EFFECTS OF ADVANCED SUPPLY CHAIN PLANNING SYSTEMS, SUPPLIER RELATIONSHIP, SUPPLY CHAIN AGILITY ON FIRM SUPPLY CHAIN PERFORMANCE OF SELECTED MANUFACTURING FIRMS IN NAIROBI COUNTY, KENYA

BY

ROBERT BETT CHUMBA

A RESEARCH THESIS SUBMITTED TO THE SCHOOL OF BUSINESS AND ECONOMICS, DEPARTMENT OF MARKETING AND LOGISTICS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN BUSINESS MANAGEMENT

MOI UNIVERSITY

2022

DECLARATION

DECLARATION BY CANDIDATE:

I hereby declare that the work contained in this thesis is my original work and has not previously, in part or in its entirety, been presented at any other university towards the award of any degree.

Sign:_____ Date:_____

Robert Bett Chumba

SBE/DPHIL/BM/037/14

DECLARATION BY SUPERVISORS:

This PhD thesis has been submitted with our approval as the university supervisors.

Sign:_____ Date:_____

Dr. Ronald Bonuke

Department of Marketing and logistics

School of Business, Moi University

Sign:_____ Date:_____

Dr. Daniel Kirui

Department of Finance & Accounting

School of Business, Moi University

DEDICATION

First and foremost, I dedicate this thesis to the Almighty God for seeing me through the writing; Secondly, I dedicate it to my, Supervisors Dr Ronald Bonuke and Dr Daniel Kirui and my family for their encouragements and support.

ACKNOWLEDGEMENT

The completion of this thesis was made possible by the contributions of numerous individuals whose efforts cannot be overstated in producing this thesis. I wish to express my heartfelt appreciation to each of them. I give thanks to God because without him, I would not have gotten to where I am. I would like to thank my colleagues and supervisors for their helpful guidance. Lastly, I express my appreciation to the works of many scholars.

ABSTRACT

Supply chain performances have been touted as improving the performance of organizations which participates in advanced planning system. In order to improve product and service quality, reduce waste, and adapt quickly to market changes, managers must also restructure their supply chains. Some research has been done on supply chain performance and how technology might help, however there are large gaps in the research. To compete in today's changing global marketplaces, most firms face numerous hurdles. Main aim of the study was to determine the conditional effect of supplier relationship on the relationship between advanced planning system, and the supply chain performance via agility. The study was grounded by transactional cost theory, Balance scorecard, dynamic capability theory and network theory. The study was anchored on quantitative paradigm and employed explanatory research design. A target population of 591 manufacturing firms of sample of 233 firms were studied. Questionnaires was used as a method of collecting data. The collected data was analyzed using multiple regression models. Results showed that supply advanced planning system significantly influences supply chain organizational performance positively ($\beta = 0.6769, p = 0.000$). Further, supply chain agility (SCA) significantly affected the supply chain organizational performance (SCOP) with coefficients and the probabilities $\beta = 0.2730$ $(p = 0.000)$. Further, the effect of SR (moderating effect of SR) on relationship between SCAPS and SCOP was strongly positive ($\beta = .0600, p = 0.0049$. The moderated mediation further was positive ($\beta = 0.0451$) and significant while mediating role of supply chain agility became insignificant to influence supply chain organizational performance. The difference association between insignificant mediating effect of SCA and significant moderated mediation effect can be attributed to the strong moderating role of SR on the link between supply chain advanced planning and the organizational performance. Meaning the supplier relation is critical player because of its effect. In conclusions that supply chain advanced planning improves performance of the overall value of the supply chain by reducing costs and increasing efficiency with leaner operations. It also balances supply and demand to maximise productivity gains and manage timely contributions to business operations. It is an incredibly significant for manufacturing firms to enhance supply chain organizational performance of the firms competing in global markets to respond to the competitive challenges they encounter in the industry and leveraging these skills to gain a competitive advantage over other.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

ABC	Activity-based costing
CPFR	Collaborative planning, forecasting, and replenishment
ERP	Enterprise Resource Planning
MRP	Material Requirements Planning
PPR	Procurement Practices
RBV	Resource Based View
SCA	Supply Chain Agility
SCAPS	Supply Chain Advanced Planning System
SCM	Supply Chain Management
SCMP	Supply Chain Management Performance
SCOP	Supply Chain Organizational Performance
SR	Supplier Relation
TCT	Transaction Cost Theory
VC	Value Chain
VMI	Vendor Managed Inventory

OPERATIONAL DEFINITION OF KEY TERMS

Activity Based Costing (ABC) is a decision-making tool that is used for a variety of tasks, including product mix costs and price decisions (Kee 2008)

Advanceds Planning Systems- An advanced planning system (APS) tracks costs based on the activities that drive costs in manufacturing. An APS balances supply and demand by allocating raw materials and production capacity (Jonsson *et al.*, 2013).

Collaborative Planning, Forecasting, and Replenishment (CPFR) is a business practice that combines the intelligence of multiple SC partners and synchronizes them into joint forecasting and planning with the aim of improving demand visibility and SC efficiency" (Danese, 2007).

Enterprise Resource Planning (ERP) is a manufacturing, finance, marketing, and human resource modules that allow organisations to plan their goods and services (Stevenson, 2007).

MRP and MRPII are production planning and control systems used to manage order fulfilment by matching the availability of materials and resources to client demand (Adams, 2020)

Supplier Relation - This word refers to the long-term relationship that exists between an organization and its vendors (Abdallah *et al.,* 2014).

Supply Chain Agility refers to how rapidly organizations can adapt their conduct to changing market conditions is a true measure of agility and its consequences for performance. (Sambamurthy e*t al,* 2003).

Supply Chain Organizational Performance- Supply chain performance spans all supplies are moved and stored from point of origin to point of consumption. The Council of Logistics Management (CLM) defines SCOP as the systemic, strategic coordination of traditional business functions and tactics across organizations and supply chains to improve long-term performance of the organizations and supply chains.

Vendor Managed Inventory (VMI) is defined as a system where "the supplier decides on the appropriate inventory levels of each of the products (within previously agreed-on bounds) and the appropriate inventory policies to maintain these levels (Simchi-Levi *et al.,* 2004).

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter presents the background of the study, the statement of the problem, the objectives of the study, the significance of the study and the scope of the study.

1.2 Background Information of the Study

Market globalization has intensified competition, and this has forced organizations to put more emphasis on customer orientation which in turn catalyzes the interest in supply chain performance (Gunasekaran *et al.,* 2001; Shepherd & Günter, 2010; Luu, 2017; Modgil & Sharma, 2017). Supply chain performance is viewed as critical to establishing a lasting competitive advantage via enhanced inter- and intra-firm interactions (Ellinger, 2000; Takeishi, 2001; Luzzini *et al.,* 2015; Ferrer *et al.,* 2009). Supply chain performance has been credited with a variety of benefits, including cost savings, improved market share and sales, and strong customer relationships (Lin & Li, 2010; Simatupang & Sridharan, 2002; Swink *et al.,* 2007; Elmuti, 2002).

Supply chain performance has also been hailed as increasing organisational performance (Hamister, 2012; Gunasekaran et al., 2001; Green, *et al.,* 2012). Due to the benefits of supply chain performance, current scholarly research has been extensive (Yusuf *et al.,* 2004; Wagner & Bode, 2006). Most studies have attempted to establish the factors affecting supply chain performance and recently the focus has been on how technological practices on advanced planning systems affect Supply chain performance (Devaraj *et al.,* 2007; Hervani et al., 2005; Stadtler *et al.,* 2015; Vickery *et al.,* 2003).

Benchmarking supply chain performance allows peer to peer and competitor to competitor comparison (Koh *et al.,* 2007; Bayraktar *et al.,* 2009; Gopal & Thakkar, 2012). This encourages continual improvement, allowing key performance measures like delivery speed, service quality, and experience to be repositioned and evaluated over time (Cigolini *et al.*, 2004; Piercy & Rich, 2009). The constant improvement of this SCM approach improves operational efficiency (Chow *et al.,* 2008). Despite the requirement for performance assessment in procurement, many firms fail to measure it appropriately (Bealt, *et al.,* 2016; Gunasekaran *et al.*, 2004; Saad & Patel, 2006). After reviewing the evidence from the 1980s to the early 1990s, Easton *et al.,* (2002) find that "traditional" measures tend to reward short-term gains over long-term benefits. MoraMonge *et al.*, (2010), asserted that assessing long-term consequences is extremely difficult.

Supply chain planning systems track costs based on the activities that drive costs in manufacturing (Brewer, 2000; Attaran & Attaran, 2007). Raw resources and manufacturing capacity are allocated optimally in an APS. They can't boost efficiency on their own because efficiency is only attained by combining advanced planning methods (Jacyna-Gołda *et al.,* 2015; Niu, 2021; Rosenfeld & Poskanzer, 2009). According to Zheng *et al.,* (2004), efficient planning systems require a coordinated effort to improve all supply chain functions, transforming supply chain performance from a functional to a general and integrative process. Common management strategies are recommended to improve supply chain performance (Estampe et al., 2013; Simangunsong *et al.,* 2012; Wu *et al.,* 2014). To examine supply chain performance integration and advanced planning systems, Wook Kim (2006) used data from an empirical survey. As a consequence of the study, an organization's supply chain performance is improved by implementing an advanced planning system.

This means that each supply chain's performance should be evaluated based on how the variable affects the efficient integration of all supply chain processes (Sezen, 2008; Craighead et al., 2009; Ramdas & Spekman, 2000). Thus, successful supply chain performance integration can be achieved by systematic use of Enterprise resource planning (ERP), Activity Based Costing (ABC), Material requirement planning (MRP), Collaborative planning, forecasting and replenishment (CPFR) and Vendor managed inventory (VMI) (Wisner *et al.,* 2014; Hansen & Mouritsen, 2007).

ERP software suites enable firms combine information flow and business processes. Each department or function is supported by a single database that collects and stores data in real time (Neubert *et al.,* 2004; Gupta & Kohli, 2006; Helo *et al.,* 2014). ERP systems can help businesses cut cycle time, improve financial management, establish the framework for e-commerce, and make tacit knowledge apparent (Maguire *et al.,* 2007; Su & Yang, 2010; Lengnick-Hall *et al.,* 2004).

Due to rising overhead (or indirect) costs from automation and technology utilisation, activity-based costing (ABC) advocates assigning final cost objects to all activities that assist production and delivery of commodities (Lea & Fredendall, 2002). ABC data can help enhance operations and reduce non-value-added costs (Hilton, 2005; Tsai & Hung, 2009a; Tsai & Hung, 2009). An ABC system has two dimensions: the cost assignment view and the performance measurement view. Thus, ABC is one method for improving SCOP in organisations (Baykasoglu and Kaplanoglu, 2008; Tsai *et al.,* 2008; Lin *et al.,* 2001). MRP, MRPII and MRP systems manage order fulfilment by matching material and resource availability to customer demand (Bayraktar et al., 2009; Stadtler, 2005). Using these technologies could help resource planning and save inventory by releasing purchase and/or work orders only when required (Koh, 2004; Stevenson et al., 2005). Using MRP, MRPII and ERP

effectively could reduce manufacturing lead times and inventory levels (Stevenson *et al.,* 2005; Koh & Simpson, 2005).

Collaborative planning, forecasting and replenishment (CPFR) is an important organisational method for managing demand volatility, sales statistics, and promotional and replenishment programmes (Barratt, 2004; Alftan, *et al.,* 2015; Fliedner, 2003). For effective implementations of CPFR, the Voluntary Inter Industry Commerce Standards (VICS) Association established it (VICS merged with GS1 US, Inc., in 2012) (Martel & Klibi, 2016; Rantanen, 2016; Hill *et al.,* 2018). The adoption of CPFR attempts to remove impediments to supply chain performance. Incomplete or erroneous knowledge leads to non-optimal decisions (Barratt and Oliveira, 2001). The CPFR initiative is designed to facilitate collaboration. Firms in a supply chain can use the application to connect demand and supply planning and execution (Baumann, 2010; Li, 2007).

Vendor-managed inventory (VMI) is an inventory and supply chain management tool where the supplier decides on the timing and amount of inventory replenishment (Sui *et al.,* 2010; Razmi *et al.,* 2010; Yao *et al.,* 2010). This tool is also known as automated replenishment or continuous replenishment (Blatherwick) (1998). Despite the introduction of the mentioned technological practices (advanced planning systems), some of the studies have yielded inconsistent results which have suggested the incorporation of moderation and the mediation to establish the relationship between advanced planning systems and supply chain performance so as to advanced greater understanding of the same (Mishra *et al.,* 2014); Tseng *et al.,* 2013). However, due to inconsistence raised by the above variables the researcher had to mediate and moderate to give a more compressive and significant SCOP.

The study examines Agility (mediator) and Supplier Relationship (moderator). As the environment changes, customer preferences shift, and competitive dynamics shift, so does supply chain agility. It measures how quickly organizations can adapt their supply chains to changes. The literature has mostly focused on production flexibility, supply chain speed, or lean manufacturing (Wilding *et al.,* 2012 Gligor, 2019; Ivanov, 2018).

Supplier Relationship Management (moderator) is a complete approach to procurement management and post-contract value capture (Day & Lichtenstein, 2006; Shakeel et al., 2018 Memia, 2018). A better relationship with suppliers allows procurement to function at a strategic level, resulting in higher value in terms of innovation and efficiency Chong and Ooi (2008).

