the degree of complicatedness and 2) Uncertainty. The two measurements were coordinated to form the two-by-two matrix which envelops structure and infrastructure technology (Vachon et al., 2002).

Choi, Dooley, and Rungtusanatham (2001) used the "Complex Adaptive System" which was propounded in the system science writing brought a new approach to supply chain complexity. Broad supply networks are being depicted as a Complex Adaptive System (CAS), bringing about the possibility of Dynamic Complexity (DC). DC was accepted to spontaneously emanates from an extensive interconnectedness of supply networks, including suppliers connecting to plenty of supply chains to improve the progression of various merchandises that are regularly difficult to foresee in addressing the necessities of a specific purchaser (Choi et al., 2001).

SerdarAsan and Tanyas (2017) borrowing from Yate (1978) definition of SSC as a situation where (a) there are different organizations; (b) there is an increased number and assortment of relations, procedures and collaborations amid enterprises (c) there is changes in these procedures and collaborations; (d) numerous degrees of systems are engaged with each procedure, and (d) the measure of data expected to control the framework is enormous. From

the earlier definition of Casti (1979), recognized two parts of SCC as 1) static SCC and 2) dynamic SCC; Static complicatedness portrays the structure of the distribution network, the assortment of its parts, and qualities of cooperation; while Dynamic complicatedness underlines the uncertainty within the distribution network and includes parts of time and irregularity.

The literature of complexity within the manufacturing has utilized this distinction to examine the complicatedness of the SCC (Deshmukh et al. 1992; 1998; Frizelle and Woodcock 1995; Calinescu et al. 1998 and among others). Similar studies on managing SCC drivers classified it as "Structural complicatedness" and "Operational complicatedness" (Sivadasan et al. 1999, Sivadasan et al. 2002a), they described structural/static complicatedness as a structure of a merchandise and that of processes to creating, conveying, and selling the products. On the other hand, the operational/dynamic complicatedness of the distribution network is related to the uncertainty of resources flow (information & material) amid firms as a result on internal and external sources (Frizelle and Woodcock 1995; Calinescu et al. 1998; Calinescu et al. 2000).

Based on the foregoing, supply chain complexity drivers are multi-dimensional depending on the field of study, it could be internal/external; dynamic/static; essential/non-essential. The next discussion is on the management of the complexity drivers in the supply chain.

2.6 Complexity Management in the Supply Chain

The complicatedness within the distribution network has been on increase due to the growth of customer's requirement, intense rivalry and because the organizations within the inventory network are forming strategic alliances, participating in mergers and acquisitions, embracing modern technologies, introducing new or augmented merchandise or services, and stretching out their activities to new market boundaries, apart from that, the development of SCC appears to quicken with issues relating to globalization, flexibility, outsourcing, customization, as well as innovativeness (BCG, 2006; Deloitte Touche Tohmatsu, 2003).

Similarly, there is no doubt that the current pandemic of Covid-19 has had a massive impact on the global supply chains of essential merchandises and services. Within the pharmaceutical industry, for example, China being the world’s manufacturer of Active Pharmaceutical Ingredients (API) has halted the production and supply of pharmaceutical products to most affected nations in a bid to ameliorate/curb the spread of Coronavirus (Oxford Business Group, 2020). Consequently, Indian being the world’s first in the manufacturing of generics receives over 70 percent of its raw materials from China and 33 percent of its supplies originate from Hubei, being the location of the virus outbreak (Oxford Business Group, 2020). This as a result has led to disruption within the supply chain network of China-Indian relations.

Additionally, the agricultural sector is not an exception as the food value chain is faced with complexity due to the global pandemic. For instance, the meeting of G20 agriculture ministers the (UN Food and Agriculture Organisation (FAO), International Fund for Agricultural Development, World Bank and UN World Food Programme) on the impact of Covid-19 on food security and nutrition: reported that “Agriculture and its food-related logistic services should be considered as essential. Increased efforts are needed to ensure that food value chains function well and promote the production and availability of diversified, safe, and nutritious

food for all" (Oxford Business Group, 2020, p. 2). This disruption in the supply chain has proven a negative impact on nations globally.

Before creating and actualizing strategies to manage SCC, it is imperative to distinguish between essential complexity and unessential complexity. Essential complexity enhances the client/enterprise/inventory network and which the customers or consumers are eager to pay, unessential complexity, on the other hand, pose additional cost on organizations and does not add any extra value to the enterprise or inventory network (Frizelle and Efstathiou 2002; Apostolatos, Keizers, Kotlik and Olovsson, 2004; Kearney, 2004). An understanding of the nature of the complicatedness experienced within the distribution network is important to create and actualize strategies to manage the complexity drivers.

The available literature on managing complicatedness within the supply chain have employed complexity reduction, complexity management and complexity prevention as an effort on how to deal with complexity drivers (see Sivadasan, Efstathiou, Calinescu and Huaccho, 2002b; 2004; Childerhouse and Towill 2003; Wildemann, 2000; Kaluza, Bliem, and Winkler, 2006). When managing the complexity drivers within the distribution network, the normal technique is to terminate or lessen the unessential complexity drivers and deal with the essential complexity drivers based on these studies. As a drawn-out procedure (complexity reduction and complexity management) to deal with complexity drivers, few authors have added one additional strategy; called complexity prevention (Wildemann, 2000; Sivadasan et al., 2002b; 2004; Kaluza et al., 2006).

Towill (1999) indicates twelve principles as an activity to manage SCC, to ensure the progression of material and material in a distribution network. The guidelines feature the requirements for "streamlining material flows, synchronization, elimination of uncertainties, visibility, use of robust decision support systems, and supply chain integration" (Childerhouse and Towill, 2003 p.3).

As indicated by Wildemann (2000), managing complexity reduction is a method of preventing complexity (means complexity reduction) which are closely related. Although complexity reduction is a short-term technique intended to limit existing product assortments, adopting product-process-elimination, product/service standardization, or augmentation. Complexity management, on the other hand, is a long-term strategy aimed at dealing with the essential complexity which involves deciding strategies and measures for supply chain complexity drivers. This long-term procedure of reducing complexity includes all drawn out actions to maintain a strategic distance from unessential complexity, for example adjusting an existing organizational structure, or redesigning the distribution network (Wildemann, 2000).

Correspondingly, Sivadasan et al. (2002b; 2004) recommends four approaches for operational complicatedness management: to send out complicatedness to a different enterprise, to place charges for the imported complicatedness, and investing in resources to retain complicatedness, and safeguarding to prevent complexity from escalating. Sending out (exporting) complexity implies moving the complicatedness amid the organization's suppliers as well as customers. Although it's not an effective way of managing SCC, as it lacks the holistic approach of SCM. Charge for imported complicatedness can be adopted as a prudent strategy. Both the sending

out and charging for complicatedness is an external focus, while absorbing and avoiding are the internal focus. Sivadasan et al. (2002b; 2004) express that an enterprise capacity to absorb and avoid complicatedness is attributed to the organizational resources.

A similar study on complexity reduction and complexity management was adopted in addressing static complexity (Perona and Miragliotta, 2004). They argued that complexity reduction helps to decrease the complicatedness within the supply chain, while complexity management is aimed at lessening the effect of complicatedness on a firm's performance of the supply chain. The authors formulated a "normative complexity framework" where an enterprise or inventory network has a basic multifaceted nature (meaning "complicatedness"). Under the basic complicatedness, a firm employs a complexity reduction levers and diminishes its basic complicatedness to a level, called (actual complexity). Next, it embraces "complexity management levers" to diminish the effect of the actual complexity on the distribution network performance. The new degree of complicatedness is characterized as a "perceived complexity" aimed at observing the performance of the distribution network. Their investigation holds a conclusive agreement that complicatedness management and reduction affect both the proficiency and adequacy of the supply chain. Thus, the Normative Complexity Model of Perona and Miragliotta (2004) aids understanding of the associations among complicatedness i.e. "complexity reduction", "complexity management" and the "distribution network performance".

The PRTM studies conducted by Hoole (2004; 2005 and 2006) round a positive effect of complexity management and the performance of a distribution chain. They likewise said that the pioneers are successful due to their capacity to manage the complexity drivers. The most significant capacities are to utilize measurements to track multifaceted nature, in reducing the number of product assortments, and to structure the merchandise easy to plan, manufacture, and easily distributed (Hoole 2006). Nevertheless, Hoole (2004; 2005) established a complexity reduction grids with four measurements of the acronyms "SCOR" (meaning "Supply Chain Operations Reference-model"), the grid encompassing 1) the process components: which covers planning, sourcing, producing and conveying, 2) the distribution network performance levers: which pertain the configuration of the organization, business practice, data frameworks, enterprises, relationships, etc. The grids entail the complexity reduction exercises, for example, reduction of suppliers, strategic alliance, outsourcing, and the execution of distribution network enabling tools and technologies.

In Nigeria, Kobo360 which was established in 2017 has been fully involved in facilitating the effective flow of the distribution network. By utilizing the electronic-based technologies in connecting both drivers and cargo organizations that can ship merchandise across the nations, has to ensure effective and efficient flow of goods and services in reducing the travel-time of merchandise from Lagos up to 1000-km to other states. To respond to the current Covid-19 pandemic, the organization has actualized systems to secure its workforce within the supply chain. Furthermore, it has executed an electronic confirmation system that limits individual-to-individual contact in the supply chain to ensure the disinfection of the virus (Oxford Business Group, 2020).

Numerous nations adopting various restrictions on the goods coming into their borders is one way or the other affecting the supply chain networks (The Global Fund, 2020). In a bid to manage these difficulties in the distribution network, The Global Fund's Procurement Service Agents are devising strategies that could help ensure the performance of the supply chain network, the possibilities according to Global Fund includes, "Re-rerouting of shipments; consolidating airfreight to ocean freight or changing transit countries to catch “cargo-only” aircraft; changing mode of transport for final delivery; shipping to neighboring countries; exploring road transport and air charter options, and among others" (p. 2).