Some firms in Kenya have effectively adopted supply chain technological strategies. For example, Nation Media Group's NSoko digital platform allows customers to buy things online (Mose et al., 2013; Oteki et al., 2018; Muriuki et al., 2019; Thiga & Makau, 2016). Awino (2011) studied the impact of strategy variables on company performance and in his findings, he concluded that manufacturing firms in Kenya should employ a Supply chain practice that identifies cost drivers, reduce wastes, and embrace teamwork in process decision making within the supply chain.

1.2.1 Manufacturing firms in Kenya

Manufacturing firms in Kenya have come to realize that effectiveness and efficiency of employing advanced planning system (APS) has improvement approaches that leads to competitive advantage and meeting customer needs (Sulaimon *et al.,* 2018; Coelho & Henseler, 2012; Barua, 2010). Thus, there are a several of manufacturing firms as per to the Kenya Association of Manufacturers (KAM) (established 1959),

Manufacturers (KAM) (est. 1959), divided into 14 sections. These industries are categorized by the raw materials or goods they import. Manufacturing contributes 13% to Kenya's industrial GDP. KAM noted that 80% the 600 members are based in Nairobi County, which enhances the research done in the county. The emergency of manufacturing sector in Kenya has greater potential economic growth and competiveness in the countries of East Africa (Wanjiru, 2018; Mugo, 2016; Mwangi, 2019). It is the third largest contributor to the Kenyan GDP. The sector has seen swings in the financial and supply chain over time. According to the World Bank (2014), inefficiencies and an unpredictable operating environment, fostered by variations in supply chain inside the firm, are limiting manufacturing sector growth in Kenya.

Kenya's contribution of EAC manufactured goods fell from 9% in 2009 to 7% in 2013. (World Bank, 2014). Kenya was the EAC's leading manufacturer exporter. Chemicals, paper, and plastics have all seen a drop-in market share (Vernon, 2017). Vernon, (2017), in his survey cited operational environment risks and manufacturing enterprises' inability to adapt to a changing environment as major factors affecting manufacturing fims. According to the Kenya Association of Manufacturers, corporations have indicated plans to close plants and relocate operations to Egypt due to lower earnings (KAM, 2014). Cadbury Kenya announced the closure of its Nairobi manufacturing site in October 2014. (Vernon, 2017). Eveready's net profit for the year ended September 2013 declined 58.7% to $493,237 from $784,783. Its yearly production capacity fell to 50 million units from 180 million due to unforeseen circumstances (Vernon, 2017). Tata Chemicals Magadi shut down its main facility (Tunga, 2013).

Manufacturing enterprises have lost 70% of their market share in East Africa (Vernon, 2017; Clough, 2012). Foreseen risks and high operational costs. Thus, it has made the researcher to look into the inefficiencies caused by these APS indicators and improving through mediation and moderation to bring in compressive and significant results that will great better supply chain performance in manufacturing firms in Nairobi County.

1.3 Statement of the Problem

Understanding and implementing supply chain performance has become a must for global competitiveness and profit growth (Gunasekaran et al., 2004; Verma, et al., 2018). In order to achieve overall performance, every organisation must maintain an effective and efficient supply chain (Luthra et al., 2014). Thus, For years procurement department have been faced with array of challenges trying to meet the general objective of supply chain performance, and managers have put in place a lot of measures to improve supply chain performance like, adaptation of the new technologies, supplier relationship mechanism, agility, just in time, customers feedback (Sanderson *et al.*, 2015) but still supply chain performance have not meet the customers' requirement in most manufacturing organization especially in developing nations (Odhiambo & Theuri, 2015). Therefore, scholars have focus more on Advanced planning system on supply chain performance and found inconclusive results on its impacts toward supply chain performance (Mikalef 2014), Victor (2017) studied the effects of the adaptation of ERP and MRP and found a direct positive and significant effect on supply chain performance of State Corporation in Kenya. Kituzi (2016) tested the relationship between the advanced planning system variables and found to be positive and negative showing significant results of a U- shape on supply chain performance.

Studies on supply chain techniques have been conducted both globally and locally. Internationally, SCOP implementation studies have focused on manufacturing enterprises (Sandberg and Abrahamsson, 2010) and retailers (Sandberg, 2007) who recognise the value of SCOP. Based on his research, Kyengo (2012) discovered that the ability to obtain products from distant suppliers affects supply chain effectiveness. In recent years, research on production and supply chain management has emphasized the link between agility and performance. Currently, the idea is particularly popular in manufacturing, where agility is a new competitive weapon (Kasarda and Rondinelli 1998).

However, supply chain organization performance has received attention and significant gaps remain in the literature on how organization should maintain supply chain performance especially in manufacturing to remain competitive in their industry. To keep consumers and remain competitive, businesses must recognize the value of supply chain practices that improve both their own and their partners' performance. Despite advances in research and practice, many organizations' still struggle to understand the complex issues associated with coordinated planning and supply chain activities among members of their supply networks. Therefore, the researcher intended to further the findings by incorporating APS variables, Supplier relationship (moderator), Agility (mediator) and its impact towards Supply chain performance of the manufacturing firms.

1.4 Objectives of the Study

The objectives were categorized into two, the general and specific objectives.

1.4.1 General Objectives

To determine the conditional effect of Supplier relationship on the relationship between advanced planning system, and the supply chain performance via agility. A survey of manufacturing firms in Nairobi County, Kenya.

1.4.2 Specific Objectives

1. To establish the effect of supply chain advanced planning systems on supply chain organizational performance
2. To determine the effect of supply chain advanced planning systems on supply chain agility
3. To examine the effect of supply chain agility on supply chain organizational performance
4. To establish the mediating effect of supply chain agility on the relationship between supply chain advanced planning systems and supply chain organizational performance
5. Moderating effect of supplier relationship on the relationship between supply chain planning systems and supply chain agility
6. Moderating effect of supplier relationship on the relationship between supply chain planning systems and supply chain organizational performance
7. Moderating effect of supplier relationship on the indirect relationship between supply chain advanced planning systems and organizational supply chain performance via supply chain agility.

1.5 Research Hypotheses

$\boldsymbol{H_{01}}$**:** Supply chain advanced planning systems does not have a significant effect on supply chain organizational performance.

$\boldsymbol{H_{02}}$**:** Supply chain advanced planning systems have no influence on supply chain agility

$\boldsymbol{H_{03}}$**:** Supply chain agility do not have statistically significant on supply chain organizational performance

$\boldsymbol{H_{04}}$**:** There is no statistically significant mediating effect of supply chain agility on the relationship between supply chain advanced planning systems and supply chain organizational performance

$\boldsymbol{H_{05}}$**:** There is no statistically significant moderating effect of supplier relationship on the relationship between supply chain planning systems and supply chain agility.

$\boldsymbol{H_{06}}$**:** There is no statistically significant moderating effect of supplier relationship on the relationship between supply chain planning systems and supply chain organizational performance

$\boldsymbol{H_{07}}$**:** There is no statistically significant moderating effect of supplier relationship on the indirect relationship between supply chain advanced planning systems and organizational supply chain performance via supply chain agility.

1.6 Scope of the Study

The study was carried out on a population of 591 manufacturing firms in Nairobi County, Kenya. The study used positivism as a research philosophy, and explanatory research design. The study targeted population and a sample of 233 Top level supply chain managers, chief executive officer and finance manager of these manufacturing firms was used for unit of analysis. The study concentrated on the conditional effect of supplier relationship on the relationship between advanced planning systems and supply chain performance through agility.

1.7 Significance of the Study

The study would be significant in different ways. The study aimed at strengthening the body of knowledge on advanced planning system on supply chain performance. The study would be innovative in the sense that it will be fusion of the independent contemporary field of advanced planning system. The integration of these two broad literatures also presents an opportunity to close. Furthermore, it well known that logistics and supply chain performance is one of the pillars of any economy. Therefore, this study would be of significant to supply chain sector.

The study would also help supply chain managers understand and identify the challenges related to supply chain and how to mitigate such challenges. The study findings would also be important for policy makers in the government and private sectors, as it would highlight areas that need policy reinforcement and positive reforms. This would be instrumental in the endeavor to improve public service. The findings of the study would also help future researchers, as a basis for further research in the fields of procurement.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter summarizes the research conducted by various researchers and focuses on the concept of Supply Chain Performance, Supply chain advanced planning systems, Agility, Supplier relationship and the conceptual framework.

2.2 Concept of Supply Chain Organizational Performance

A product or service must be delivered to the correct place, at the right time, and at the lowest cost (Chen & Hsieh, 2012). Companies realized that improving internal efficiencies was not enough to make their supply chains competitive (Barratt & Oke, 2007; Markley & Davis, 2007). Understanding and using supply chain management has become critical to maintaining global competitiveness and increasing profitability (Tan *et al.*, 2002). Council of Logistics Management (2000) defines SCOP as controlling all product and service flow movement and storage activities. A "focal organization" is managed by managing inbound and outbound flows of goods, services and related information from several perspectives, such as purchasing, supply chain management, logistics, transportation, operations and marketing, organizational theory, and management information systems.

From mass manufacturing to lean (agile) production appeared in the 1960s (Huang and Keskar, 2007). To maintain market profit margins, organizations' have been forced to outsource their organizational activities to appropriate and certain suppliers due to factors such as competitive marketplace for products, customer demands, and development of information technology (Chin *et al.*, 2004). There are various studies on integration and performance, but none that quantify supply chain performance

based on stakeholder integration (suppliers, internal customers, and external customers) (Lee *et al.,* 2007; Flynn *et al.,* 2000). For example, Won Lee *et al.,* (2007) investigated the performance of supply chain processes utilising CPFR without stack-holder responsibilities. For their research, Brewer and Speh used the balance scorecard. Won et al. (2005) investigated the link between stock price and supply chain management advertising. They looked at supplier selection and evaluation without respect to performance. The measurement of high growth performance and supply chain operations is growing (Syahira, 2017).

Industrial structure and associated transaction cost analysis (Ellram, 1991), resource-based and resource-dependency theory (Halldorsson *et al.,* 2007), competitive strategy, and social–political perspective (Cigolini *et al.,* 2004). Despite the increased focus to SCM, the literature has not been able to provide much assistance for SCM practice (Cigolini et al., 2004). SCM has covered Purchasing, Supply, and Transportation Management (Tan, 2001). SCM is tied to the integration of traditional purchasing and materials functions (Kannan & Tan, 2005). SCM also refers to integrated logistics systems that focus on reducing inventory within and between enterprises in the supply chain (Alvarado, 2001).

SCM research reflects SCM's evolutionary and complicated nature. Much of the present SCM research focuses on only one side of the supply chain, or one aspect/perspective of SCM (Tesfa, 2018) These include supplier selection (Vonderembse MA, 1999; Nguyen & Nguyn, 2017), supplier alliances (Stuart FI, 1997), success factors in strategic supplier alliances (Monczka RM, 1997; Naseer, 2017), supplier management orientation and supplier/buyer performance (Shin H, 2000), and supplier responsiveness (Handfield, 2002). Other research focuses on the

downstream linkages between producers and merchants (Hung Lau 2012; Alvarado and Li 2005). A few recent studies examined the supply chain from both upstream and downstream perspectives. Tan *et al.,* (1998) investigated supplier management, customer interactions, and organizational performance. Tan *et al.,* (1998) explore SCM and supplier assessment procedures and link the constructs to business performance. Min and Mentzer (2004) construct a conceptual supply chain orientation and SCM measurement tool. They develop a collection of supply chain strategies and tools for assessing SCM performance.

Scholars have used analytical and empirical methodologies to build foundational SCM theories and structures. Several researchers have examined the impact of SCM methods on organizational performance (Zhu et al., 2008; Giunipero et al., 2008; Jakhar et al., 2018). Many SCM researchers are now focused on the cross-industry validity of past findings. Using diverse "best practices" by firms at various supply chain positions is one aspect of interest (Larsson & Lind, 2019; Boehme, 2009). This is an important problem to investigate to see if frequently recommended techniques are equally applicable throughout the supply chain. One study looked at the effectiveness of SCM procedures applied on the supply or distribution side of the supply chain (Frohlich and Westbrook 2001; Kim, 2013; Li et al 2005b), however other studies considered the supply and distribution sides as one stage.

Benchmarking supply chain performance allows peer to peer and competitor to competitor comparison (Bayraktar et al., 2009; Gopal & Thakkar, 2012). This encourages continual improvement, allowing key performance measures like delivery speed, service quality, and experience to be repositioned and evaluated over time (Ugboma *et al.,* 2007; Zineldin, 2006). Constant improvement leads to greater

operational efficiency in this SCM technique (Chima, 2007). Despite the requirement for performance assessment in procurement, many firms fail to measure it appropriately (Bealt *et al.,* 2016). After reviewing the evidence from the 1980s to the early 1990s, Easton *et al.,* (2002) find that "traditional" measures tend to reward short-term gains over long-term benefits. According to MoraMonge *et al.,* (2010), assessing long-term impact is difficult.

The concept of increasing only one unit's performance (a traditional technique of ensuring PP) has been widely challenged in the literature (Shepherd & Günter 2010) and is contradictory to the entire quality management philosophy. Traditional PP measurements have also been criticised for being too focused on financial success, too one-dimensional or incomplete, rigid, and even invalid (Easton et al., 2002).

Traditional disciplines like operations, purchasing, and logistics were considered as part of early SCM research (Ellram & Cooper, 2014; Giannakis, 2012; Li, 2014). This narrow view of SCM procedures analysed only a few organisational stakeholders and concerns. Since then, SCM research has grown to include viewpoints such as supplier relationships, supply chain network topology, and collaboration (Croomet al., 2000; Tan, 2002; Chen and Paulraj, 2004, 2007; Cook et al.,2011).