Based on the foregoing, it is evident that dealing with the complexity driver of the distribution network is centered on reduction, management, and prevention of essential and unessential complicatedness to ensure the performance of the supply chain networks. It is additionally imperative to distinguish SCM activities the organizations embrace in dealing with the complexity drivers. The next discussion is on the literature on supply chain management activities in dealing with the complexity drivers.

2.7 Literature on Supply Chain Activities and Management of Supply Chain Complexity Drivers.

Studies on supply chain management (SCM) stresses the significance of system integration, system coordination, data sharing, visibility, channel's benefit-risk sharing, as well as a long-term collaboration between partners as the SCM activities (Mentzer et al., 2001; Min and Mentzer, 2004). The activities of the SCM significantly support coordinating the reliance between firms in the distribution network, as well as managing the SCC drivers. The literature on supply chain complexity (SCC) outlined the SC activities in dealing with the SCC drivers as 1) Supply Chain Integration (SCI), 2) Increased Coordination (IC), 3) Information Visibility (IV), 4) Synchronization; 5) Standardization; 6) Automation of processes; 7) Elimination of non-value adding processes; 8) Adoption of Use of strong decision frameworks (SerdarAsan and Tanyas, 2017). Each of these activities on how to deal with the complicatedness of the distribution chain is discussed below.

According to Maloni and Benton (1997), efforts of SCM are aimed at expanding the performance of each member in the distribution network by using information sharing, innovation, as well as planning to cut the cost down and manage stock level. In other to maximize profits and get the best out of the distribution networks, organizations are attempting to curb the hindrances within and outside the company through the enhancement of its integration.

Integration as a vital key in SCM was first recognized by (Oliver and Webber, 1982). Afterward, Towill (1997) noted that SC integration encompasses the entire activities expected to accomplish a consistent supply chain, where the entire functions and procedures inside and between organizations comprising the distribution network are managed as a whole. Fawcett and Magnan (2002) express that a genuine integration implies the combination of the firm’s objectives, effective communication, collaboration, as well as risk and awards sharing amid partners of distribution network.

Three vertical integration dimensions (i.e. scope, direction, and level) describing supply chain integration were identified by (Harrigan, 1985). The direction of integration according to Fawcett and Magnan (2002) could be a link between the suppliers (upstream) and customers (downstream). The size of the integration determines the number of functions or activities involved with SC integration accomplishment (van Donk and van der Vaart 2005). The level of integration determines the degree of integration from the distribution network made of delegated functions to the one completely integrated (Frohlich and Westbrook, 2001). Studies suggested that supply chain complexity drivers can be managed by a true supply chain integration (Bowersox et al. 2000; Stank et al. 2001).

Coordination is an essential and powerful supply chain integration (SCI) (Fawcett and Magnan 2002). The notion that SC is comprised of many interconnected enterprises and functions; dealing with SC involves dealing with the interdependencies of these functions to accomplish the sole purpose of the distribution network. The process of dealing with the interdependencies of the SC activities is described as coordination (Malone and Crowston, 1994). The idea of SC means coordinating resources flow (information and material), operations as well as distribution. Coordinating the entire effort of the SC as an activity was found to eliminate the complicatedness within the distribution network; as the entire parties in the chain collaborate, and coordinate their operations, assets, and disseminate information (Wang and Archer, 2004).

Synchronization of procedures and information helps to achieve supply chain coordination and integration (Chandra and Kumar 2001). Viable synchronization empowers the chain members to communicate effectively. The impact of dynamism in the procedures, plans, and information needs to be disseminated all over the SC in real-time to guarantee synchronization. This can be accomplished through automation, coupled with standardization of information and procedures. Studies have revealed that the capability to automate the SC procedures empower the SC partners to effectively communicate, as well as be free from error and the complicatedness of the distribution network (Cachon and Fisher, 2000; Sahin and Robinson, 2002).

As per standardization of the entire processes of the SC, Child, Diederichs, Sanders, and Wisniowski (1991) and Wildemann (2000) noted that complexity reduction as an approach to dealing with the SCC drivers can be achieved through the standardization of firm's materials and parts, procedures, packaging materials, tools, policies and among others. With respect to the standardization of data initiatives, partners of the distribution network must concur upon data exchange protocol (DEP) with the goal that their PC system can comprehend and process the information accurately.

Visibility is a key component of building the e-supply chain (electronic supply chain). Visibility is the capacity to monitoring procedures and activities over the SC continuously; that helps to notify the supply chain partners on any huge deviations from plans and take proactive action to redress the deviation. According to Enslow (2006), "visibility to orders, inventory, and shipments across the supply chain drive sustainable improvements in lead times, delivery reliability, and inventory reductions" (Enslow, 2006, p. 8). This suggests that partners of the distribution network are required to invest in technology to accomplish better visibility and deal with the SCC drivers.

Now, it is important to refer to the contribution of data sharing as SC activities. Studies have shown that both information dissemination and utilization of information technologies positively affect both information and material flow; which consequently addresses the complicatedness of the chain networks (Cachon and Fisher, 2000; Sahin and Robinson, 2002; Zhou and Benton, 2007). Paulraj, Chen, and Chung (2006) noted that data sharing between SC parties turns out to be less demanding due to the present information technologies.

Based on the foregoing, data sharing encourages integration, processes coordination, and visibility, as well as vital supply chain activities to managing complexity drivers of the distribution network. Thus the following hypothesis is deduced which states that: H1: Supply chain activities (SCA) "Supply Chain Integration; Increased Coordination; Information Visibility; Synchronization; Standardization; Automation of processes; Elimination of non-value adding processes; Adoption of Use of strong decision system" have a significant effect in the management of supply chain complexity drivers (SCC).

2.8 Literature on Supply Chain Management Tools and Management of Complexity Drivers.

The more sophisticated a distribution network is, there is a need to have a model in place to deal with the complicatedness within the distribution network. Studies have proposed advance devices and strategies that are broadly embraced in business practices, for example, the Supply Chain Operations Reference-model (SCOR), Collaborative Planning, Forecasting and Replenishment (CPFR), Quick Response (QR), Efficient Consumer Response (ECR), Vendor Managed Inventory (VMI), as well as Lean-Agile initiatives aimed at improving the flows of information and materials within the supply chain (p. 10).

The SCOR model has been improved since its introduction in 1996 and has broadly been adopted by several industries (Cohen and Roussel, 2005). The SCOR model depends on five important SCM processes namely (Planning, sourcing, creating, conveyance, and returns of defected items), and has three degrees of SC processes of (process, process structure, and process component (Stewart, 1997; Supply-Chain Council, 2008). The SCOR model explains a typical system that coordinates the SC processes and enables the enterprise to transmit the SC practices, quantify the KPI (key performance indicators) of the SC and recognize any deviation and create improvement (Supply-Chain Council, 2008). Thus, it improves the capacity of a firm to comprehend and adapt to the dynamic and complicatedness within the SC.

QR, ECR, and VMI models are aimed at coordinating the level of inventory in the supply chain. According to Mentzer (1999); Zacharia and Mentzer (2004), the QR, ECR and VMI models are time-based rivalry strategies aimed at decreasing the excess level of inventory, maintaining the exactness of stock level and providing stock level information to clients (Daugherty, Myers and Autry, 1999). The models also support the joint coordination of data flow and ITs (information technologies) (Daugherty et al. and Angulo et al. 2004). These programs contribute to the efforts to dealing with the complicatedness in the distribution network.

The CPFR is an advanced software for replenishment activity which gives guidance in ensuring cooperation between the parties involved in the SC and enables joint management of the production processes and the conveyance of resources to ensure optimum performance of the

distribution network (VICS, 2004). CPFR is unique compared to other replenishment programs because it requires planning the demand and supply under an organized business plan to bring about operation visibility, joint planning, and decision making among the SC parties (Barratt and Oliveira, 2001). As a result, the CPFR diminishes the uncertainty in the inventory network processes and help to deal with the supply chain complexity drivers. The fundamental concept of the CPFR replenishment tool is the need for organizations to be responsive, where agility is the appropriate response (Lee, 2004; Christopher, 2000).

Naylor, Naim, and Berry (1999) presented "leagility" which underlines the decoupling point with respect to the characteristics of the Agility-Leanness Models. SerdarAsan and Tanyas (2017) citing Naylor et al. (1999); Mason-Jones, Naylor, and Towill (2000); Towill and Christopher (2002) described the nature of leagile model as "upstream of the decoupling point the processes are designed to be lean (level scheduled) and downstream of the decoupling point the processes are designed to be agile (responsive)" (p, 9). The ISC (Integrated Supply Chain) which ensures the flow of resources is simplified to reduce the lead times and waste; this can be accomplished by the Lean and agile model (Naylor et al. 1999; Mason-Jones et al. 2000; Towill and Christopher 2002). These models are significant in dealing with the complexity drivers in the distribution network. Based on the literature, the following hypothesis is derived; H2: Supply chain management tools (SCMT) have a significant effect on the management of supply chain complexity drivers (SCC).

2.9 Literature on Supply Chain Enabling Technologies and Management of Supply Chain Complexity Drivers.

The Supply Chain Enabling Technologies (SCeT) encompass broad categories of information and telecommunication technologies that are facilitating an effective flow of resources (merchandise, services, data) and integrating the entire SC activities as a whole. The notion that the SCeT ought to be viewed as a tool for SC activities and a facilitator to manage issues relating to the distribution network is suggested by (Gunasekaran, Ngai, and McGaughey, 2006; Singh, Lai and Cheng, 2007). In any case, several factors motivate the organization to adopt and successfully implement enabling technologies for business operations (Patterson, Grimm, and Corsi, 2003).

Gunasekaran et al. (2006), and Sassi (2006) classified the Supply Chain Enabling Technologies (SCeT) as information technologies and technologies system. In other words, the SCeT are communication technologies and application software developed to facilitate business functions. The term "technologies" are communication, information capturing and dissemination technologies (for example, phones, Fax machine, PoS "Point of Sale", Barcode scanner, and among others). To facilitate effective communication among partners of the distribution network and synchronization of data sharing across the SC network. The benefits of adopting these technologies are widely captured in previous studies (Chao et al., 2007; Klein, 2006; Power and Simon, 2004; Singh et al., 2007).

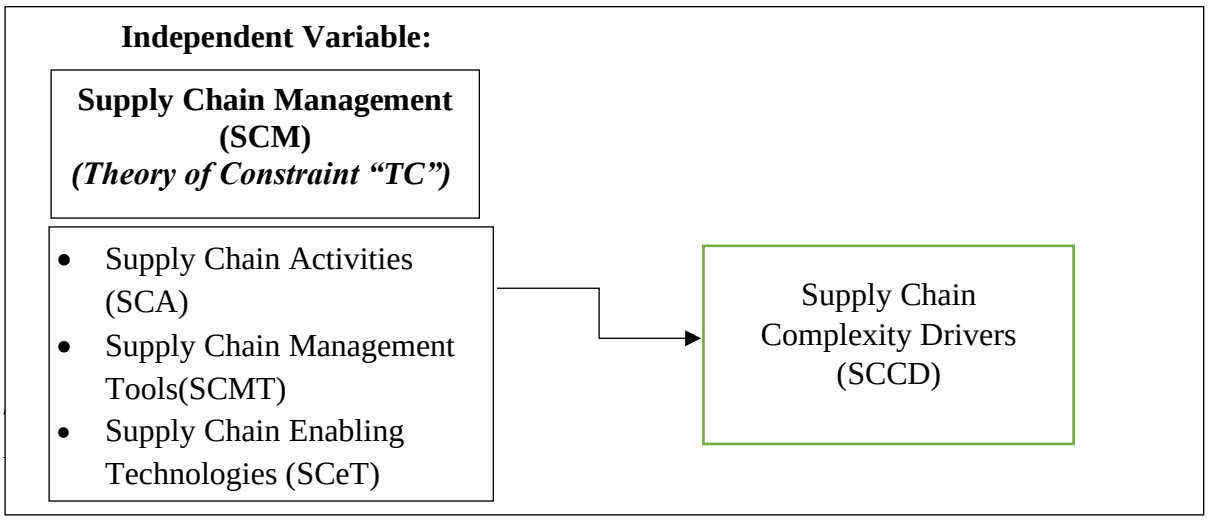
Application software (AS); the advancement of AS has been quickened due to the growth of computer technology (Mabert, 2007; Jacobs and Weston, 2007). Starting from the 1960s, a software of the "Bill of Materials" (BOM) progressed into "Material Requirements Planning"

(MRP), to "Manufacturing Resource Planning" (MRPII), up to the "Enterprise Resource Planning" (ERP) which was augmented to bring about the efficiency of the expanding business practices. The extent of ERP applications is the need to coordinate and integrate the entire business functions of a firm (Ptak and Schragenheim 2000; Kumar and van Hillegersberg, 2000). Even though the development of ERP presents a move from being absolutely business focused on facilitating collaboration with business partners, the focal point of ERP frameworks stays at the individual business level. Additionally, ERP systems have a few weaknesses in overseeing a distribution network where the unit of analysis is a system of an enterprise (Akkermans et al. 2003, Verwijmeren 2004).

The Advanced Planning Systems (APS) as an optimization application have initially facilitated the SC processes of production decisions (Kumar and van Hillegersberg, 2000). The utilization of APS has brought about momentous enhancements in SC effectiveness and productivity. However, an APS works best in static inventory network with stable supply chain partners, which doesn't translate to the present dynamic and demand-driven business condition, where the management of distribution network partners and the rate of implementation generally become more significant compared to the SC optimization (Kumar, 2001). Along these lines, the requirement for the cutting edge software emerges. The ERP vendors and the SCM software (i.e. "Best of Breed" (BoB) suppliers embrace to satisfy the need. "Supply Chain Event Management" (SCEMA) is a significant advancement that monitors the distribution network and ensuring that both the suppliers and consumers deal with uncertainty in the SC (Otto 2003).

A study done by conducted by Serdar Asan and Tanyas (2005) uncovers that problem solver offers different solutions concerning the key SCM activities, by adopting visibility and synchronization as SC activity. It was likewise indicated that reasonable attention has concentrated on the management of complexity drivers in the supply chain. This suggests the need for the cutting edge (new generation) software providers should upgrade the functionality of their software in a bid to monitor and deal with the complexity drivers of the inventory network. Based on the foregoing, successful adoption of the supply chain enabling technologies can help deal and eliminate the complicatedness of the supply chain arising within and outside the organization and its supply chain partners. There, the following hypothesis is generated form the literature H3: Supply chain enabling technologies (SCeT) have a significant effect on the management of supply chain complexity drivers (SCC).

2.10 The Research Conceptual Framework



From the conceptual model in figure one, Supply Chain Management (SCM) represents the independent variable (ID) which was measured using the SCM initiative involving (Supply Chain Activities "SCA"; Supply Chain Management Tools "SCMT"; and Supply Chain Enabling Technologies "SCeT"). On the other hand, the supply chain complexity driver (SCCD) is the dependent variable (DV).

2.11 Conclusion

This chapter critically reviewed the existing literature on the current study. The critical review of the relevant literature helped to understand the relationship between the construct of the study and its linkage. Likewise, various approaches in dealing with the complexity drivers were succinctly discussed in line with previous authors. It also helped in understanding the main approaches taken by various authors to study them. Despite the existing literature on complexity management, a dearth of empirical studies exists on how supply chain management can deal with the complicatedness within the distribution network. Particularly in a developing country like Nigeria, this present is motivated to fill the gap in knowledge using Jubaili Agrotec as the focus of the study and pave way for further research.

CHAPTER THREE: RESEARCH QUESTIONS AND HYPOTHESES

3.1 Research Questions

The major research question this study seeks to provide an answer to is; "***What is the effect of supply chain management in dealing with the supply chain complexity drivers in Jubaili Agrotec?***"

Other minor research questions are:

i. **What is the impact of Supply Chain Activities in dealing with the supply chain complexity drivers in Jubaili Agrotec?**

This question aims to ascertain how supply chain activities such as (Supply Chain Integration; Increased Coordination; Information Visibility; Synchronization; Standardization; Automation of processes; Elimination of non-value adding processes; Adoption of Use of strong decision system) can be adopted for the management of complicatedness within the distribution channel of Jubaili Agrotec. Responses from the participants about these supply chain activities will help answer this question.

ii. **What is the impact of supply chain management tools in dealing with the supply chain complexity drivers in Jubaili Agrotec?**

To answer this question whether these supply chain management tools such as (Supply Chain Operations Reference-model (SCOR), Collaborative Planning, Forecasting and Replenishment (CPFR), Quick Response (QR), Efficient Consumer Response (ECR), Vendor Managed Inventory (VMI), as well as Lean-Agile initiatives) can be utilized in dealing with the complexity within the supply chain of Jubaili Agrotec. Based on the participant's responses from the electronic questionnaire, this question would be answered.

iii. **What is the impact of supply chain enabling technologies in dealing with the supply chain complexity drivers in Jubaili Agrotec?**

This question is aimed to answering the question whether the supply chain enabling technologies such as (*COMMUNICATION TECHNOLOGIES:* Phones, Fax machine, PoS "Point of Sale", Barcode scanner and *APPLICATION SOFTWARE:* Bill of Materials" (BOM) progressed into "Material Requirements Planning" (MRP), to "Manufacturing Resource Planning" (MRPII), up to the "Enterprise Resource Planning" (ERP)) can be employed to deal with the complexity drivers within the supply chain.

3.2 Hypotheses

Based on the literature that was reviewed in the previous chapter, the following hypotheses have been formulated. It will be tested on 0.05 level of significant and either of the null (H_0)/ alternative hypothesis (H_1) will be accepted based on a significant level.

Hypothesis 1:

H_0: Supply Chain Activities does not have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec

H_1: Supply Chain Activities have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec

Hypothesis 2:

H_0: Supply Chain Management Tools does not have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec

H_1: Supply Chain Management Tools have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec

Hypothesis 3:

H_0: Supply Chain Enabling Technologies does not have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec

H_1: Supply Chain Enabling Technologies have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Introduction

This chapter describes the methodology to be utilized for the current study. In light of the Research Onion model created by (Saunders, Lewis and Thornhill, 2009) as represented in Figure 4.1, this chapter incorporates key components which include the research philosophy and design, study population, sample size, sampling techniques, data collection & analysis, reliability of research instruments and limitations.