2.3 Concept of Advanced Supply Chain Planning Systems

Supply Chain Management (SCM) has become a topic of discussion today in practically every industry (Bandyopadhyay, 2004; Gold et al., 2010; Dehning et al., 2007). These concepts, methodologies, and tools originated in the late 1980s and became widely used in the 1990s to promote a holistic perspective of the entire supply chain. Planning is critical to supply chain optimization (Jespersen & Skjott-Larsen, 2005; Shapiro, 2004). Supply chain asset optimization seeks to balance supply and

demand from primary suppliers to ultimate customers. Complicating the process is the presence of conflicting aims and stochastic behaviour. (Lin *et al.,* 2007; de Santa-Eulalia et al., 2011; Camarinha-Matos and Afsarmanesh, 2004; Roldán et al., 2017; Schneeweiss and Zimmer, 2004; Lalmazloumian et al., 2016; Terzi&Cavalieri, 2003; Min and Zhou, 2002).

In order to deal with the complexity of supply chain planning systems, IT technologies can be employed directly or indirectly. Input/output systems are used to manage inventory and integrate data. (Chen *et al.*, 2017; Acquaye *et al.*, 2014). Due to its focus on a particularly relevant topic in supply chains, APS systems are actively debated nowadays. This moderately challenging objective necessitates a complex solution.

APS assist strategic, tactical, and operational procurement, manufacturing, distribution, and sales planning (Stadtler, 2005). These systems represent a quantitative model-driven approach to using IT to support SCM, utilising advanced analytical and supply chain optimization approaches. Since the 1970s, APS systems have been a logical progression of industrial planning methodologies (Martel & Vieira, 2008). After MRP, there followed Manufacturing Resources Planning II, Distribution Resources Planning (DRP), and then ERP in the 1990s (ERP systems). APS systems evolved to fill the hole left by transactional ERP systems (Stadtler, 2005). ERP's planning capabilities are limited without an APS solution (de Man & Strandhagen, 2018; Haberlandt, 2013). It seeks to aid decision-making by recognising potential future actions and picking good or even the best strategy (Fleischmann et al., 2004) while considering the decision-objectives maker's and restrictions.

2.4 Concept of Supply Chain Agility

A true test of agility and its consequences for success is how easily and swiftly organisations can alter their behaviours based on unfolding marketplace events (Tallon & Pinsonneault, 2011; Chiu et al., 2017; Sambamurthy et al., 2003). Customers, business partnerships, and operations are defined as agility by Sambamurthy et al. (2003).

Since the 1990s, ideas to assist firms deal with and respond to changing business environments have centred on the concept of agility (Goldman et al., 1995; cited in Ismail and Sharifi 2006). According to Jackson and Johansson (2003), business agility is not a goal for any organisation, but rather a prerequisite for high competitiveness in today's extremely dynamic and complicated business environment. It is commonly acknowledged that agility is the key to success in today's fast-paced corporate climate (Ismail and Sharifi, 2006).

Kidd (1994), cited in Jackson and Johansson (2003), defined agile manufacturing as "...the integration of organisation, highly skilled and knowledgeable people, and advanced technologies, to achieve co-operation and innovation in response to the need to supply our customers with quality customised products". Brown and Besant (2003), cited in Narasimhan et al. (2006) describe agile manufacturing as the ability to respond swiftly to market changes.

It has recently been introduced to the entire organisation, where it is characterised as an organisation with a dynamic nature, focusing on building knowledge and flexible procedures to respond to changing market conditions (Nielsen & Michailova, 2007; Harrison & Leitch, 2005). Supply chain agility is crucial for competitive advantage in

rapidly changing markets. Supply chain management is becoming increasingly reliant on IT as a competitive tool (Gligor & Holcomb, 2012; Madhani, 2017; Power, 2005).

Agility encompasses organisational structures, information systems, and most importantly, brains (Christopher, 2000). Agility involves exploiting valuable possibilities in a volatile market (Mason-Jones & Towill, 1999). Christopher (2000) defined an agile supply chain as follows: Based on information supplied by all supply chain partners, it is linked to consumer patterns. Process integration is a high degree of process interconnection between network members (Hiete et al., 2012; Berkman et al., 2000).

Bal et al., (1999) suggested a virtual teaming concept for supply chain agility. Designing an agile manufacturing system involves four critical characteristics, according to Yusuf et al. (1999). Production system agility was quantified by Meade and Sarkis (1999). These are leveraging people and information, managing change and uncertainty, and improving customer satisfaction (Bieberstein et al., 2005; Gunasekaran et al., 2002; Zain et al., 2005).

Asynchronous and real-time collaboration technology can help manufacturers boost supply chain agility, according to Tolone (2000). Prater et al. (2001) used case studies to highlight how organizations' successfully balanced supply chain vulnerability with agility.), For lean, responsive, and agile supply chains, high levels of perceived confidence from suppliers and customers are required according to Svensson (2001. Power et al. (2001) identified essential agile supply chain management features. Stratton and Warburton (2003) investigated inventory and capacity in an apparel manufacturer's supply chain.

To build and develop an agile supply chain system, Lau et al. (2003) built an infrastructure architecture that allows for unforeseen changes in supplier management and components movement inside the value chain of the complete production network. A supply chain's value chain practise, competitive aims, change drivers, and company success can all be evaluated as agile supply chain four dimensions (Yusuf et al., 2004; Yusuf et al., 2014; Ambe, 2009)

The most significant characteristic of a supply chain agility is market sensitivity (Christopher, 2000). The supply chain agility must be market sensitive to read and respond to real demand (Christopher & Towill, 2001). A supply chain's market sensitivity is determined by its trading partners' cooperation and IT tools' use. Sharing business information and working on the same data stimulates trading partners to collaborate (Agarwal & Shankar, 2002).

Scholars have applied many methods to improve supply chain agility and responsiveness. Petersen et al. (2001) emphasise virtually that allows integration with supply chain elements to achieve efficiency. Yang and Li (2002) suggested agile product design to respond quickly to client needs. Knowledge management and mass customisation are vital in meeting unforeseen demands. Postponement (delayed configuration) is the most prevalent approach used to establish a strategic inventory (Yang et al., 2004; Christopher & Towill, 2000; Tuck et al., 2007). Keeping production units close to end-users, markets, and demand generators. Demand-driven and forecast-driven supply chains are all about consumer demands. De-coupling points are where consumer demand enters the supply chain (Mehralian et al., 2015).

2.5 Concept of Supplier Relationship

Supplier relationship management is the process of interacting with suppliers. This is a mirrored version of customer relationship management (Nyamasege & Biraori, 2015; Lee & Johnsen, 2012; Duffy et al., 2013). Just as a firm must build relationships with customers, so must it with suppliers. Like with customers, a corporation should cultivate tight connections with a few suppliers while maintaining more traditional relationships with the rest (Croxton et al., 2001).

Management of strategic buyer-supplier partnerships has recently gained popularity (Simoens & Erlacher, 2018; Ellram & Murfield, 2019). An organization's relationship with present and potential suppliers is managed through supplier relationship management (Akamp and Müller, 2013). Selected suppliers are appraised and monitored for development and integration. Purchasing and supply management success relies on supplier selection (Abdollahi et al., 2015). On the list of most important factors for selecting suppliers is quality (Thakur and Anbanandam, 2015).

Better Supplier Base, according to Moeller et al. (2006). Solve major issues quickly, act more coordinated and consistently, and increase customer value creation. As a result, Overall, SRM increases supplier collaboration, process coordination, and communication (information systems) (Mettler and Rohner, 2009).

Wieteska Grayna (2016) explains how organisations can build relationships with suppliers in a volatile market, it focused on SRM's flexibility and adaptability (SRM). Flexible supply chains respond quickly to changes in supply, demand, and goods. Adaptability is developed by adjusting to major environmental changes. Flexible Purchasing and Supplier Flexibility provide for relationship flexibility (Stevenson & Spring, 2007; Jin et al., 2014; Zhang et al., 2002).

Oghazi et al. (2016) identified potential SRM integration barriers. From the literature research and empirical findings, it appears that the SRM process can be integrated into strategic and operational elements. Sub-processes are divided into strategic and operational sub-processes. SRM integration may be hampered by a lack of mutual commitment or confidence between manufacturer and supplier (Kanyoma, et al., 2018; Sjoerdsma & van Weele, 2015).

“Trust” is one of the seven qualities widely employed in literature to describe buyer-supplier relationships (Soh et al. 2016). Commitments, communication effectiveness, cooperation, and transparency affect trust. Supplier Quality (SQ) and Supplier Commitment (SC) are directly related to Supplier Performance (SP). Supplier Engagement (SE) and Supplier Infrastructure (SI) are not mediated by BSR (SP). Ivens et al. (2013) discussed key supplier management (KSM) and discussed how it should be implemented, the implications (organisational), and the benefits. KSM deals with analysing, planning, managing, and controlling interactions with key suppliers.

Akamp and Müller (2013) looked into ways to improve supplier performance and buyer satisfaction. Less Squares was used to examine the proposed structural equation model (PLS). Supplier performance and buyer satisfaction are dependent variables in the conceptual model. The results reveal that supplier development and integration are beneficial cooperative activities, but supplier monitoring appears to have no effect on supplier performance.

Trust and dependency in business interactions were studied empirically by Jiang et al. (2011). In addition to commitment, communication, satisfaction, and long-term direction, the scholar studied trust. Trust has a stronger impact on relationships

(commitment, communication, satisfaction, and long-term orientation) than reliance, the study found.

2.6 Theoretical Framework

The following are theories supporting the study

2.6.1 Transactional cost theory

TCO, QM, and Supplier Relationships

Transaction cost economics (Williamson 1988) sheds light on long-term supplier relationships and sole sourcing. Transaction costs economics aims to explain alternate kinds of internal and external governance. Much has been said about vertical integration and supplier relationships (Williamson 1988). Transaction cost theory tackles many of the same considerations as analysing different supplier arrangements. Specific assets, uncertainty, bounded rationality, and opportunistic behaviour are key principles in TCE.

Specific assets are assets that only have value inside a supplier relationship.

The transaction costs are the costs incurred while providing items and services externally rather than internally (Argyres & Zenger, 2012; Espino-Rodríguez & Padrón-Robaina, 2006; Aubert et al., 1996). Aspects of transaction costs include choosing and negotiation as well as information search (Zanello et al., 2014; Maina, 2015; Ouma et al., 2010). The intricacies and uncertainty of every economic system cause these costs. According to Shahab & Allam (2020), most businesses have cut transaction costs by using technology. Businesspeople can make swift and intelligent decisions with information technology. Using information and communication tools to connect buyers and sellers can improve contracting efficiency (Carr & Kaynak,

2007). Mahdillou and Akbary (2014) link electronic tendering to transactional advantages. It saves time, improves efficiency, and enhances data accuracy.

TCT, or transaction cost economics, has grown in prominence as a theoretical framework for analysing a wide range of strategic and organisational concerns (Williamson, 2005; Ghoshal & Moran, 1996; Williamson, 1996; Madhok, 2002; Williamson, 2008). The TCT has been used to investigate firm borders, vertical integration decisions, acquisition justifications, networks, and other hybrid governance forms (Cuypers et al., 2021; Hennart, 2010). As a result of this expansion, the TCT now covers strategic management and international business as well as the structural arrangements essential for success. In reality, the TCT is a widely used theory in organisational research (Wakaisuka-Isingoma, et al., 2016; Martins et al., 2010).

For example, if a buyer invests in training and technology transfer to a supplier, the value of that investment is lost if the relationship ends. Specific assets indicate connection sunk costs. Uncertainty and limited rationality hinder the ability to write contracts. Contracts that cover every eventuality are deemed hard to write or enforce. Combining the first two aspects, specific assets and unfulfilled obligations, opens the door for opportunism. For example, once a buyer has invested significant resources into strengthening a supplier's skills, the prospect of losing that investment makes the buyer reluctant to break relationships. This may allow the supplier to evade or delay the buyer by charging higher rates or lowering quality. To assure supplier performance, incentives, monitoring, or some type of governance structure is frequently required (Toffel, 2008). A firm's supplier connections should be organised

to reduce total cost, including transaction expenses (Corsten & Felde, 2005; Grover & Malhotra, 2003).

The costs of locating competent suppliers, negotiating contracts, improving suppliers' capabilities, monitoring supplier performance, enforcing contracts, and managing with delays, scrap, rework, etc (Anderson & Dekker, 2009; Trent, 2008). According to a number of empirical research (Monteverde and Teece 1982, Walker and Weber 1987), transaction costs explain the “make” vs “buy” decision (Walker and Poppo 1991). The hypothesis predicts that when specific assets and uncertainty exist, vertical integration occurs. In reality, there are numerous intermediary forms of quasi-integrated connections (Walker and Poppo 1991). Deming's sole sourcing thesis can be reframed in terms of transaction costs. Deming says that sole sourcing reduces supplier costs (Dean & Bowen 1994). The overall costs comprise the purchase price, the cost of quality control, and the cost of poor quality due to poor quality control.