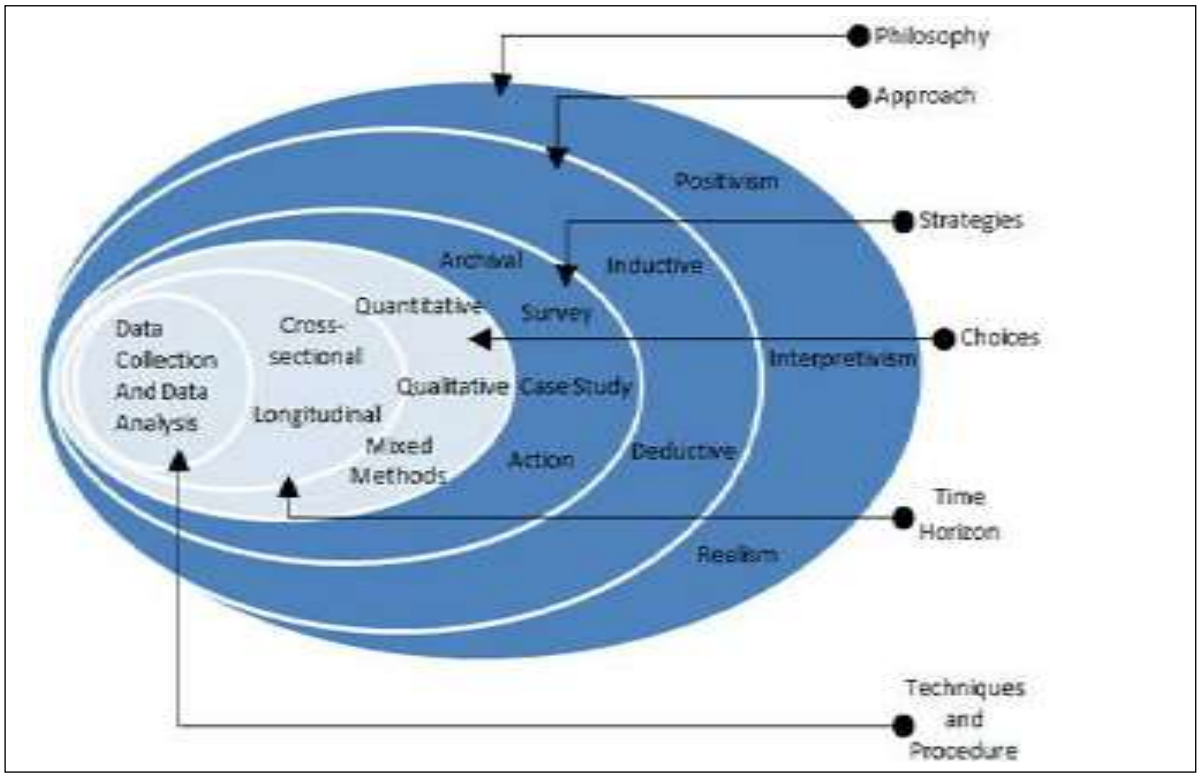


*Figure 4.1: Research Onion model (***Source**: *Saunders et al., 2009)*

4.2 Research Philosophy

Research Philosophy describes the idea of knowledge created while conducting a research study (Saunders et al., 2009). The researcher should be aware of the philosophy as it profoundly affects their investigation (Johnson and Clark, 2006). The two essential points of view about the approach of the research study are "ontological" and "epistemological" viewpoint. Ontological deals with the investigator's perspective on the nature of the real world or truth, while epistemological is concerned with what ought to be or is viewed as satisfactory knowledge in research studies (Saunders et al., 2009). For the current study, the researcher will utilize the epistemological viewpoint to achieve the purpose of the study. Regarding the

research philosophy, the study embraces the positivism approach because it is more appropriate. This is because the positivism as a philosophical framework perceives just the verified and logical proof (Remenyi et al., 1998). Hence, the current study will reflect the Positivism position to objectively test the effect and relationship between the study variables, as well as to ensure generalisability of the findings.

4.3 Research Approach

All research studies have a certain degree of theory use, however whether the utilization of theory in the investigation is an explicit manner or not the study must be subjected to the research design. Thus, it is important to succinctly explain the research approach to be adopted before embarking on the actual research. There are two principal approaches namely the "Deductive Approach" (DA) and "Inductive Approach" (IA) as indicated by (Saunders et al., 2009). The DA visualizes creating hypothesis from existing theories and afterward testing the hypothesis; On the other hand, IA implies gathering relevant information and creating theories according to results.

Based on the nature of the study objectives, the deductive approach is embraced. This approach is suitable for the study because it will help to understand the current theories, formulate, and test the study hypotheses through data gathering and analyzing. A deductive approach is an exceptionally organized approach in which an adequate sample size is required to arrive at a conclusion. Research conducted through a deductive approach has five key stages vis: Deducting hypothesis; stating the relationship between the study variables and their measurement scale; Hypothesis testing; Analysing results; and modifying the existing literature if required (Robson, 2002). Hence, this study will follow these steps to accomplish this study.

4.4 Research Design

Research design as indicated by Saunders et al. (2009) encompasses: research type, research strategy, choice of the research method, and time horizon.

4.4.1 Research Type

Saunders et al., (2009) broadly classified the research design as descriptive, exploratory, and explanatory. While exploratory investigation attempts to comprehend what's going on and surveying the natural happening (Robson, 2002), the descriptive investigation is keen on depicting an exact picture of an individual, events or circumstance and explanatory investigation is centered about investigating an issue by ascertaining causal connection between the study variables. The current research can be viewed as a blend of both exploratory

and explanatory research since it plans to achieve important information by examining an effect between the study variables.

4.4.2 Research Strategy

As indicated by Saunders et al. (2009), there are absolute seven strategies to an investigation viz. 1) Experiment, 2) Survey, 3) Case Study, 4) Action Research, 5) Grounded Theory, 6) Ethnography, 7) Archival Research. Despite the fact that every strategy can be utilized for exploratory approach, descriptive, as well as explanatory research (Yin, 2003), few out of every strategy is suitable for both deductive and inductive techniques (Saunders et al., 2009). While some have a place with deductive research, some can only be utilized for the inductive research.

A survey technique is adopted for the current study. A survey is frequently utilized in business research to address exploratory and descriptive inquiries (Saunders et al., 2009). This procedure is exceptionally practical to conducting a research study with a large sample within a short time-frame. Based on the fact that the researcher plans to achieve this study within a specified time in an affordable manner, the author utilized a self-administered questionnaire electronic questionnaire to solicit responses from the staff of Jubaili Agrotec.

As indicated by Saunders et al. (2009), survey research is an effective method for gathering opinions since every member is inquired a similar question. Likewise, the self-administered online questionnaire enables the staff of the company to participate in the survey regardless of the differences in time and at a convenient time.

4.4.3 Method Choice

As indicated by Saunders et al. (2009), an investigation can utilize either multiple methods or mono methods. While multiple methods utilize more than one method for soliciting information and analysis, the mono method utilizes just a single strategy. The current study belongs to the mono method because it utilizes just a survey for information gathering, the talked about research has a place with Mono Method.

It should be noted that both qualitative and quantitative approaches can utilize a mono method. While the quantitative approach deals with numerical data through questionnaires and analyzed using a statistical tool, on the other hand, a qualitative approach has to do with non-numerical information through interviews and focus group discussion. Prior literature on supply chain management and managing supply chain complexity has adopted a quantitative approach (SerdarAsan and Tanyas, 2017; Lockett and Thompson, 2001; Priem and Butler, 2001). Moreover, it is contended that the quantitative approach encourages data collection of unbiased

responses through a scientific approach (Wright, 2006). Then again, a qualitative methodology was disposed of because it is time-consuming and focuses on limited participants (Mcleod, 2014). Along these lines, a quantitative technique is adopted haven weigh the pros and cons of both methodologies.

4.4.4 Time Horizon

Studies are additionally characterized into two kinds as indicated by their time horizon. While an investigation completed at one specific time to examine a specific issue is called as Cross-sectional examination, on the other hand, an investigation that observes the same events over a period is regarded as a Longitudinal investigation (Saunders et al., 2009). The current study employs a cross-sectional approach since the author is aimed at investigating the problem of the study within a specific time horizon.

4.5 Instrument Design

This section discusses the formulation of the research instruments. The study was based on a survey in light of the fact that it is regularly utilized in cross-sectional investigations (Easterby-Smith et al., 2008). The data was assembled by utilizing the self-administered questionnaire designed in two sections. The first segment comprises the list of questions regarding the respondent's demographic questions.

The second part of the online questionnaire was designed to seek participant’s opinions about the construct of the study. A four-point Likert scale rating which ranges from “strongly agree” to “strongly disagree” vis Supply Chain Complexity Drivers, Supply Chain Activities, Supply Chain Management Tools, Supply Chain Enabling Technologies. It was measured and edited using a drafted questionnaire (SerdarAsan and Tanyas, 2017).

Additionally, the questionnaire was comprised of the following variables:

Independent Variables: - Supply Chain Activities (SCA), Supply Chain Management Tools (SCMT), Supply Chain Enabling Technologies (SCeT).

Dependent Variable: - Supply Chain Complexity Drivers (SCCD)

Categorical Variables: - Age Group, Gender

Additionally, one open-ended question was included which permitted the participants to give some other suggestions considering the recent global pandemic.

4.6 Pilot Test

In order to ascertain the questionnaire is free from any errors that might affect the purpose of the questionnaire, it was at first pre-tested with the project supervisor to verify the validity and wordings of its content, which was accordingly adjusted. Through the pilot test, the author was able to adjust unclear words to make it more meaningful for the participants. The modified questionnaire was then administered to 10 participants who were not part of the target population.

The changes made in the final version of the survey instrument were as follows:

i. Reduction of the overall items to twelve: This is to ensure that the participants do not feel exhausted during the processes of providing answers to the questions.

ii. Adjustment of the age scaling

iii. Addition of "Preferred not to say" to gender responses

4.7 Population and Sample Size

The study population comprised of the entire staffs of Jubaili Agrotec in its four branches (Kano, Ibadan, FCT, and Lagos). Based on the official data from the office of the management of Jubaili Agrotec, the population of the staff in the production and Logistics departments are 120. Below is the breakdown of the population figures

i. Kano: 28
ii. Ibadan: 30
iii. FCT: 37
iv. Lagos: 25

The sample size was determined using Yamane (1967) formula:

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

Where: n: Sample size

N: Elements of population of the study: 120

e: Sampling error= 0.05

1: Constant value

$$= \frac{120}{1+120\ (0.05)^2}$$

n= 92

Therefore, the sample size for this study is 92.