Buyers must devote significant resources to suppliers in order to control essential input quality (Adams et al., 2012; Rezaei et al., 2015). In order to eliminate variability in the supplier's product and ensure high quality, sourcing and selecting suppliers is required (Pi & Low, 2006; Petersen et al., 2003). The alternative is to pay for delays, scrap, rework, and process changes caused by poor supplier performance. Deming argues that investing in several suppliers for the same input is simply too costly (Walton 1986; Dean & Bowen 1994). Even if each supplier produces good quality, product variances make quality control more complex and costly (van Beek & Montoro, 2009; Mitra, 2016). In other words, a single source reduces the costs of setting up and coordinating with suppliers to ensure quality (Handfield et al., 2006; Cannon & Homburg, 2001). Unlike the transaction cost hypothesis, Deming is

unconcerned about opportunism and shirking. He advises organisations to seek for and select suppliers devoted to quality and improvement. There is minimal empirical research on lone sourcing (Walker and Poppo 1991).

2.6.2 Balance Scorecard

Founded on the idea that the premise that organisations exist solely to satisfy stockholders, Kaplan and Norton (1996) developed the Balanced Scorecard (Kaplan & Norton, 1996). Customers, Internal Business Processes, and Finance are its four dimensions (Kaplan & Norton, 1996). On-time delivery and client loyalty are claimed by the writers as benefits of competent workers. The improvement chain should eventually lead to stronger investment returns and hence higher shareholder satisfaction (Kaplan & Norton, 1996). In other words, the BSC is a performance management system designed to stimulate interest and participation (De Waal, 2003; Biron et al., 2011; Rhodes et al., 2012; Kagioglou et al., 2001).

It allows for a balance between short-term and long-term goals, intended results and performance drivers, as well as hard objective and soft subjective metrics (Raub & Sthapit, 2001; Bhagwat & Sharma, 2007; Thakkar et al., 2007). According to Kaplan and Norton (1996), strategies are designed based on causality. In this vein, “the measuring system should make clear the links (hypotheses) among objectives (and measurements) in multiple perspectives” (Kaplan & Norton, 1996). For example, investing in learning can enhance internal business processes, which will improve procurement methods, resulting in a higher return on investment, pleasing shareholders (Kaplan & Norton, 2001).

Any company operation requires identifying suitable performance indicators on most criteria that has strategic significance for any firm, such as supply chain management

(SCM) (Chae, 2009; Bhagwat & Sharma, 2007; Gunasekaran et al., 2004. Many approaches for SCM evaluation have been proposed over time. Traditional methods only use well-known financial metrics to assess the value of simple SCM solutions (Golrizgashti, S. (2014; Kocaoğlu et al., 2013; Estampe et al., 2013). Unfortunately, financial measures are not suitable for the newer SCM applications. A wide range of benefits are sought from these complicated supply chains, many of which are intangible (Muysinaliyev & Aktamov, 2014). As a result, it offers a balanced approach to measuring and evaluating supply chains.

Several companies have recently understood the value of SCM in daily operations management (Wu et al., 2012; Ramanathan et al., 2011). It is difficult to establish effective performance measures and metrics without a balanced approach and a clear distinction between strategic, tactical, and operational measurements (Gunasekaran et al., 2001; Hudson, Lean, & Smart, 2001). The overall scenario and the measurements employed are required for effective SCM. These should be balanced, using financial and non-financial measurements at strategic, tactical, and operational levels (Sharma, M. K., & Bhagwat, R. (2007; Maduekwe & Kamala, 2016).

A prominent strategic management tool, the BSC has helped some business leaders implement new strategies based on customised products and services (Martinsons, Davison, &Tse, 1999). Literature describes several methods of performance measurement (Chan & Qi, 2003, Bhagwat, & Sharma, 2007; Maskell, 2013; Kald & Nilsson, 2000).

2.6.3 Dynamic Capabilities Theory

Dynamic capacities (DC) theory arose as a solution to various RBV theory faults (Galvin, Rice & Liao, 2014). Organisations can build, integrate, and rearrange

resource and capability portfolios to respond to changing environments (Teece, Pisano & Shuen, 1997) until the 1980s, strategic management was mostly ignored. 1980s saw the most attention given to Porter's industry-based theory (Porter 1979–85). (Barney & Ouchi, 1986). The RBV proposal was hotly contested at the time. Intangible and tangible resources, human resources, and competencies make up a firm (Wernerfelt, 1984, Grant, 1991; Helfat et al., 2007; Barney, 1991). Competitive advantage is achieved “when a corporation implements a value-creating strategy that no existing or potential competitors” (Barney, 1991). These ideas are VRIN (Barney, 1991; Tondolo & Bitencourt, 2014).

In a dynamic situation, DC theory explained sustainable competitive advantage and superior performance better than RBV theory (Raduan et al., 2009; Halawi et al., 2005; Wei & Wang, 2011). Integration or reconfiguration of internal and external competencies in rapidly changing settings (1997). With each new market, firms create new resource arrangements (Eisenhardt & Martin, 2000, p. 1107). Teece (2007) talked about the micro-foundations for each of the three DC dimensions: sensing, seizing, and changing. Its nomenclature (Zahra, Sapienza & Davidson, 2006), DCs, and the absence of clear ways to evaluate these capabilities and their impact on organisational performance have all been harshly criticised (Zahra, Sapienza & Davidson, 2006). (Zott, 2003). Repetitiveness (Zollo & Winter, 2002) and ineffectiveness (Schreyögg & Kliesch-Eberl, 2007) have also been challenged. DC theory's key notions have also been unclear (Ambrosini & Bowman, 2009). Despite the growing number of studies on DCs (Ambrosini & Bowman, 2009), academics must continue to collaborate to illustrate the theory's notions and link them to practical practises within companies (Wang & Ahmed, 2007).

The DCV (Teece et al., 1997), an extension of the RBV, can be used to analyse the need for resilience capability requirements following disruptive occurrences (Wernerfelt 1984; Barney 1991). The RBV emphasises developing capacities to overcome challenges and obtain competitive advantage. However, in uncertain contexts, the standard RBV lacks sufficient capability delineation. By preparing resources and capacities to adjust to situational changes (Teece et al., 1997; Eisenhardt & Martin 2000), the DCV tackles the quirks of contingencies.

An organization's ability to respond to changes in the environment and devise new value-creating strategies is the DCV's primary concept (Teece et al., 1997; Eisenhardt & Martin 2000). Similarly, we propose that firms' supply chains must establish dynamic resilience skills to mitigate risks in an uncertain environment. The DCV can help explain SCRE's proactive and reactive capabilities (Teece et al. 1997). Difficult settings necessitate flexible resource allocation and reconfiguration, according to the DCV. Companies must be proactive in adapting to environmental changes and preventing supply chain vulnerabilities (Teece et al., 1997) to speed up change (Teece et al., 1997).

2.6.4 The Network Theory

One of the broad ideas for purchasing and supply management proposed in recent decades is the network theory (Van Weele & Van Raaij, 2014; Zsidisin et al., 2019). Company-to-customer ties are described by network theory. The idea arose in the 1970s and 1980s and evolved from focusing on only two companies to including counterparts throughout the supply chain (Al-Imamy, 2018; Agrawal, 2003).

The network theory, often known as the network’s perspective, focuses on inter-organizational value creation (Westaby et al., 2014; Klijn & Koppenjan, 2012).

Harland (1996) defines a network as a sort of relation linking people, things, or events. Network theory, say McNichols and Brennan (2006), emphasises both dyadic and multi-party relationships. A supply chain theory created in the 1970s and 1980s, this theory focuses on numerous interactions between counters throughout the supply chain (Wellenbrock, 2013). According to Chang, Chiang, and Pai (2012), a supply chain network is a complex network model whose context depends on network members' relationships (Hakansson & Ford, 2002). Peck (2005) and Zhao, Anand, and Mitchell (2005) state that networks perspective has been used to investigate global and local supply chains. But nothing is understood about how a network perspective might help understand performance.

People, things, or events form a network according to Harland (1996). Based on the relationships between members of the supply chain network, their (2012) claim (Chang, Chiang, & Pai, 2012). Thorelli (1986) defines a long-term connection as (Thorelli, 1986). A network also benefits all parties involved (Hkansson & Ford, 2002).

Companies sharing information and knowledge with partners could give them a competitive advantage (Chakravorti, 2009; Li et al., 2006). The approach also applies to the most critical decision points in terms of its impact to purchase. The approach aids demand planning by simplifying resource allocation through strategic long-term partnerships. Companies in a network can also choose from a larger pool of suppliers, ensuring the supply of vital commodities (Christopher, 2017; Buddas, 2014; Datta, 2017).

Furthermore, the trustworthiness of the relationships between organisations is assumed, which adds value to both parties and simplifies the supply strategy decision.

Network theory also helps in negotiating, because organisations in networks want to create long-term contracts that foster solid ties between counterparts. Supply chains have been described as the network that contributes to the incoming and outward of products and services inside the value chain since the late 1980s (Miles & Snow, 2007, p. 459). The term ‘network' was believed to broaden the concept of supply chain management to better understand resource potential and collaboration efficacy (Lamming, Johnsen, Zheng, & Harland, 2000, p. 676). The reason was that the literature and some actual studies revealed that firms were generally entrenched in several supply chains with multiple consumers and suppliers (Mills, et al., 2004, p. 1014).

From then on, Lamming, Johnsen, Zheng & Harland outline two distinct research approaches to the concept of ‘supply networks' (2000). The Industrial Marketing and Purchasing Group (IMP) researchers established models to enhance a better consensus of business marketplaces in relation to linkages between buyers and suppliers and the embeddedness of organisations in networks. Another study, Lamming et al. (2000) examined strategic, operational, and logistic management.

Despite its obscurity, network theory was more relevant in the 1970s and 1980s (Katz et al., 2004). Researchers have focused on understanding what makes an organization productive and what processes are required (Kessels, 2001; Robinson *et al.,* 2005). However, interacting with other supply chain participants has been known for decades (Hkansson & Snehota, 1989,). Many firms become stronger rivals by combining with specialized providers in an integrated supply chain. (Miles & Snow, 2007, p. 460).

2.7 Empirical Review

2.7.1 Supply Chain Advanced Planning Systems and supply chain Performance

IT tools can help cope with supply chain planning complexity directly or indirectly. Input/output systems are used to integrate data and manage inventory (Jacobs et al., 2011; Chen et al., 2017). Due to its focus on a particularly relevant topic in supply chains, APS systems are actively debated nowadays.

As a result, each supply chain's performance should be assessed in relation to the variable's impact on overall supply chain efficiency (Hult et al., 2004; Sezen, 2008; Charan et al., 2008). Using ERP, ABC, MRP, collaborative planning, forecasting, and replenishment can successfully integrate supply chain performance (VMI) (Govindasamy, 2006; Knolmayer et al., 2002; Kim, 2005).

ERP software suites enable firms combine information flow and business processes (Lengnick-Hall et al., 2004; Xu et al., 2002; Ndede-Amadi, 2004). Each department or function is supported by a single database that collects and stores data in real time. ERP systems can help businesses cut cycle time, improve financial management, establish the framework for e-commerce, and make tacit knowledge apparent (Su & Yang, 2010; Maguire *et al.*, 2007).

Due to rising overhead (or indirect) costs from automation and technology utilisation, activity-based costing (ABC) advocates assigning final cost objects to all activities that assist production and delivery of commodities (Lea & Fredendall, 2002). Less non-value-added costs with ABC data (Hilton, 2005; Tsai & Hung, 2009a; Tsai & Hung, 2009). Two views exist in an ABC system: cost assignment and performance measurement. Thus, ABC is one method for improving SCOP in organisations (Baykasoglu and Kaplanoglu, 2008; Tsai et al., 2008).

MRP, MRPII and MRP systems manage order fulfilment by matching material and resource availability to customer demand (Kuo et al., 2016). Using these technologies effectively assist resource planning and save inventory by releasing purchase and/or work orders only when required. (Koh, 2004; Stevenson et al., 2005). Using MRP, MRPII, and ERP effectively could reduce manufacturing lead times and inventory levels. CPR is a crucial corporate procedure for managing demand unpredictability, sales data, and promotional and replenishment programmes (Simatupang et al., 2004; Tsironis et al., 2019; Zhang, 2004).

For effective implementations of CPFR, the Voluntary Inter Industry Commerce Standards (VICS) Association established it (VICS merged with GS1 US, Inc., in 2012). The adoption of CPFR attempts to remove impediments to supply chain performance. Incomplete or erroneous knowledge leads to non-optimal decisions (Barratt and Oliveira, 2001a). The CPFR initiative is designed to facilitate collaboration. Firms in a supply chain can use the application to connect demand and supply planning and execution.

Vendor-managed inventory (VMI) is an inventory and supply chain management technique in which the provider selects when and how much inventory to refresh. This tool is also known as automated replenishment or continuous replenishment (Blatherwick) (1998). Some research has suggested using moderation and mediation to investigate the relationship between advanced planning systems and supply chain performance (Mishra et al., 2014; Tseng et al., 2013). This is because the researcher had to mediate and moderate to give a more compressive and substantial SCOP.

2.7.2 Effect of Vendor managed Inventory on supply chain Performance.

Vendor Managed Inventory (VMI) is defined as a system where “the supplier decides on the appropriate inventory levels for each product (within previously agreed-upon constraints) and the relevant inventory practises to sustain these levels,” says VMI (Simchi-Levi et al., 2004; Tyan & Wee, 2003; Razmi, et al., 2010). In the supply chain, vendor managed inventory (VMI) provides greater integration and coordination among partners (Dresner et al., 2009; Disney and Towill, 2003). This technique relies on the manufacturer or supplier taking responsibility for managing and making decisions about the customer's product inventory based on demand information (Zammori et al., 2009; Claassen et al., 2008).

VMI requires information exchange. Beyond information sharing, VMI needs a decision-shift from the client to the supplier or vendor. Retail pioneers Walmart and P&G used VMI (Niranjan et al., 2012). Since the early use of this strategy, the prospective benefits have been obvious (Dong et al., 2014). VMI has been studied empirically and model-based since then.

More research is needed to assess VMI adoption and the factors that influence VMI adoption (Kaipia et al., 2002; Classen et al., 2008; Kauremaa et al., 2009). Customer service, supply chain control, and cost savings are important concerns for buyers, according to a survey by Classen et al. (2008). In a case study in the grocery business, Kaipia et al. (2002) found that effective stock management saves suppliers time.

According to Kauremaa et al. (2009), brand offering, buyer professionalism, big delivery batch size relative to customer demand, limited percentage of overall business, and extended product life cycle length are all impediments to VMI deployment. These obstacles impact the buyer's supplier dependence and perceived

value of VMI. Elvander et al. (2007) provide a paradigm with four aspects for characterising VMI system design: inventory, information, decision-making, and system integration level. Niranjan et al. (2012) propose a VMI readiness assessment focusing on three aspects: product, company, and supplier.

Angulo et al. (2004) investigated VMI demand and lead time variation, while information accuracy is critical, delay is not. Sari (2008) compared VMI and CPFR performance gains in a simulation. The study found three elements affecting both techniques' performance improvements: plant capacity constraints, replenishment lead periods, and market demand unpredictability. Kamalapur et al. (2013) study a manufacturer-retailer connection. On the other hand, the study contrasts the benefits received from a VMI strategy under a variety of scenarios. However, the study found that in most supply chain contexts, CPFR outperforms VMI in terms of cost savings.

According to Haavik (2000), hospitals must increase data collection and create electronic communication networks with suppliers to maximise VMI concerning Malaysian health supply chains. They claim that due to transportation constraints in developing countries, VMI is a better solution than JIT and a stockless method. Turhan and Vayvay (2009) use SOA to represent VMI in a hospital, sharing information and reengineering reduce VMI costs.

Bhakoo et al. (2012), listed product attributes as one of five dependent elements influencing collaborative interactions. Matopoulos and Michailidou (2013) investigate VMI for five medical equipment at a Greek hospital. The results show that reducing overstocking and expired products may help the hospital. Watson et al. (2012) report on a VMI project for USAID and offer five VMI models for public healthcare supply chains. The research says VMI can help the public sector. However, public sector

health initiatives, infrastructures, goods, potential VMI partners, and stakeholders face major obstacles. Stanger (2013) proposed a broad paradigm for evaluating VMI. It focuses on two aspects of customers: their technical and organisational competence to deploy VMI, and their willingness to do so.

2.7.3 Effect of Collaborative Planning, Forecasting, and Replenishment and supply chain Performance

CPFR is “a business practise that incorporates the intelligence of numerous SC partners and synchronises them into collaborative forecasting and planning” (Danese, 2007; Hollmann et al., 2015; Naidoo & Mbhele, 2018; Ho & Choi, 2014). The capabilities of inter-organizational information systems (Kalchschmidt, 2012) and demand management (Rexhausen et al., 2012) have already been investigated (Hadaya and Cassivi, 2007). CFPR facilitates information sharing, supply chain visibility, and demand forecasting (Yu et al., 2010). But it's unclear how it influences supply chain innovation.

Research on the CPFR-SCOP relationship has shown inconsistent results. Clark and Hammond (1997) discovered that CPFR increases inventory turnover 40–100%.CPFR enhances profitability by 20–30% while lowering COGS by 3–4%, operating expenses by 1–2%, and lead and cycle times by 25–30% (Vickery et al., 2003) (Ireland) (Jaipuria and Mahapatra, 2014). Affects SCOP as well as internal forecasts (Nakano, 2009). They claim that collaboration decreases inventory costs and increases customer service (2008). While CPFR and SCOP had a strong relationship, their impact on supply chain flexibility was minimal (Hadaya and Cassivi, 2007).

Crum and Palmatier (2004) observed that CPFR could cut inventories by 30-50% while enhancing customer service. To reduce inventory, Whirlpool Corporation used

CPFR and collaborative forecasting. Better forecasting and replenishment methods minimise inventory, say Holmström et al. (2002). Customer service may suffer as a result of low inventory levels due to supply chain collaboration, according to Sari (2015). Achieve better sales, operational and financial results.

Crum and Plamatier (2004) observed enhanced customer service and sales with CPFR.

According to Steermann (2003), Sears and Michelin both improved financially and operationally after introducing CPFR. Whirlpool reduced predicting errors by half since introducing CPFR (Anthes, 2005). The use of CPFR with consumers or suppliers can also increase product availability and eliminate forecasting errors.

High demand unpredictability, high inventory holding and backorder penalty costs, and long delivery lead times maximise CPFR benefits, according to Kamalapur and Lyth (2014). To demonstrate how cloud-based information sharing enhances hospital supply chain performance and decreases inventory expenditures, Kochan et al. (2018) Automated replenishment programmes increase supply-demand matching and inventory placement across the supply chain, according to Stank et al. (1999). They discovered that both manufacturers and distributors reduced inventory costs by up to 50% after using the CPFR scheme.

According to Attaran and Fliedner, CPFR's synchronised planning and forecasting approach increased retailer and manufacturer sales (2004). Burnette (2011) found that applying CPFR reduced forecast error by up to 25% and increased sales by 20%. Both Panahifar et al. (2015) and Demiray et al. (2017) found comparable results.

Kazemi and Zhang (2013) found that CPFR outperforms other programmes like vendor management inventory in terms of total profit. Better forecasting and reduced supply chain bullwhip allow for better inventory placement and faster inter-firm activity completion thanks to inter-firm information sharing (Lee and Padmanabhan, 1997). Joint product design and development requires inter-firm coordination and that improves supply chain performance (Modi and Mabert, 2007; Gu et al., 2017).

The automatic replenishment system, part of CPFR, provides a standardised process for efficient daily replenishment operations. Incorporating and collaborating to implement such a system has a positive impact on firm performance (Caridi et al., 2005; Dehning et al., 2007; Disney et al., 2004; Ranganathan and Brown, 2006). Cost savings, reduced inventory, and increased service and sales are reported (Cigolini and Rossi, 2006; Sari, 2008), which positively impact firm profitability and other financial measures (Daugherty et al., 1999; Sabath *et al.*, 2001; Smith *et al.*, 2011; Stank *et al.*, 1999).

CPFR systems include supply chain planning. Improved decision-making through collaboration with supply chain partners (Petersen et al., 2005; Subramani, 2004). They observed that supply chain collaboration impacts financial performance. Collaboration, for example, increases supply chain flexibility by reducing capacity requirements and boosting production capacity availability. Collaborative planning reduces supply chain costs and increases customer responsiveness (Chen et al., 2004; Holweg et al., 2005; Rosenzweig et al., 2003; Soosay et al., 2008; Vickery et al., 2003).

2.7.4 Effects of Enterprise resource planning (ERP) on supply chain performance

Globally, enterprise resource planning is a well-known business activity (Shaul, L., & Tauber, D. (2013; Quiescenti et al., 2006). This system improves customer service, improves production capabilities, and reduces production overhead costs. Despite its many advantages, this ERP system has been called difficult and perilous (Keskinocak & Tayur, 2001; Häkkinen & Hilmola, 2008; Zhang et al., 2003).

The ERP system enables high levels of cross-functional integration among different functions such as manufacturing, advertising, human resources, purchasing, innovation, finance, operations, sales, and logistics, allowing people to run and establish the highest customer value and long-term economic output with efficiency (Rahim & Malik, 2010; Murillo-Oviedo et al., 2019; Pimenta et al., 2016).

Using ERP for Supply Chain Management (SCM) improves SCM efficiency. According to Shatat and Udin (2012), ERP improves SCM effectiveness by integrating internal business processes, information flow, and supplier and customer collaboration. Seip and Sprengel (1998) outlined the variables that contribute to a successful ERP installation, starting with senior management's commitment to the project and ending with effective communication with all stakeholders. It is critical that all users or staff understand and can use the ERP system (Beheshti, 2006; Muscatello & Chen, 2008).

According to Ie-Ray (2003), ERP enhances SCM capabilities, customer responsiveness, and satisfaction by automating corporate processes and dealing with change. ERP systems have a tremendous impact on global businesses and organisations (Janvier-James, 2011). Many companies use ERP systems to improve

management, strategy, IT, operations, and eventually their bottom line (Zhang et al., 2011). According to Devenport (1998), enterprise resource planning is the most important component of IT robustness. According to Nah and Lau (2001), Ruivo et al. (2013), and Zhou-Sivunen (2005), ERP is a software that links all business processes and provides coherence amongst all business operations. Using a shared data infrastructure, Hwang and Min (2013) indicate that ERP systems enable coherence and connectivity between distributors and suppliers as well as customers.

Supply chain efficiency is among the main aims of ERP systems, yet there are many variables that might affect efficiency. Conventional supply chains include four tiers: supply, manufacturing, distribution, and consumer. The supply chain's performance is a crucial efficiency factor.Cost, activity time, flexibility, and cost-customer responsiveness are supply chain performance indicators.

Olson (2007) evaluated other ERP solutions and acquisition of ERP systems as package programmes and created a list of the merits and downsides of both ways. Yan (2008) studied ERP difficulties in the Chinese retail sector and proposed remedies. Karsakandzoul (2009) studied how to choose the right ERP software for decision making.

Vandai (2008) explored crucial success variables in ERP application; Chang (2008) studied the performance implications of ERP on supply chain. Bose et al. (2008) investigated the use of ERP systems in supply chain and inventory management for a Chinese manufacturing firm, while Mabert (2003) investigated the fundamental variations in ERP implementation methodologies.

A uniform interface across the entire enterprise, according to Tadjer (2010). ERP systems provide distinct advantages to its users (Abd Elmonem et al., 2016; Botta-

Genoulaz et al., 2005). This is achieved by strengthening organisational decision-making processes through timely information (Hunton et al., 2012). To maintain quality and predictability in global business interests, most firms have to standardise procedures and adopt best practises integrated in ERP systems (Ross, 2013). With the evolution of ERP systems, so has interest in how these systems affect organisational performance (Wieder et al., 2006; Gavrea et al., 2011).

According to Kumar and Keshan (2009), organisations without an ERP system struggle to compete and expand utilising programmes that are functionally outmoded, isolated from other applications and data. According to Asemi and Jazi (2010), the total cost of installation could be three to five times the purchase price of prewritten software.

The advent of ERP technology has fundamentally altered accounting methods in financial reporting, management accounting, auditing, and taxation (Scapens & Jazaeyri, 2003; Schneider et al., 2015; Wagner et al., 2011). These complex accounting approaches include the ABC method, financial ratio analysis, budgeting, profit centres, and customer profitability analysis (Ittner & Larcker, 2001; Spathis & Constantinides, 2004). Galani (2010) revealed that ERP-enabled organisations use the ABC method, targeted cost, and balanced scorecard more.

2.7.5 Effect of Material requirements planning (MRP & MRP II) on supply chain Performance

MRP and MRPII are production planning and control systems used to order fulfillment coordinated by matching material and resource availability to client demand (Stadtler, H. (2005; Gupta & Kohli, 2006; Jui-Chin & Kou-Huang, 2007).

This could help resource planning and save inventory by releasing purchase and/or work orders only when required (Hoque *et al.,* 2015).

MRP is a data processing concept, not an optimization one, but we may develop an optimization model for it (Voß & Woodruff, 2006; Conejo et al., 2010). This will be a good starting point for more modelling. MRP does not require an optimization model, but we will utilise our model to better understand its limitations and to build more advanced models (Buyya et al., 2002; Kortabarria et al., 2018). Orlicky is often credited with inventing or popularising MRP. His seminal work on MRP has been updated (Orlicky 1975). This book teaches MRP procedures and record keeping. Remember that MRP was a huge improvement over prior management systems designed for make-to-stock environments. Production cycles are shorter and require a planning system that anticipates the requirement for shifting component mixtures.

There is few scientific research on MRP. Yeo et al. (1988) conducted a survey to assess MRP users' implementation status, success, and difficulties. They used 26 people. MRP's main benefits were found as reduced stock inventory, reduced material waste, and reliable delivery. The key success factors were MRP training, senior management backing, and inter-departmental cooperation.

Yuen and Sia (1990) tested her MRP efficacy tool on 36 postal survey respondents. Its effectiveness is measured by data integrity, management commitment and education and training. In a 1990 Sia survey, only 21 out of 33 companies used MRP.

2.7.6 Effect of Activity Based Costing (ABC) on supply chain Performance

Combining ABC and SCM is a complex costing technique that helps managers make strategic business decisions, according to Lin et al. (2001). Cost data are necessary for every SCM decision, say the researchers, a strong ABC-SCM connection. Based

on current global competitiveness, they expect cost data in SCM and the integration of ABC and SCM to grow in relevance.

ABC appears to help SCM and organisational performance in several ways (Baykasoglu and Kaplanoglu, 2008; Charles and Hansen, 2008). A clear image of where resources are spent, where customer value is created, and where money is made or lost is provided by Baykasoglu and Kaplanoglu (2008).

Tsai et al. (2008) claim that ABC helps organisations grasp the cause-and-effect relationship between expenses and activity demands, leading to increased performance. Modern production processes can be misled by normal cost accounting, especially when overhead costs are significant. The researcher claims ABC can maximise long-term profit by controlling all business overhead.