4.8 Sampling

As per Saunders et al. (2009), the decision of selecting a sampling technique ought not to be relied upon just on the research question and the objectives of the study, it should likewise consider how attainable information can be acquired.

The current study embraced a stratified sampling approach which is a probability sampling method in which the participants must have some positive attributes, based on which they are assembled into different strata, and afterward samples are randomly chosen from every stratum. It is to be noted that the strata consider for this study are production and logistics departments in the four branches.

The staff of Jubaili Agrotec in the product and logistics department were randomly shared with an Online Google Form questionnaire over the company's Whatsapp group and twitter platform for 2 weeks.

4.9 Primary Data Collection and Storage

The sources and stages of primary data collection for this research study includes the following:

For the Pilot Study: Data was collected from 10 random online participants.

For the Main Study: Primary data was collected from the staff of Jubaili Agrotec

Information Storage

Storage over the Google Drive: The whole primary data gathered for this research was safely put in Google Drive. Respondents data were secretly kept and only the author had access to the records

4.10 Data Analysis

Information from the Google Form was coded utilizing the Statistical Package for Social Sciences (version 25). Since the objectives of the study were to test the effect of the

independent variables (Supply Chain Activities; Supply Chain Management Tools; and Supply Chain Enabling Technologies) on the dependent variable (Management of Supply Chain Complexity drivers), it is suitable to utilize an inferential statistic using linear regression and correlation to test the impact and relationship between the study variables.

4.11 Reliability and Validity

To guarantee that the questionnaire is free from mistakes and understandable to the participants, the researcher presented it to the project supervisor for inspection. Also, a pilot study was undertaking to verify the content validity before embarking on the actual field survey.

Likewise, to ensure the reliability of the instrument in terms of internal consistency, the test of internal consistency was utilized through the Cronbach's alpha that associates the response of each item with one another (Saunders et al., 2009). For the result of the Cronbach's alpha, refer to chapter five.

4.12 Limitations

The present study had a major limitation pertaining to the methodology adopted. The first limitation is attributed to the number of questionnaires retrieved which was relatively low as projected. The reason is due to the recent global pandemic virus of COVID-19. This denied most workers, especially Lebanon from taking part in the survey despite the fact that it was an online-based survey.

4.13 Ethical Consideration

The author kept up the security and privacy of the entire participants during the entire time of academic research. None of the participants were obliged to give their personal information. Also, the author requested an ethical approval from school before the beginning of the study and safe guided it with no issues. In this way, this academic research didn't represent any privacy-related threats to the respondents in ensuring the study followed all ethical standards.

4.14 Conclusion

The present chapter recognized and altogether assessed the accessible methodologies available for accomplishing the objectives of the study. The researcher did not just introduce the contention in favor or against the available methodological approaches while choosing the most suitable approach, yet the implication and limitations of the ethical standards were put forth.

CHAPTER FIVE: ANALYSIS AND FINDINGS

5 Introduction

This chapter covers the data analysis and interpretation of findings. It first presents the result of the test of the reliability of the construct of the study. Afterward, it presents the descriptive statistics of the questionnaire items. It finally presents the test of hypotheses; correlation and linear regression were utilized in testing the four hypotheses formulated for the study.

5.1 Test of Reliability

Table 5.1: Reliability Results of the Study Variables

	Cronbach's Alpha
Total_SCCD. (Supply Chain Complexity Drivers)	.902
Total_SCA. (Supply Chain Activities)	.908
Total_SCMT. (Supply Chain Management Tools)	.938
Total_SCeT. (Supply Chain Enabling Technologies)	.885

Case Processing Summary

		N	%
Cases	Valid	79	100.0
	Excluded[a]	0	.0
	Total	79	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.902	9

SPSS Version 25

The test of the reliability of the study variables is presented here. Four variables included in the investigation includes; Supply Chain Complexity Drivers (SCCD); Supply Chain Activities (SCA); Supply Chain Management Tools (SCMT); and Supply Chain Enabling Technologies (SCeT). These four variables had been measured in this dissertation using Cronbach's Alpha, as required when the Cronbach's Alpha value is beyond 0.7 that indicates that the results are reliable. As shown in Table 5.1, the result of the study variables is between the values of 0.8 to 0.9, while the overall value is 0.902 which was measured using the 9 items of the questionnaire. The outcome is above the benchmark of 0.7. Therefore, the constructs are reliable.

5.2 Descriptive Statistics of Questionnaire Items

Table 5.2: Descriptive Statistics of Demographic Data

Gender	Frequency	Percent	Cumulative Percent
Female	37	46.8	46.8
Male	42	53.2	100.0
Total	79	100.0	
Age			
18-25	26	32.9	32.9
26-35	44	55.7	88.6
36-45	7	8.9	97.5
46-60	2	2.5	100.0
Total	79	100.0	

SPSS Version 25

Table 5.2 describes the demographic information of the staffs of the Jubiali Agrotech, as clearly captured in the table, a higher value of males participated in the study representing N=42(53.2%), while female accounts for N=37(46.8%). This implies that both genders in the organization were samples.

The descriptive statistics of age group indicates that majority of the employees are between the age of 26-35 years old N=44(55.7%), this was followed by those between the age of 18-25 years old N=26(32.9%), while the remaining lesser values are between the age of 36-45 and 46-60years accounts for 7= (8.9%) and N=2(2.5%) respectively. This denotes that majority of the staff who participated in the study are between the ages of 18-35 years old.

Table 5.3: Descriptive Statistics of Supply Chain Complexity Drivers (SCCD)

Changing customer needs and expectations constitute complicatedness in the company's distribution networks	Frequency	Percent	Cumulative Percent
Strongly agree	18	22.8	22.8
Agree	49	62.0	84.8
Disagree	9	11.4	96.2
Strongly disagree	3	3.8	100.0
Total	79	100.0	
Domestic and/or international laws and regulations affect the company's distribution networks.			
Strongly agree	20	25.3	25.3
Agree	48	60.8	86.1
Disagree	6	7.6	93.7
Strongly disagree	5	6.3	100.0
Total	79	100.0	
Increased number of companies involved in the company's distribution networks create complicatedness in the supply chain			
Strongly agree	12	15.2	15.2
Agree	52	65.8	81.0
Disagree	9	11.4	92.4
Strongly disagree	6	7.6	100.0
Total	79	100.0	

SPSS Version 25

The descriptive statistics of the supply chain complexity drivers (SCCD) as showed in Table 5.3 indicates that the employees of Jubaili Agrotec who were asked whether the changing customer needs and expectations contribute to the complexity in the organization's supply chain, the outcome shows that 62 percent of the majority of the participants agree, while the lesser values of 22.8 percent, 11.5 percent, and 3.8 percent strongly agree, disagree and strongly disagree, respectively. This can be deduced that the changing customer needs and expectations contribute to the complexity drivers in Jubaili Agrotec distribution networks.

An inquiry of whether domestic or international laws and regulations affect the organization's distribution channel networks reveals that, 60.8 percent of the majority of the respondents agreed to the statement, while the remaining lesser value of 25.3, 7.6 and 6.3 percent strongly agreed, disagreed and strongly disagreed. In implication, the multifaceted problems of both the local and international laws and regulations affect the Jubaili Agrotec distribution network.

The employees who were asked whether the increasing number of the partners in the supply chain creates complexity in the distribution network shows that 65.8 percent of the majority of the respondents agreed to be faced with the increasing parties in the supply chain, while the remaining lesser values of 15.2, 11.4, and 7.6 percent strongly agree, disagree and strongly disagreed, respectively. This implies that the increased numbers of parties in the distribution network constitute complexity in the supply chain.

Table 5.4: Descriptive Statistics of Supply Chain Activities (SCA)

Our company eliminates non-value adding processes (i.e. product/service/firm) to ensure the performance of the distribution chain	Frequency	Percent	Cumulative Percent
Strongly agree	52	65.8	65.8
Agree	16	20.3	86.1
Disagree	5	6.3	92.4
Strongly disagree	6	7.6	100.0
Total	79	100.0	
Our company coordinate, integrate and synchronise the whole distribution chain process to deal with those factors constituting complexity in the supply chain.			
Strongly agree	19	24.1	24.1
Agree	51	64.6	88.6
Disagree	5	6.3	94.9
Strongly disagree	4	5.1	100.0
Total	79	100.0	

SPSS Version 25

Table 5.4 shows the descriptive statistics of supply chain activities (SCA). The outcome of the table indicates that 65.8 percent of the majority of the employees strongly agreed that Jubaili Agrotec can eliminate non-value adding processes as the supply chain activities to ensure the performance of the distribution chain, 20.3 percent also agreed, while the remaining lesser values of 7.6 and 6.3 percent strongly disagreed and disagreed. It can be deduced that Jubaili

Agrotec ensures its distribution chain performance by eliminating non-value adding processes vis-a-vis product, service, and firms.

The participants who were asked the supply chain activities adopted in dealing with the complexity drivers indicates that higher value of 64.6 percent agreed that Jubaili Agrotec coordinates, integrate and synchronize the entire distribution chain process to managing the complexity drivers in the network chain, while the remaining lesser values of 24.1, 6.3 and 5.1 percent strongly agree, disagreed and strongly disagreed, accordingly. This implies that Jubaili Agrotec coordinates, integrates, and synchronizes the entire distribution chain process to managing the complexity drivers in the network chain.

Table 5.5: Descriptive Statistics of Supply Chain Management Tools (SCMT)

My company adopts advanced tools and methods to improve the flows in its supply chain.	Frequency	Percent	Cumulative Percent
Strongly agree	60	75.9	75.9
Agree	4	5.1	81.0
Disagree	10	12.7	93.7
Strongly disagree	5	6.3	100.0
Total	79	100.0	
The use of SCM tools has improved the company's supply chain performance by managing the supply chain complexity			
Strongly agree	20	25.3	25.3
Agree	44	55.7	81.0
Disagree	7	8.9	89.9
Strongly disagree	8	10.1	100.0
Total	79	100.0	

SPSS Version 25

Table 5.5 shows the descriptive statistics of the supply chain management tools (SCMT). Employees who were asked the SCMT employed in dealing with the supply chain complexity drivers reveals that higher value of 75.9 percent strongly agreed that Jubaili Agrotec utilizes advanced tools and methods in improving the flows of information and materials within its distribution chain, while the remaining lesser values of 12.7, 6.3 and 5.1 percent disagreed, strongly disagreed and agreed, respectively. It implies that Jubaili Agrotec uses advanced tools and methods to improve the flows of information and materials within its distribution chain.

Additionally, a higher value of 55.7 percent agreed that the SCMTs have improved Jubaili Agrotec supply chain performance by dealing with the complexity within the distribution network, while the remaining lesser values of 25.3, 10.1 and 8.9 percent strongly agreed, strongly disagreed and disagreed. It can be deduced that the use of SCM tools has improved Jubaili Agrotec's supply chain performance in managing the supply chain complexity drivers.

Table 5.6: Descriptive Statistics of Supply Chain Enabling Technology (SCeT)

My company utilize the SCM technologies (i.e. E-mail, Phones & Fax, Barcode technology, Advanced application software)	Frequency	Percent	Cumulative Percent
Strongly agree	13	16.5	16.5
Agree	54	68.4	84.8
Disagree	9	11.4	96.2
Strongly disagree	3	3.8	100.0
Total	79	100.0	
The use of SCM software and technologies helps us to solve problems caused by supply chain complexity.			
Strongly agree	50	63.3	63.3
Agree	17	21.5	84.8
Disagree	5	6.3	91.1
Strongly disagree	7	8.9	100.0
Total	79	100.0	

SPSS Version 25

Descriptive statistics of Table 5.6 shows the supply chain enabling technology (SCet). The table indicates that higher value of 68.4 percent agreed that Jubaili Agrotec utilizes (SCet) vis a vis mail, phones, fax machine, barcode technology, and advance application software to managing the complexity within the distribution network, while the remaining lesser value of 16.5, 11.4 and 3.8 percent strongly agree, disagree and strongly disagree, respectively. This implies that Jubaili Agrotec adopts mail, phones, fax machine, barcode technology, and advanced application software as a SCeT to dealing with the complexity within the distribution network.

The descriptive statistics of SCeT also reveal that 63.3 percent strongly agreed that using the supply chain management software and technologies have helped Jubaili Agrotec to solve the problems caused by supply chain complexity drivers, while the remaining 21.5, 8.9 and 6.3 percent agree, strongly disagree and disagree, respectively. The implication suggests that helped Jubaili Agrotec have been able to solve the problems caused by supply chain complexity drivers through the supply chain management software and technologies.

Table 5.7: Multifaceted Challenges Encountered by Jubaili Agrotec caused by COVID-19.

Badly affected the flow of resource between the supply chain
Movement of items has been placed on hold
Decline in sales
Demand has reduced and getting items have become difficult. And made prices of commodities to increase.
Due to the lockdown, everything has been on hold.
Everything has ground to a halt as airfreight and logistics have been on lockdown.
Logistics is a challenge at this point. And the company is faced with loan issues from the financial institute and long term prospect has become negative and profit drops.
Government laws on movement restriction have posed a great challenge in the delivery of the company's merchandise. And ultimately affected the monthly sales volume.
Its effect on the supply chain is really bad.
It has affected the supply chain terribly.
It has affected us (the firm) negatively in that everyone has been stuck indoor and it has become so difficult to have any form of distribution.
It has drastically cut off the organisation supply chain which nothing can be done about it as at the moment (during the lockdown).
It has limited the free flow of the distribution chain of the company; thereby reducing the company’s revenue and increasing inventory holding period. This has adversely affected the firm’s reputation with some customers and reduced its rating on performance management.
It has made business and supply to be on hold.
It has put some on hold while we are still carrying on supply for others as well
It has affected the organisation because the firm has been unable to receive supplies from the suppliers as all the borders are closed.
It has affected supply chain distribution network
It has slow down distribution due to restriction in movement of goods and services
It has slowed down productivity and distribution.
It has slowed down the rate of product and service delivery
Logistics support limitations
No movement, no import and no customers.
Physical deliverables are next to impossible now.
The physical signing of receipt documents, visual verification of items also impacted
Quite badly as there is little to no movement of goods/products
Restriction of movement and limitations.
The company's supply chain networks have been interrupted due to the global lockdown in the quest of curbing COVID-19.
The current pandemic harms our distribution network due to the lockdown which is also affecting our line of industry. Due to the ceased movement, all essential services which require manpower have been put on hold, thereby negatively affects the business and supply chain.

The current pandemic has affected the supplier chain as it has crippled the economy where customers have to cut their budget as a result of the inability to work as the current global lockdown keep workers at home. Also for the few that still have resources to survive, supplies ordered takes longer, more funds and more complications to get to them thereby affecting the availability of these products and services.
The lead time has increased
The pandemic has affected supply chain/distribution cause the sit at home policies has made the swift flow of work slow, making us have inabilities to reach clients as quick as possible. The pandemic has served as a setback globally.
The pandemic situations have made supply chain/distribution network relatively slow, cause certain measures are put in place to help reduce the exposure to the virus 'vis a vis (Social distancing, Social distancing has made it difficult to have an effective supply chain/distribution network all over the retail outlets.
The workflow has been greatly interrupted as we have run of raw materials for production while buffer stock will soon finish.
There has been an inadequate supply of raw materials from our suppliers whose plants and facilities are located in China.
We depend substantially on imports from our vendors and suppliers overseas. Due to this pandemic, we are facing challenges on logistics as a result of border closures. Also, our shipments already at the seaport has been quarantined and subjected to scrutiny by the health port services which have delayed our shipment. Our inventory has reduced and sales dropped as we couldn't meet up with demands with our clients. Our revenue has also dropped.

Self-compilation of individual's responses, 2020

5.3 Hypotheses Testing

5.3.1 Restatement of Hypotheses

***1*H$_1$:** Supply Chain Activities have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec

***2*H$_1$:** Supply Chain Management Tools have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec

***3*H$_1$:** Supply Chain Enabling Technologies have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec.

To test the impact of Supply Chain Activities (SCA), Supply Chain Management Tools (SCMT), and Supply Chain Enabling Technologies (SCeT) on the management of complexity drivers, the author of this study adopts a linear regression. The choice of this statistical tool is to provide a new insight in dealing with the complexity drivers, and since available papers have intensively utilized a literature review approach.

Table 5.8: Test of Hypothesis One

(A) Descriptive Statistics

	Mean	Std. Deviation	N
SCCD (Supply Chain Complexity Driver)	6.0253	1.64842	79
SCA (Supply Chain Activities)	3.4810	1.27963	79

(B) Correlations

		SCCD	SCA
Pearson Correlation	SCCD (Supply Chain Complexity Driver)	1.000	.827
	SCA (Supply Chain Activities)	.827	1.000
Sig. (1-tailed)	SCCD (Supply Chain Complexity Driver)	.	.000
	SCA (Supply Chain Activities)	.000	.
N	SCCD (Supply Chain Complexity Driver)	79	79
	SCA (Supply Chain Activities)	79	79

(C) Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.827[a]	.684	.680	.93318

a. Predictors: (Constant), SCA.

b. Dependent Variable: SCCD.

(D) ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	144.896	1	144.896	166.390	.000[b]
	Residual	67.053	77	.871		
	Total	211.949	78			

a. Dependent Variable: SCCD.

b. Predictors: (Constant), SCA.

(E) Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	2.318	.306		7.574	.000	1.708	2.927
	SCA.	1.065	.083	.827	12.899	.000	.901	1.230

a. Dependent Variable: SCCD.

Table 5.8 test hypothesis one which states that ***1*H₁:** Supply Chain Activities have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec. The subsection **(A)** indicates that seventy-nine employees where surveyed about the impact of Supply Chain Activities (SCA) in dealing with the Supply Chain Complexity Drivers (SCCD), the result of the descriptive statistic reveals that participants rated SCCD as high with a mean

of 6.0253 and standard deviation of 1.64842. Also, SCA is rated high with a mean of 3.4810 and a standard deviation of 1.27963.

Sub-section **(B)** is the correlation test that indicates the strength and direction of a linear relationship between an attribute A (Independent variable) and B (Dependent variable). Based on the outcome in table (**B**), there is a statistical relationship between SCCD and SCA. In other words, there is a strong and positive relationship between SCA and SCCD. The result is presented as follows (r= 0.827; Pvalue= .000).

Sub-section **(C)** is a model summary that reports the R^2 as the measure of the amount of variance in the dependent variable (SCCD) that the independent variable (SCA) accounted for. The outcome of the model reveals a high variance of R^2 68 percent in SCCD is explained by SCA.

Sub-section (**D**) is the ANOVA table which tests whether the value of R^2 (0.68%) is statistically significant. The overall regression model is statistically significant as the F (df=1, 77= 166.390, P<000, R^2=68%).