Kee (2008) advises using ABC to make judgments about product mix costing and pricing. Qian and Ben-Arieh (2008) prefer ABC for cost estimate. The researchers contend that ABC can assist managers discover and eliminate non-value-adding activities by highlighting original factors that demand indirect and support resources. Arieh et al. (2003) and Qian et al. (2008) suggest the ABC technique is much more efficient. Singer and Donoso (2008) determined that the accuracy of ABC cost estimation was valid in terms of real indirect cost vs forecast utilising ABC.

According to SCM literature, ABC can improve organisational performance, productivity, and profitability by providing decision support for decentralised mini-storage conversion, costing services for land transportation companies, facilitating optimal joint product mix decisions, pricing, product mix, and capacity expansion decisions, offering cost-estimation model, providing more accurate product-cost information and improving decision quality, offering more accurate costing, and

providing more accurate product-cost information (Satoglu et al., 2006;Baykasoglu and Kaplanoglu, 2008; Tsai *et al.,* 2008; Kee, 2008; Kingsman and de Souza, 1997; O¨ zbayrak et al., 2004; Qian and Ben-Arieh, 2008; Charles and Hansen, 2008; Berling, 2008; Comelli *et al.,* 2008; Whicker *et al.,* 2006 ;Thyssen *et al.,* 2006; Ben-Arieh and Qian, 2003; Tornberg *et al.,* 2002;Tatsiopoulos and Panayiotou, 2000).

2.8 Effect of supply chain advanced planning systems on supply chain agility

A supply chain's ability to respond to changing market conditions depends on agility (Christopher and Towill, 2000; Mavengere, 2013; Prater et al., 2001; Gligor et al., 2013). We've built up a number of supply chain agility definitions using conceptual and structural models (Swafford et al., 2008, Gligor and Holocomb, 2012). Many attributes and measures are utilised to approach it: flexibility (Swafford et al., 2006), market sensitivity (Agarwal et al., 2007), awareness (Braunscheidel and Suresh, 2009), data accessibility, speed, and data quality (Gligor et al, 2013). There are two basic dimensions to supply chain agility (Sharifi et al., 2006; Giannakis & Louis, 2016; Chiang et al., 2012).

Agility refers to a supply chain's capacity to respond quickly to unanticipated external events (Ngai et al., 2011; Braunscheidel & Suresh, 2009). Demand must be perceived without distortions or latencies. Visibility of information promotes demand sensitivity and thus supply chain responsiveness (Giannakis et al., 2019; Hashemi, 2015). Supply and demand uncertainties, as well as supply chain hazards, necessitate rapid supply chain adjustment (Richey et al., 2021; Stadtler, 2005). A second trait of responsiveness is the ability to detect and respond quickly to supply chain threats (Handfield & Bechtel, 2002). A third measure of responsiveness is the speed of supply chain companies delivering goods or services (Reinhert and Holweg, 2007).

Supply chain agility is the capacity to restructure operations, reorganise capabilities, or realign strategic objectives in response to unpredictability in demand (Swafford et al., 2006; Roh et al., 2011). We all know how tough it is to be flexible in operations and SCM. A versatile product/service mix, the ability to launch new or altered items, and a flexible delivery period (delivery flexibility) (Reichhart and Holweg, 2007). It is well proven that IT integration promotes supply chain flexibility, agility, and ultimately corporate performance (Swafford et al., 2008). e-commerce, ERP, and advanced planning systems (APS) have all been used to improve SCM (Moyaux and Chaib-draa, 2006).

Successful e-commerce demands cutting-edge information systems that can handle the complexities of supply chain procedures and interpret the massive amounts of "big data" accessible today (Daneshvar Kakhki, M., & Gargeya, V. B. (2019; Zhong et al., 2016. The latest ERP and APS systems allow strong supply chain process integration via internet-based applications (Link and Back, 2015). It is split into internal corporate procedures or a dual context of co-operation (Botta et al., 2005).

Their computational realisation of business connections (CPFR, vendor/buyer) is similarly restricted. They must therefore simultaneously support multiple "types" of collaboration while ensuring smooth transitions between them. Few solutions for complete cross-organizational collaboration have been developed. Companies that can afford the high degree of investment will be able to achieve responsiveness and overall competitive advantage through collaborative SCM systems, which takes time and money (Fawcett et al., 2006; Chin et al., 2015). Even if ERP systems fully actualize the extended enterprise notion, small players in a supply chain would encounter substantial challenges (Braglia & Frosolini, 2014; Møller, 2005). It is also

difficult to integrate and exploit data that is too large, raw, or expensive to integrate and exploit. They can perform data mining analysis such as clustering and correlations (Berkovich and Liao, 2012), but not provide real-time data analysis or develop knowledge from huge data (Mayer-Schönberger et al., 2013).

2.9 Effect of Supply chain agility (mediator) on organization supply chain performance

Agility has gained popularity in recent years in production and supply chain management research (Dubey et al., 2019; Gligor et al., 2019; Dubey et al., 2014). As a new paradigm in manufacturing, manufacturers have seen agility as an emerging competitive weapon (Kasarda and Rondinelli 1998 and Sharifi and Zhang 2001). Agility is considered a building block for mass customization by Ismail as al. (2007), while Ismail et al. (2011) look at how agile strategic competencies help manufacturing-based small enterprises achieve resilience.

Fisher (1997) was among the first to analyse supply chain agility as a firm-wide capability to adapt to changing market conditions (Braunscheidel and Suresh 2009, Lee 2004, Swafford et al., 2006). It is a mindset as well as a set of processes (Christopher and Towill 2001, Shaw et al., 2005). So, supply chain agility aligns with major consumers and suppliers (Braunscheidel and Suresh 2009 and Swafford et al (2009). Flexibility influences supply chain agility, whereas integration influences supply chain agility. However, both studies acknowledge the absence of empirical data in supply chain agility research. Vinodh et al. (2010) developed an agility index measuring using a multi-grade fuzzy approach.

Agility should improve business profitability, competitive position, and competitive actions (Lee et al., 2009; Chen, 2019). (Chi et al., 2010). They predict a homological

network of links between procurement practises competences, company performance, and firm agility. Recent empirical research examines numerous aspects of conceived homology. Tallon and Pinsonneault (2011) examine the relationships between agility and organisational performance, as influenced by environmental instability. It has an entrepreneurial or attacking dimension and an adaptive or defensive dimension, according to Lee et al. As a result of changing market conditions, a firm's positioning and strategy can be modified, and new business techniques might be organised to obtain an early edge.

Sambamurthy et al. (2003) contend that agility is a dynamic quality that allows for rapid competitive action, surprise, and disruption. In order to seize chances for entrepreneurship or challenges that need adaptive action, businesses must constantly activate and exercise these capacities, mobilising resources and endowments to launch suitable competitive actions. They claim that in information-rich contexts, organisations' competitive performance is dependent on the interconnections of competences and other organisational capacities. Firm performance is influenced by how skills combine with other organisational capabilities (Banker et al., 2006, Raiet al., 2006).

For practical purposes (Collin and Lorenzin 2006, Lee 2004), more research is required (Braunscheidel and Suresh 2009, Collin and Lorenzin 2006). While the benefits of supply chain agility are well understood, little is known about its origins (Swafford et al., 2006). Understanding how to develop agility is critical in today's dynamic world (Ismail et al., 2007).

Organizational agility is defined as being flexible, adaptable, and growth-oriented (Goldman et al., 1994; Panda & Rath, 2016; Goncalves et al., 2020). It is dynamic

since today's methods of achieving agility may not be effective tomorrow. It is context-dependent since the market environment affects required agility. It is change-embracing because it encourages adaptation. Agility fosters progress through re-imagining vision, methods, and techniques (Hamel and Prahalad, 1994).

Relevance, accommodation, and flexibility are the building components of agility (Global Logistics Research Team, 1995). Flexibility is the ability to respond to unforeseen circumstances (Bernardes, E. S., & Hanna, M. D. (2009; Skipper & Hanna, 2009). Agility is a wide word that encompasses many aspects of a corporation. Agility throughout the value chain (VC) is one component of organisational agility in manufacturing (Porter, 1985; Margherita et al., 2021; Battistella et al., 2017). A flexible VC allows a company to create, produce, and deliver new goods. While earlier research has addressed organisational agility in general (Fliedner and Vokurka, 1997; Swafford et al., 2006; Mason-Jones and Towill, 1999; Li et al., 2008; Nagel and Bhargava, 1994), little is known about value-adding procedures and agility.

Trust in suppliers and consumers is required, according to Svensson (2001). Power, Sohal, and Rahman (2001) defined successful agile supply chain management. Stratton and Warburton (2003) studied inventory and capacity in a clothing supply chain. The ability of Lau, Wong, Pun, and Chin (2003)'s agile supply chain system to adapt to changes in supplier management and component mobility throughout the value chain of the entire production network. Each of these elements contributes to the overall effectiveness of an agile supply chain.

A firm's supply chain agility affects financial (David, 2015). DeGroote and Marx (2013) claim that supply chain agility increases financial success (Sharon, 2013). Blome et al. (2013) defined the benefits of supply chain agility. He observed that

supply chain adaptability improves operational and cost performance. Yahaya (2014) examined how agility affects oil and gas business performance and found out that the value of supply chain agility in business.

2.10 The Mediating Role of Supply Chain Agility on the on the Relationship between Advanced Supply Chain Planning System and Organization Supply Chain Performance

A focused firm's supply chain must be flexible to meet changing client demands (Duclos et al., 2003; Wisner, 2003). Demand fluctuations and short product life cycles require a flexible supply chain (Blome et al., 2013; Gligor et al., 2015). To satisfy changing customer demands, supply chain agility is critical (Qi et al., 2011 and Yusuf et al. (2004). Zara's supply chain is so responsive that new designs are ready for worldwide retail in just 15 days (Lee 2004; Ferdows et al., 2004). For example, Seven-Eleven replenishes its stores within twelve hours of receiving orders (Ferdows et al., 2004). Supply chain agility accounts for both.

Supply- and demand-side skills are the assets or resources needed to achieve supply chain agility, according to the Resource Based View (Brusset, 2016; Feizabadi et al., 2019). This relates to the idea that having heterogeneous resources is no longer sufficient, but their configuration and utilisation is (Barney et al., 2011; Eisenhardt and Martin 2000). Moreover, supply chain agility is a higher-order capacity “derived through combining lower-order capabilities and resources” (Vickery et al., 2010). More difficult to imitate than lower-order competencies (Grant 1996). A more powerful model would add supply chain agility as a mediator (Blome et al., 2013; Yang, 2014; Chan et al., 2017).

Research supports the claim. Vickery et al. investigated the effect of agility in the link between antecedents (supply chain information technology and supply chain organisational activities) and corporate performance (2010). Swafford et al. (2008) presented agility as a bridge between IT integration and business competitiveness.

Also, because practically every business, including manufacturing and retail, faces dynamic surroundings and unpredictable changes, supply chain competencies alone may not be enough to achieve optimal operational efficiency. As a result, supply and demand-side competencies must be developed into capabilities in order to contribute most effectively to the firm's operational success (Swafford et al. 2008, Vickery et al., 2010). Supply chain agility is the capacity to adjust to changing environments and ultimately improve performance (Swafford et al., 2006).

According to Vickery et al. (2010); Chhabi Ram Matawale (2016); Chan, Ngai, and Moon (2016) employed structural equation modelling to explore the impact of supply chain agility, strategy, and manufacturing flexibility on firm performance (Alan, 2016).

Yusuf et al. (2012) studied 158 UK oil and gas managers' views on supply chain agility and business success. The research demonstrated that supply chain agility impacts corporate performance and competitiveness. Tan (2002) found a direct link between supply chain competence and organisational performance, whereas Wisner (2003) found a link between quality commitment and supply chain dynamics.

2.11 Moderating effect of Supplier relationship on the Relationship between Advanced Supply Chain Planning System and organization supply chain performance

Strategic Supplier Partnership is the process of building long-term relationships with suppliers (Li et al., 2005; Monczka et al., 1998; Agus, A., & Hassan, 2008; Qrunfleh & Tarafdar, 2013; Prajogo & Olhager, 2012). Suppliers are selected based on joint planning, issue solving, and continuous improvement programmes (Maloni and Benton 1997; Li et al., 2005). It enables close collaboration between the company and its suppliers. It allows for collaborative product design and knowledge exchange with suppliers, allowing for flexibility (Baihaqi & Sohal, 2013; Makarius, E. E., & Srinivasan, M. (2017; Kumar, et al., 2014; Kumar et al., 2016). Sourcing demand and detecting changes in technologies/products early allows the focal firm to be responsive and adaptable (Whitten et al., 2012).

Product diversity is influenced by consumer wants, market competitiveness, and personalization (Silveira, 1998), therefore each SC participant must provide the best product or service for clients (Jeong and Hong, 2007). The product, as well as the entire SC from raw material acquisition to final consumption, must meet consumer expectations (Zokaei and Hines, 2007). The product, as well as the entire SC from raw material acquisition to ultimate consumption, must be handled successfully and efficiently to match end-consumer expectations (Zokaei and Hines, 2007). Fisher et al. (1995) recommend two techniques to reduce undesired product variety: better customer relationships to verify current products meet customer needs and removing obsolete items.

To minimise information overload and disengagement from purchasing decisions, Child et al. (1991) advise organisations to assess customer attractiveness.To increase customer engagements, a SC must get client feedback (Tummala et al., 2006). Long-term customer relationships need responding to consumer feedback (Tan et al., 1999; Ranganathan et al., 2004; Wang and Feng, 2012). Close client interactions necessitate continual customer service monitoring and response. (Power et al., 2001; Zokaei and Hines, 2007; Wang and Feng, 2012).

Close client ties can lead to SC flexibility in product, volume, and delivery. Unlike supplier management, customer management is demand driven. Understanding client needs and wants is critical to expanding a SC's flexibility (Tracey and Tan, 2001). External integration initiatives can improve SC flexibility by strengthening customer relationships.

Supplier relations and management are crucial for any company that subcontracts component design and production. For example, an automobile comprises around 15,000 components, just a few of which are produced in-house. So, to get the greatest quality parts at the best price, managers must choose between long-term relationships and mutual cooperation with suppliers, or more in-house development and manufacture (Abernathy, 1979; Monte- verde and Teece, 1982). Supplier relations are therefore critical for organisations seeking to expand their market access, reduce costs, or otherwise benefit from multi-national or global operations (Kang et al., 2012; Kogut, 1985; Barlett and Ghoshal, 1987; Panizzolo et al., 2012; Ghoshal, 1987; Acs et al., 1997; Porter, 1987)

This study also evaluates supplier performance in a service (financial services) environment, whereas most empirical supply chain studies focus on manufacturing

(Narasimhan and Jayaram, 1998). Supplier relations management and its relationship to supply chain performance may not be generalizable from manufacturing because financial services “products” are often intangible (e.g., information). (Ellramet al., 2004, 2007 and Baltacioglu et al. 2007).

Collaboration (such as supply chain coordination, cooperation, and information exchange) is required, according to various scholars (Barratt and Oliveira, 2001; Bowersox et al., 2000; Soosay & Hyland, 2015; Vereecke and Muylle, 2006; Xu and Beamon, 2006). It is important to note that while collaborative planning and information sharing have been found to increase supply chain performance, the quality of shared information and trust between organisations must (Monczka et al.,1998; Peterson et al.,2005). According to Mohr and Spekman (1994), firm-firm collaborations succeed when they are coordinated and committed. As described by Lee (2004), the finest supply chains are collaborative and information-sharing among supply chain participants.

In their study, Tan et al. (2002) found very minor links between supplier or customer collaboration and performance improvement, with little indication that better performing organisations interact more.However, despite the potential benefits, implementation is generally difficult, time-consuming, and costly (Hammer, 2001; Xu and Beamon, 2006). This means integrating inter-organizational supplier information systems with supply chain planning (da Silveira and Cagliano, 2006).

According to Bensaou (1997), the supply chain relational environment (goal compatibility and fairness perception) best predicts inter-organizational collaboration. A similar point is made by Prahinski and Benton (2004). They found that while buyer-supplier feedback improves the buyer-supplier relationship, it does not improve

supplier performance. They also find that enhanced buying firm cooperation and commitment boost supplier performance via supplier commitment.

The major features are collaboration, cooperation, commitment, information-sharing, and feedback (Field & Meile, 2008; Carr and Pearson, 1999; Colicchia et al., 2019; Fynes et al., 2005; Heide and John, 1992; Tran et al., 2016; Morgan and Hunt, 1994; Prahinski and Benton, 2004). Overall, recent research links improved supplier connections to higher supplier performance. The literature analysis indicated that these five components are often, but not always positively associated with supplier performance. SCM research reflects SCM's evolutionary and complicated nature. Much of the present SCM research focuses on only one side of the supply chain, or one aspect/perspective of SCM. Supplier selection, supplier participation, and production performance TY Choi (1996), Strategic supplier alliances: success determinants. Supplier management orientation and buyer performance (Narasimhan et al., 2000). Improving supplier responsiveness through relationships. On the supplier side, the antecedence and repercussions of buyer–supplier relationships have been studied. The downstream linkages between producers and retailers are studied by researchers like Clark and Lee (2004) and Alvarado and Kotzab (2001). A few recent studies examined the supply chain from both upstream and downstream perspectives. Tan et al. (2004) investigated supplier management, customer interactions, and organisational performance.

2.12 The Relationship between Supply Chain Agility and Supplier Relationship on Organizational Supply Chain Performance

Agile organisations deliver faster product launches and better product development (Cooper & Sommer, 2016; Sambamurthy et al., 2003; Highsmith, 2009; Swafford et

al., 2006; Youndt and Snell, 2004; Masson et al., 2007). Today's practitioners have emphasised the importance of supplier relationships in boosting agility. Outsourcing, according to Barrar and Gervais (2006), improves performance, agility, and customer service. Most buyer–supplier outsourcing cooperation focus on product release and enhancement agility for buyers.

But the research on enhancing agility through collaboration and trust in buyer-supplier collaborations is lacking. This study uses contingency theory to better understand how collaboration affects (agility) performance. Agility performance requires supplier collaboration (Heric and Singh, 2010; Narayanan et al., 2015). Utilization of international suppliers' investments, innovations, and professional expertise (Quinn and Hilmer, 1994). Contrary to popular belief, establishing agility performance through supply partnerships is still difficult (Heric and Singh, 2010). So, a study of how collaboration affects performance in strategic buyer-supplier collaborations is needed.

Collaboration is defined by shared ideals, standards of collaboration, information sharing, and managerial participation (Cannon et al., 2000; Hoegl and Wagner, 2005). Collaboration can help improve agility performance (Narasimhan and Das, 2001; Vickery et al., 2003; Tarafdar & Qrunfleh, 2017). Collaboration has several advantages (Holcomb and Hitt, 2007; Jap, 1999; Quinn and Hilmer, 1994), but it can also impair sourcing relationships (Anderson and Jap, 2005; Al-Doori, 2019; Jap, 1999; Rossetti and Choi, 2005; Villena et al., 2011). Prior study may have found inconsistent results due to the exclusion of critical moderators that increase or detract from the link. Thus, elements that influence the relationship between collaboration and agility are examined.

TCE research identifies uncertainty and asset specificity as transaction cost drivers (Walker, 1994; Walker and Poppo, 1991). Using specialised assets increases buyer performance (Handfield and Bechtel, 2002). There is no empirical research on specific assets and their role in buyer-supplier collaboration. According to De Vita et al. (2011), the impact of asset specificity on buyer–supplier partnership results is understudied.

In accordance with contingency theory, the researcher explores the boundary conditions when collaboration benefits the focal firm. Identifying the border conditions around the phenomenon allows for richer theory development and is in line with contingency theory (Luthans and Stewart, 1977; McMahon and Perritt, 1973). The researcher uses these perspectives to contextualise the impact of collaboration on agility performan

Introduction in today's turbulent business environments, organisations must be adaptable to rapid changes, challenges, and opportunities (Prahalad 2009). Agility is a firm's capacity to adapt to quick, unpredictable change and prosper in a competitive environment (Dove 2001; Goldman et al., 1995). Firms invest in IT to respond quickly to a changing market.

Academics and practitioners have recently focused on agility. According to a recent Economist Intelligence Unit survey (Glenn, 2009), 88% of executives believe that global success requires agility. Agility likely enables an organisation to swiftly refine its business and operations to deal with unexpected external and internal changes (Dove, 2001; Van Oosterhout et al., 2006; Cegarra-Navarro et al., 2016).

Business process agility refers to an organization's ability to quickly adapt to changing market conditions (Tallon, 2008). It stresses the need for a firm to quickly

adapt to changes in the environment and response to consumers and stakeholders (Mathiyakalan et al., 2005). Business process agility is a key way for companies to interact with the market (Van Oosterhout et al., 2006; Raschke, 2010). Agile business procedures are anticipated to reduce costs by stressing speed and ease of responding to market changes. They also help firms to innovate and compete (Sambamurthy et al., 2003; Seethamraju, 2006).

Although organisations are increasingly focusing on process agility, little is understood about how to really become more agile (Sambamurthy et al., 2003). Businesses must be agile in their process. It also enables firms to quickly adapt to changing market conditions (Raschke, 2010). This method is embedded in organisational routines, making it difficult for competitors to identify valuable portions or procedures. So, business process agility is hard to duplicate and non-replaceable. A strategic organisational competency, business process agility helps organisations better acquire and deploy resources to meet their market environment.

Business process agility means speed, flexibility, and creativity. It enables organisations to respond swiftly to changing market conditions and new technology possibilities (Mathiassen& Pries-Heje, 2006; Benzidia & Makaoui, 2020; Gong & Janssen, 2012). Agility is the ability to quickly detect significant events, evaluate them, assess their implications for the company, explore choices, make decisions, and implement suitable solutions (Haeckel, 1999). Businesses can rapidly modify or create new processes to adapt to changing market circumstances (Sambamurthy et al., 2003).

Supply chain agility allows organisations to better adapt to unexpected developments by synchronising supply and demand (Swafford et al., 2008; Siagian et al., 2021;

Ahmed et al., 2019). Because enterprises no longer compete as autonomous entities, synchronising supply and demand necessitates integration of internal processes, suppliers, and customers (Narasimhan, 1997). Supply chain vs. supply chain (Mentzer et al., 2001; Christopher, 2000; Tarn et al., 2002; Lambert and Cooper, 2000; Christopher and Towill, 2001). In order to obtain a competitive advantage, companies should align with their suppliers, suppliers of suppliers, consumers, and even competitors (van Hoek, 2001; Sahay & Mohan, 2003; Sheffi, 2007; McAdam & McCormack, 2001). The supply chain must be able to quickly respond to changing market and customer demand.

Supply chain agility is critical for business performance (Hefu, 2013; Um, 2017). Supply chain competency and agility were examined by Ngai et al. (2011). Customers influence corporate performance.

2.13 Knowledge Gap

Recent management study has focused on supply chain performance (Burgess et al., 2006). Companies meticulously plan and adjust their supply chain practises to remain competitive in meeting client demands (Fisher, 1997). It is often said that rivalry is no longer between enterprises, but between supply networks. SCOP has major long-term effects on corporate goals, managers say (Yeung, 2008).

The SCOP procedures appear to improve several performance measures. Kaynak and Hartley (2008) identify customer interaction, information sharing quality and degree, procedure, and product design as critical supply chain principles. They link these practises to competitive advantage in quality, pricing, innovation, delivery reliability, and time to market.

Analytical and empirical methodologies have helped academics discover and validate basic SCOP models and structures. Many research have evaluated SCOP's impact on organisational performance. Many SCM researchers now focus on cross-industry validity. One aspect of interest is how organisations use various “best practises” along the supply chain. Inquire if commonly advised procedures are equally applicable throughout the supply chain. While some research has looked on the performance of SCM approaches when used on the supply or distribution side of the supply chain (Frohlich and Westbrook, 2001, 2002; Kim, 2006; Li et al., 2005b). So, largely dyadic treatment. Finding specific supply network issues in a broader supply chain picture may be difficult.

Is it fair to compare the perspectives of distributors and retailers? The supply chain practises that work for one should work for the other. However, the retailer stage is often the final stage before reaching the client.

2.14 Conceptual Framework

The conceptual framework depicts independent, dependent, moderating, and mediating variables. The independent variable is Supply chain planning system, the dependent variable Supply chain performance, the mediator is Supply chain Agility and the moderating variable is Supplier relationship.

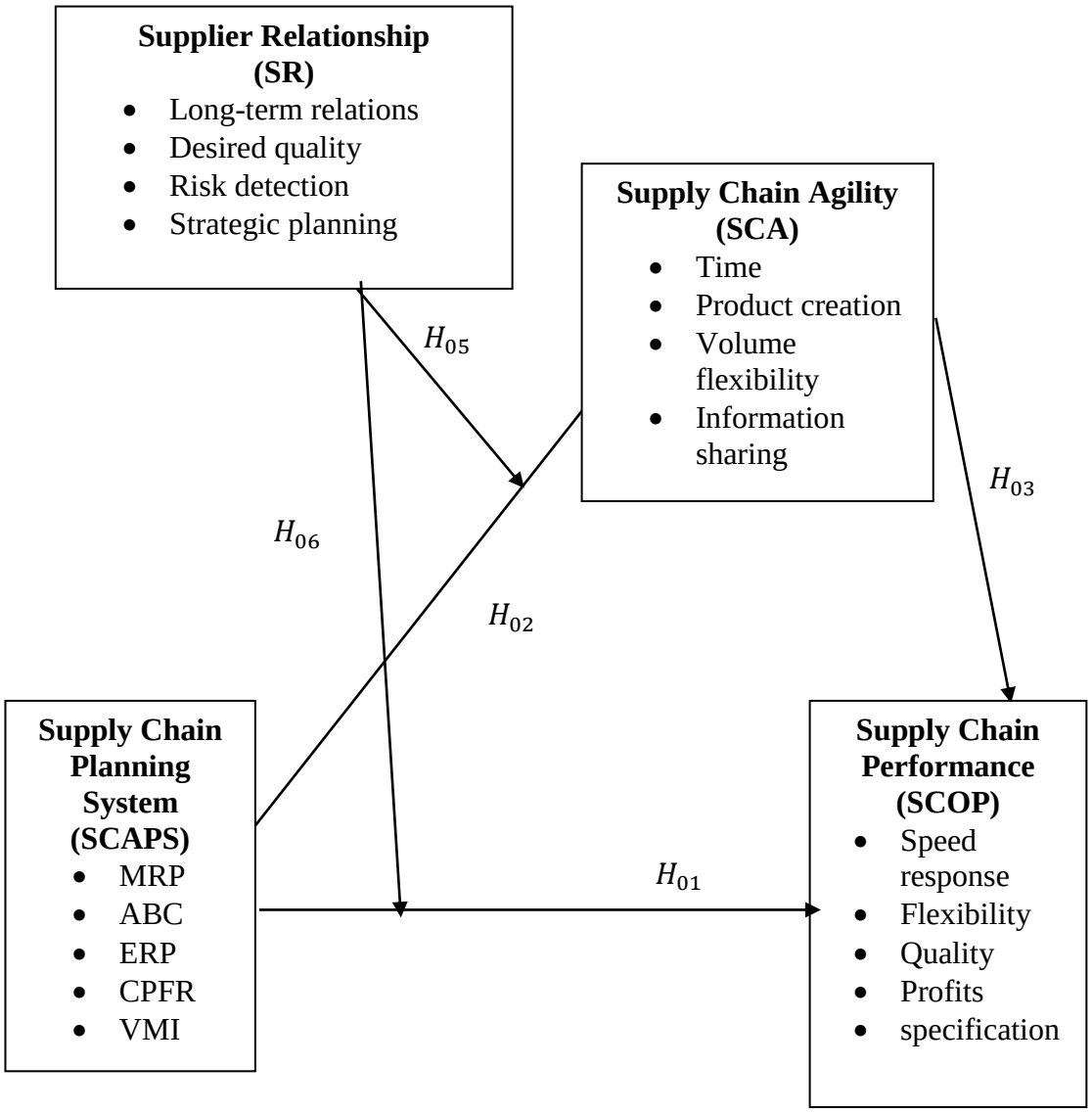

Figure 2. 1: Conceptual Framework

Source; Researcher 2019; Hayes model 8

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

The research methodology refers to the system of techniques or systems utilized as a part of sampling and collecting information needed for specific research. It is likewise the use of the standards of data collection techniques and methodology in any field of knowledge. This chapter depicts research design, target population, data collection approaches, validity and reliability of the research tools and data analysis approaches.