Sub-section (**E**) is the coefficient tests of the predictive/independent variable (SCA) at 0.05 alpha level. The Standardized Coefficients Beta of (.827) is the degree of association of SCA on SCCD with a significant level of .000 that is based on the 't' distribution of 12.899. The coefficient is statistically significant; therefore, the alternative hypothesis is accepted at 5% significant level and the rejection of the null hypothesis. The result concludes that H_1: Supply Chain Activities have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec

Table 5.9: Test of Hypothesis Two

(A) Descriptive Statistics

	Mean	Std. Deviation	N
SCCD (Supply Chain Complexity Driver)	6.0253	1.64842	79
SCMT (Supply Chain Management Tools)	3.5316	1.69339	79

(B) Correlations

		SCCD	SCMT
Pearson Correlation	SCCD (Supply Chain Complexity Driver)	1.000	.725
	SCMT (Supply Chain Management Tools)	.725	1.000
Sig. (1-tailed)	SCCD (Supply Chain Complexity Driver)	.	.000
	SCMT (Supply Chain Management Tools)	.000	.
N	SCCD (Supply Chain Complexity Driver)	79	79
	SCMT (Supply Chain Management Tools)	79	79

(C) Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.725[a]	.526	.520	1.14204	.526	85.505	1	77	.000

a. Predictors: (Constant), SCMT.

b. Dependent Variable: SCCD.

(D) ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	111.521	1	111.521	85.505	.000[b]
	Residual	100.428	77	1.304		
	Total	211.949	78			

a. Dependent Variable: SCCD.

b. Predictors: (Constant), SCMT.

(E) Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	3.532	.299		11.822	.000	2.937	4.126
	SCMT.	.706	.076	.725	9.247	.000	.554	.858

a. Dependent Variable: SCCD.

Table 5.9 tests hypothesis two which states that ***2*H₁:** Supply Chain Management Tools have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec.

The subsection **(A)** indicates that seventy-nine employees where surveyed about the impact of Supply Chain Management Tools (SCMT) in dealing with the Supply Chain Complexity Drivers (SCCD), the result of the descriptive statistic reveals that participants rated SCCD as

high with a mean of 6.0253 and standard deviation of 1.64842. Also, SCMT is rated high with a mean of 3.5316 and a standard deviation of 1.69339.

Sub-section **(B)** is the correlation test that indicates the strength and direction of a linear relationship between an attribute A (Independent variable) and B (Dependent variable). Based on the outcome in table (**B**), there is a statistical relationship between SCCD and SCMT. In other words, there is a strong and positive relationship between SCMT and SCCD. The result is presented as follows (r= 0.725; Pvalue= .000).

Sub-section **(C)** is a model summary that reports the R^2 as the measure of the amount of variance in the dependent variable (SCCD) that the independent variable (SCMT) accounted for. The outcome of the model reveals a high variance of R^2 53 percent in SCCD is explained by SCMT.

Sub-section (**D**) is the ANOVA table which tests whether the value of R^2 (0.53%) is statistically significant. The overall regression model is statistically significant as the F (df=1, 77= 85.505, P<000, R^2=53%).

Sub-section (**E**) is the coefficient tests of the predictive/independent variable (SCMT) at 0.05 alpha level. The Standardized Coefficients Beta of (.725) is the degree of association of SCMT on SCCD with a significant level of .000 that is based on the 't' distribution of 9.247. The coefficient is statistically significant; therefore, the alternative hypothesis is accepted at 5% significant level and the rejection of the null hypothesis. The result concludes that ***2*$\mathbf{H_1}$: Supply Chain Management Tools have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec

Table 5.10: Test of Hypothesis Three

(A) Descriptive Statistics

	Mean	Std. Deviation	N
SCCD (Supply Chain Complexity Driver)	6.0253	1.64842	79
SCeT (Supply Chain Enabling Technologies)	3.6329	1.38839	79

(B) Correlations

		SCCD.	SCeT.
Pearson Correlation	SCCD (Supply Chain Complexity Driver)	1.000	.833
	SCeT (Supply Chain Enabling Technologies)	.833	1.000
Sig. (1-tailed)	SCCD (Supply Chain Complexity Driver)	.	.000
	SCeT (Supply Chain Enabling Technologies)	.000	.
N	SCCD (Supply Chain Complexity Driver)	79	79
	SCeT (Supply Chain Enabling Technologies)	79	79

(C) Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.833[a]	.694	.690	.91749	.694	174.784	1	77	.000

a. Predictors: (Constant), SCeT.

b. Dependent Variable: SCCD.

(D) ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	147.131	1	147.131	174.784	.000[b]
	Residual	64.818	77	.842		
	Total	211.949	78			

a. Dependent Variable: SCCD.

b. Predictors: (Constant), SCeT.

(E) Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	2.432	.291		8.362	.000	1.853	3.011
	SCeT.	.989	.075	.833	13.221	.000	.840	1.138

a. Dependent Variable: SCCD.

Table 5.10 tests hypothesis two which states that ***3*H₁:** Supply Chain Enabling Technologies have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec.

The subsection **(A)** indicates that seventy-nine employees where surveyed about the impact of Supply Chain enabling Technologies (SCeT) in dealing with the Supply Chain Complexity Drivers (SCCD), the result of the descriptive statistic reveals that participants rated SCCD as high with a mean of 6.0253 and standard deviation of 1.64842. Also, SCeT is rated high with a mean of 3.6329 and a standard deviation of 1.38839.

Sub-section **(B)** is the correlation test that indicates the strength and direction of a linear relationship between an attribute A (Independent variable) and B (Dependent variable). Based on the outcome in table (**B**), there is a statistical relationship between SCCD and SCeT. In other words, there is a strong and positive relationship between SCeT and SCCD. The result is presented as follows (r= 0.833; Pvalue= .000).

Sub-section **(C)** is a model summary that reports the R^2 as the measure of the amount of variance in the dependent variable (SCCD) that the independent variable (SCeT) accounted for. The outcome of the model reveals a high variance of R^2 69 percent in SCCD is explained by SCeT.

Sub-section (**D**) is the ANOVA table which tests whether the value of R^2 (0.69%) is statistically significant. The overall regression model is statistically significant as the F (df=1, 77= 174.784, P<000, R^2=69%).

Sub-section (**E**) is the coefficient tests of the predictive/independent variable (SCeT) at 0.05 alpha level. The Standardized Coefficients Beta of (.833) is the degree of association of SCeT on SCCD with a significant level of .000 that is based on the 't' distribution of 13.221. The coefficient is statistically significant; therefore, the alternative hypothesis is accepted at 5% significant level and the rejection of the null hypothesis. The result concludes that ***3*$\mathbf{H_1}$: Supply Chain Enabling Technologies have a significant impact on the Management of Supply Chain Complexity drivers in Jubaili Agrotec

CHAPTER SIX: FINDINGS ANG DISCUSSION

6.0Introduction

This chapter entails the discussion of the findings from the self-administered electronic questionnaire. These findings are in line with the three hypotheses formulated based on the extant literature that was reviewed in chapter two. Interestingly, the whole three hypotheses tested were found to be positive and the outcome led to the acceptance of the entire alternative (H_1) hypothesis. The discussion of each finding is presented underneath:

6.1 Discussion of Findings in Test of Hypotheses Result

6.1.1 Hypothesis One

The first hypothesis indicated that supply chain activities (SCA) have a significant impact on the management of supply chain complexity drivers (SCCD) in Jubaili Agrotec. As depicted in table 4 in chapter five which shows the descriptive statistics of SCA indicated that the vast participants of the staffs within the supply chain department in Jubiali Agrotec; representing 65.8% strongly agreed that eliminations of non-value adding processes vis-à-vis product, service and firms has enabled them to assure the performance of the distribution network. Evidently, supply chain activities such as coordination, integration, and synchronization of the whole distribution chain processes in dealing with the complexity drivers as 64.6% of the majority if the participant agreed.

Given the outcome of the test of the hypothesis shows a strong and positive relationship between the SCA and the management of SCCD (r= 0.827; pvalue= .000). Additionally, the impact of SCA in dealing with the SCCD is reported in the Standardized Coefficients Beta of (.827) with a significant level of .000 which is based on the 't' distribution of 12.899. This suggests that the coefficient of the SCA on the management of SCCD is statistically significant.

Previous literature also concluded that the activities of the SCM significantly support coordinating the reliance between firms in the distribution network, as well as managing the SCC drivers. Earlier studies of Mentzer et al. (2001); and Min and Mentzer (2004) stresses the significance of system integration, system coordination, data sharing, visibility, channel's benefit-risk sharing, as well as a long-term collaboration between partners as the SCM activities. The literature of SerdarAsan and Tanyas (2017) on supply chain complexity (SCC) verified the supply chain activities that can be adopted in dealing with the supply chain complexity drivers can be achieved through the supply chain integration, increased coordination, information visibility, synchronization, standardization, automation of processes, elimination of non-value adding processes, and adoption of the use of strong decision frameworks.

6.1.2 Hypothesis Two

The second hypothesis reveals that supply chain management tools (SCMT) have a significant impact on the management of supply chain complexity drivers (SCCD) in Jubaili Agrotec. A closer look at table 5 in the previous chapter indicated that the adoption of advance tools and method in Jubiali Agrotech is not only an apparatus in assuring the effective flow of the supply chain networks; represented by 75.9% of the majority of the participants who strongly agreed,

it likewise ensures the performance of the supply chain by managing the complicatedness within the distribution network, as 55.7% of the majority if the participant agreed.

Based on the result generated from the test of the hypothesis, it is evident that a strong and positive relationship exists between SCMT and the management of SCCD (r= 0.725; Pvalue= .000). The impact of SCMT in dealing with the SCCD is verified in the Standardized Coefficients Beta of (.725) with a significant level of .000 which is based on the 't' distribution of 9.247. This suggests that the coefficient of the SCMT on the management of SCCD is statistically significant.

A dearth of empirical validation exist on the impact of Supply Chain Management Tools (SCMT) in dealing with the Supply Chain Complexity Drivers (SCCD), however, the previous study of SerdarAsan and Tanyas (2017) found out that stated that "Supply Chain Operations Reference-model (SCOR), Collaborative Planning, Forecasting and Replenishment (CPFR), Quick Response (QR), Efficient Consumer Response (ECR), Vendor Managed Inventory (VMI), as well as Lean-Agile initiatives" as a supply chain management tools are aimed at improving the flows of information and materials within the distribution network (p. 10).

6.1.3 Hypothesis Three

Lastly, hypothesis three shows that supply chain enabling technologies (SCeT) have a significant impact on the management of supply chain complexity drivers (SCCD) in Jubaili Agrotec. It is evident from table 6 in chapter five as 68.4% and 63.3% of the majority of the participant who strongly agreed and agreed that the utilization of supply chain enabling technologies vis-à-vis: e-mail, phones & fax, barcode technology, advanced application software has helped to manage the problems caused by the complicatedness within the distribution network.

From the result generated from the test of the hypothesis, it is can be said that a strong and positive relationship exists between SCeT and the management of SCCD (r= 0.833; Pvalue= .000). To establish the impact of SCeT in dealing with the SCCD is verified in the Standardized Coefficients Beta of (.833) with a significant level of .000 which is based on the 't' distribution of 13.221. This suggests that the coefficient of the SCeT on the management of SCCD is statistically significant.

6.2 Discussion About Research Objective

6.2.1 Research Objective One

Research objective one which is aimed at ascertaining the impact of supply chain activities (SCA) in dealing with the supply chain complexity drivers in Jubaili Agrotec. Given the outcome of the test of the hypothesis, there is a strong and positive association between SCA and the management of SCCD (r= 0.827; Pvalue= .000). Additionally, the impact of SCA in dealing with the SCCD is reported in the Standardized Coefficients Beta of (.827) with a significant level of .000 which is based on the 't' distribution of 12.899. This suggests that the coefficient of the SCA on the management of SCCD is statistically significant.

Previous literature also concluded that the activities of the SCM significantly support coordinating the reliance between firms in the distribution network, as well as managing the SCC drivers. Earlier studies of Mentzer et al. (2001); and Min and Mentzer (2004) stresses the

significance of system integration, system coordination, data sharing, visibility, channel's benefit-risk sharing, as well as a long-term collaboration between partners as the SCM activities. The literature of SerdarAsan and Tanyas (2017) on supply chain complexity (SCC) verified the supply chain activities that can be adopted in dealing with the supply chain complexity drivers can be achieved through the supply chain integration, increased coordination, information visibility, synchronization, standardization, automation of processes, elimination of non-value adding processes, and adoption of the use of strong decision frameworks.

6.2.2 Research Objective Two

Research objective two which is aimed at investigating the impact of supply chain management tools (SCMT) in dealing with the supply chain complexity drivers in Jubaili Agrotec. Based on the result generated from the test of the hypothesis, it is evident that a strong and positive correlation exists between SCMT and the management of SCCD (r= 0.725; pvalue= .000). The impact of SCMT in dealing with the SCCD is verified in the Standardized Coefficients Beta of (.725) with a significant level of .000 which is based on the 't' distribution of 9.247. This suggests that the coefficient of the SCMT on the management of SCCD is statistically significant.

A dearth of empirical validation exist on the impact of Supply Chain Management Tools (SCMT) in dealing with the Supply Chain Complexity Drivers (SCCD), however, the previous study of SerdarAsan and Tanyas (2017) found out that stated that "Supply Chain Operations Reference-model (SCOR), Collaborative Planning, Forecasting and Replenishment (CPFR), Quick Response (QR), Efficient Consumer Response (ECR), Vendor Managed Inventory (VMI), as well as Lean-Agile initiatives" as a supply chain management tools are aimed at improving the flows of information and materials within the distribution network (p. 10).

6.2.3 Research Objective Three

Research objective three which is aimed at establishing the impact of supply chain enabling technologies (SCeT) in dealing with the supply chain complexity drivers in Jubaili Agrotec. From the result generated from the test of the hypothesis, it is can be said that a strong and positive relationship does exist between SCeT and the management of SCCD (r= 0.833; pvalue= .000). To establish the impact of SCeT in dealing with the SCCD is verified in the Standardized Coefficients Beta of (.833) with a significant level of .000 which is based on the 't' distribution of 13.221. This suggests that the coefficient of the SCeT on the management of SCCD is statistically significant.

The findings of this study are similar to the previous study of SerdarAsan and Tanyas (2017) who found out that supply chain enabling technologies is crucial in achieving supply chain integration as well as the management of the complicatedness in the supply chain to attain the performance of the distribution network. This result further indicated that the surveyed enterprise utilize e-mail, phone, fax, barcode devices, and ERP software.

Considering the relevance of the distribution channel network in the flow of resources, prominent organizations have been very divergent in proposing the best business model to deal with the recent distortion in the supply chain necessitated by Covid-19. For instance, The Global Fund proposes the solution to managing complexity in recent time to focus on "Re-

rerouting of shipments; consolidating airfreight to ocean freight or changing transit countries to catch “cargo-only” aircraft; changing mode of transport for final delivery; shipping to neighboring countries; exploring road transport and air charter options; and among others" (Global Fund, 2020, p. 2).

Oxford Business Group (2020) likewise proposed the need to adopt an electronic-based technology in connecting parties of the distribution network, as well as restricting person-to-person contact in the supply chain network to ensure disinfection of Coronavirus. A recent study conducted in May 2020 on the global supply chain put forth the likely supply chain strategies in dealing with the complicatedness faced in the manufacturing, as well as the distribution channel of shipment transit during the global pandemic of COVID-19 to include: the renationalization of the global supply chain in the quest of safeguarding nation’s economies against any unforeseen lockdown in future as a result of pandemic (Bonadio, Huo, Levchenko and Pandalai-Nayar, 2020)

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

The author of this study has extensively examined the impact of supply chain management initiatives in dealing with supply chain complexity drivers in Jubaili Agrotec Limited, Nigeria. It is worth reiterating that supply chain management is not only those efforts tailored to effectively facilitate both the market interest across organizations, but it also covers the joint effort amid the network members aimed at ensuring the flow of the final products or services. This as a result has prompted many firms to adopt supply chain management to deal with the complexity drivers within the distribution network and Jubiali Agrotec is not an exception. This chapter, therefore, presents the conclusion of the study with the study findings, it also provides useful recommendations, limitations, and suggestions for further studies.

7.2 Conclusion

Based on the results of the study, the Supply Chain Activities (SCA), Supply Chain Management Tools (SCMT) and Supply Chain Enabling Technologies (SCeT) are significant predictors in dealing with the Supply Chain Complexity Drivers (SCCD). Given these results, this study concludes that the initiatives of supply chain management have an impact on the management of the complexity drivers. The supply chain initiatives can better ensure the performance of the distribution chain by eliminating non-value adding processes vis-a-vis product, service, and firms. It likewise coordinates, integrates, and synchronizes the entire distribution chain process to managing the complexity drivers in the network chain.

7.3 Recommendations

This study provides useful recommendations based on the findings of the study.

For the management of Jubaili Agrotec to deal with the supply chain complexity driver, they need to effectively communicate and have a vast knowledge of the internal, external, and interfacial complexity. This will assist them in identifying non-value adding processes as well as activities and thus eliminating such activities.

To achieve optimum performance of the supply chain/distribution networks, there is a need for the management to develop capabilities through the supply chain management initiatives vis-a-vis (SCA, SCMT & SCeT) to help manage unforeseen, uncertain and dynamism in the distribution network.

To attain the best out of the SC technologies and SC software, there is a need for proper training of the technologies to ensure technological know-how. This can help in tracking the activities of the distribution network and take the necessary precaution when necessary.

7.4 Limitations and Suggestions for Further Studies

This study has some limitations; the first limitation is attributed to the relatively small sample size which is a result of the global pandemic of Covid-19. This deprived most staff of the sample company of participating in the survey. The second limitation is the lack of recent and relevant research papers on SCM initiatives and management of the SCCD. To this end, there is a need for further research on SCM and the management of complexity drivers. Further studies need to distinguish between the forms of supply chain complexity and who each can be managed through the SCM initiatives.

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APPENDIX

QUESTIONNAIRE

SECTION A: Personal Data: (Please Indicate Appropriately)

1. Gender: (please Specify)_____
2. Department: (please Specify)_____
3. Years worked: (please Specify)_____

SECTION B: RESEARCH QUESTIONS

Please read the following statements carefully and tick appropriately to show the degree of your agreement or disagreement with each statement.' 'SA=Strongly Agree, A=Agree', 'U=Undecided', 'D=Disagree'; and SD = Strongly Disagree'.

S/N	A. Supply Chain Complexity Drivers (SCCD)	SA	A	D	SD
4.	Changing customer needs and expectations constitute complicatedness in the company's distribution networks				
5.	Domestic and/or international laws and regulations affect the company's distribution networks.				
6.	Increased number of companies involved in the company's distribution networks create complicatedness in the supply chain				
S/N	**B. Supply chain Activities (SCA)**	**SA**	**A**	**D**	**SD**
7	Our company eliminates non-value adding processes (i.e. product/service/firm) to ensure the performance of the distribution chain				
8	Our company coordinate, integrate and synchronise the whole distribution chain process to deal with those factors constituting complexity in the supply chain.				
S/N	**C. Supply Chain Management Tools (SCMT)**	**SA**	**A**	**D**	**SD**
9	My company adopts advanced tools and methods to improve the flows in its supply chain.				
10	The use of SCM tools has improved the company's supply chain performance by managing the supply chain complexity				
S/N	**D. Supply Chain Enabling Technologies (SCeT)**	**SA**	**A**	**D**	**SD**
11	My company utilise the SCM technologies (i.e. E-mail, Phones & Fax, Barcode technology, Advanced application software)				
12	Use of SCM software and technologies helps us to solve problems caused by supply chain complexity.				

Additional information

13. Considering the current pandemic situation in the world; how have you been able to manage your supply chain/ distribution network?

_____

_____

_____

Thank you for your co-operation.