3.2 Research Paradigm/ Philosophy

A research paradigm is a set of beliefs, attitudes, and assumptions that govern research and assess reality and knowledge (Morrison, 2014; Gelo et al., 2008; Antwi & Hamza, 2015). The two primary research perspectives are positivism and interpretivism (Alharahsheh & Pius, 2020; Cecez-Kecmanovic, 2005). This study used a positivist perspective.

Positivism assumes that there is an objective reality that exists regardless of the researcher's opinion (Neuman, 2017; Tuli, 2010; Ormston et al., 2014). It requires a more planned and controlled approach to study, guided by a clearly defined research topic, hypotheses, and procedures (Runeson & Höst, 2009; Jones & McBeth, 2010). The positivist paradigm is used to make temporal and context generalisations using statistical and mathematical approaches (Morrison, 2014; Neuman, 2017).

3.3 Research Design

Explanatory research design was utilized in this study. This design endeavors to determine the relationship between variables it goes for recognizing how one variable influences the other; it looks to give an experimental clarification to the causality and

circumstances and end results connection between at least one factor (Saunders *et al.*, 2000, 2007; Malhotra & Birks, 2007; Cooper & Schindler 2006). They are likewise utilized when the reason for the study is to answer "why" in each setting. According to Cooper and Schindler (2000) describe explanatory research as a type of inquiry that focuses on why questions. It was the study's involvement in formulating and offering clarifications that enabled it to provide answers to the "why" questions. The clarifications contend that a phenomenon Y (Organizational supply chain Performance) is influenced by factor X (Advanced Planning system). This outline was picked on the grounds that it connected nearly to the examination goals of this study and was functional in testing the study

3.4 Target Population

Robson and McCartan (2016) defined population as a set of all participants in a hypothetical or real set of events, persons, or objects used by the researcher to align the answer result. The survey was done in Nairobi County, Kenya, among significant private manufacturing organizations' that are members of the Kenya Association of Manufacturers (KAM). The primary rationale for this selection is that these firms are more likely to have a comprehensive SCOP mindset and to employ SCOP best practices. Additionally, the study concentrated on the manufacturing sector; other sectors were excluded from the study since they lacked sufficient data for statistical analysis. A total of 591 manufacturing companies were chosen.

3.5 Description of the Sample size and Sampling Procedures

In the sampling of manufacturing companies, and in order to get a 95% confidence level and sampling error of 5%, the sample size was determined by using the following formula (Noordzij *et al.*, 2010; Kalof, Dan, & Dietz, 2008):

$$SS = \frac{Z^2(p) * (1-p)}{c^2}$$

Where, SS = the sample size; Z^2 = 1.96 a 95% confidence interval (area under a standard normal curve or a student t distribution with infinity degrees of freedom, which contains 95 percent of the observations). p = the estimated proportion of the attribute of interest present in the population. Since prior research could not acquire this proportion, the study utilised 0.5, which assumes maximum population variability. Thus, the estimated sample size likely to be more conservative, that is, the sample size would likely to be inflated.

Thus,

$$SS = \frac{(1.96^2)(0.5)(0.5)}{(0.05^2)} = 385 \text{ Manufacturing firms}$$

Because the target population was 591 businesses, the small population correction was utilised (a given sample size delivers proportionately more information for a small population than a large one) Gigerenzer, 1993):

$$n = \frac{SS}{1 + \frac{(SS-1)}{N}}$$

Where, *n* is the corrected sample size while *N* is the population size.

$$n = \frac{385}{1+\frac{(385-1)}{591}} = 233 \text{ firms}$$

Thus, the study targeted 233 manufacturing firms.

Table 3. 1: Strata Distribution Table

Sector	Population	Sample
Services and consultancy	72	28
Building Mining and Construction	34	13
Chemical and Allied Sector	37	15
Energy, Electrical and Electronics	32	13
Food and Beverages	125	49
Leather and footwear	30	12
Metal and Allied Sector	36	14
Motor Vehicle and Accessories	33	13
Paper and Board Sector	32	13
Pharmaceutical and Medical Equipment	30	12
Plastic and Rubber	35	14
Fresh Produce	34	13
Textile and Apparels	32	13
Timber, Wood and Furniture	29	11
Total	**591**	**233**

Source: KMA (2018)

3.6 Data Type, Data Collection Instruments and Procedures

3.6.1 Types of Data

The study analyzed primary data acquired directly from respondents via questionnaires.

3.6.2 Data Collection Instruments

The process of data collecting entails gathering the necessary information for each designated unit in the population (Ritchie et al., 2013). All respondents completed questionnaires, which were chosen because they allow for the rapid collection of data from a broad sample population and the easy contact of a large number of respondents (Borg and Gall, 1983; Bourque & Fielder, 2003). They are time, effort, and money effective. For these reasons, the questionnaires were self-administered

with the assistance of research assistant, whom they collect immediately. The issue about understanding of statement and clarification was solved on the spot.

3.6.3 Data Collection Procedures

Prior to conducting the real data collection, the researcher conducts a preliminary survey inside manufacturing enterprises to become acquainted with the study region and to schedule appointments with chosen firms/persons. The researcher distributed questionnaires to manufacturing firms on the appointment day and collected them once they were completed; however, the researcher collaborated with respondents to assist them in answering the questionnaire's questions, as some respondents, particularly clients and employees, may not understand all of the statements.

3.7 Measurement of variables

3.7.1 Independent Variable

Supply Chain Advanced Planning Systems was measured using five items adopted from (Raymond, 2005) some of the statement include, we use ERP to monitor procurement functions and performance ratings, we use collaborative planning, forecasting, and replenishment (CPFR), we use material requirements planning (MRP) systems and activity-based costing (ABC) accounting methods, we use enterprise resource planning (ERP) system. The five Likert point scale were categorized as follows 1= strongly disagree 2= Disagree, 3=Neutral, 4= agree, 5= strongly agree**.**

3.7.2 Mediating Variable

Supply Chain Agility was measured using five Likert scale adopted from Juneho Um, (2017), some of the questions include Our organization can response to changes in production and services on time, our company is responsive to processing market

demand on new products. There is a high level of reliability among partners in the supply chain, and we are working to increase product and volume flexibility throughout the supply chain, We acquire and disseminate information as part of organization learning. The five Likert scale will be categorized as follows 1= strongly disagree 2= Disagree, 3=Neutral, 4= agree, 5= strongly agree**.**

3.7.3 Dependent Variable

Supply Chain Organization Performance was measured using five Likert scale adopted from Awwad (2013), some of the questions that were asked include; our company delivers goods on time, We deliver quality goods, Achievement of defect freer deliveries, Delivery flexibility, We have the distribution capability, Our company quickly reconfigures supply chain operations to address changes in the environment.(speed response Our company meets customers specifications, The company's profits has increased due to Procurement practices. The five Likert point scale were categorized as follows 1= strongly disagree 2= Disagree, 3=Neutral, 4= agree, 5= strongly agree**.**

3.7.4 Moderating Variable

Supplier Relationship was measured by five Likert scale adopted and modified by from According to Njagi (2016), several questions were posed, including if the firm's supply chain success may be attributable to long-term strategic partner relationships with important suppliers. Suppliers have reached and maintained the organization's targeted level of quality in goods and services. Through collaborative relationships with suppliers, the company discovered and realised additional value. The organisation plans for and handles all relationships with third-party suppliers of goods and/or services strategically. The organization collaborates with suppliers to detect

risks in the procurement process. 1= strongly disagree 2= Disagree, 3=Neutral, 4= agree, 5= strongly agree**.**

3.8 Data Reliability and Validity

3.8.1 Reliability of the Research instrument

Reliability is the capacity of a measurement device to produce consistent results under similar conditions (Nishiguchi et al., 2012). In a measurement equipment, it is the component that provides comparable outputs for similar inputs. It is the proportion of survey responses that are inconsistent due to respondent variances. That is, survey replies vary because respondents have differing ideas, not because the questions are unclear. Instrument reliability can be assessed theoretically or by pre-testing. Because the questionnaire items were adapted from prior research but suited to the manufacturing setting, a pilot test was conducted to fine-tune the tool. As a result, the questionnaire items were pilot tested to remove problematic terms and increase clarity. Statistically, the Cronbach's alpha can be used to determine an instrument's dependability. Many researchers consider dependability ratings of 0.70 and above satisfactory (Cooper & Schindler, 2006; Malhotra & Birks, 2006)

3.8.2 Validity

Validity refers to the extent to which the tool analyze what it claims to measure (Ewen *et al.,* 2013; Sullivan, 2011). Validity of an instrument has a two-fold purpose, first the instrument should measure the concept in question, and secondly, it should be accurate (Brett, 2005). Internal validity was used in the study since it explains the cause-and-effect relationship. Various methods were used to ensure study instrument validity (Slack & Draugalis, 2001; Van de Valk & Constas, 2011). The preliminary questionnaire was pre-tested on a manufacturing business pilot group. The pre-test respondents were from five manufacturing firms, and their backgrounds and

knowledge of the research issue were similar to those in the actual survey. Pre-tested manufacturing enterprises were not included in the study because they would have introduced biases.

The questionnaire's content, language, sequencing, form and layout, question difficulty, and instructions were all pre-tested. For construct validity, exploratory factor analyses of the constructs were performed, which helped select viable items for each study concept. Expert advice was requested.

3.9 Factor Analysis

The study's unobserved and latent constructs were each measured by many observable (manifest or indicator) variables. In order to condense the enormous number of measured variables into a few composite variables that retain as much information as possible and confirm whether they represent the underlying constructs, a factor analysis was performed. Principal Components Analysis (PCA), a statistical method used to find a small set of unobserved variables (called components) which can account for as much variance as possible among a larger set of observed variables, was used to execute this data reduction (Mann, 1995; Jain & Shandliya, 2013; Hubert et al., 2002; Rato & Reis, 2013; Reid & Spencer, 2009).

In the study, four steps were followed in conducting factor analysis: assessing the factorability of data; deriving factors and assessing overall fit; interpreting factors and factor labelling; and computing factor scores that was used in subsequent statistical analysis (Heir *et al.,* 2006). Several criteria were used to assess the data's factorability (suitability for factor analysis). To ensure no multicollinearity among the factors, the determinant was inspected to ensure that it is not zero. The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy was used to determine if it was greater than 0.5,

and the Bartlett's test of sphericity was used to determine if it was significant (at p 0.05), indicating that the correlation matrix of the original variables is not an identity matrix, implying that a factor model is appropriate. The diagonals of the anti-image correlation matrix were examined to determine if they were all greater than 0.5, indicating the presence of an underlying (latent) structure among the measured variables.

PCA was used to extract the components or factors from the data. The method allowed for the extraction of as many components so long as each has an Eigenvalue (the amount of variance each component explained) greater than one. To improve interpretability of the factors, rotation was conducted. Varimax (one that forces the components to be uncorrelated) rotations was used and the one that give the best component structure was adopted. The resultant component structures of the factors were left as they make a lot of theoretical sense and explain a lot of the variance in the observed variables (a threshold of 50 percent) or simplified by dropping variables that appeared unspecified due to either having a standardized loading larger than 1 or in having high cross-loading (Mann, 1995).

3.10 Data Analysis and Presentations

Field data was coded, cleaned, and processed into SPSS version 22 for analysis. The data was summarised to identify emerging themes and trends based on factors and objectives. To achieve the scores, the researcher added scores from indicators for each variable. Parveen and Leonhauser (2004) claim that combining scores from numerous variables into indices is a qualitative method based on acquired data.

Cross-tabulations and frequency distributions were used to compare and contrast Advanced planning systems and supply chain performance. Inferential statistical

analysis for example. Multiple regression model and uni-variate correlation analysis will be done.

Multiple regression and correlation analysis were used to evaluate the acquired data; the significance of each independent variable was determined at a 95% confidence level. The regression equation of the study was applied as shown below.

Model 1: Hierarchical Regression model for testing direct

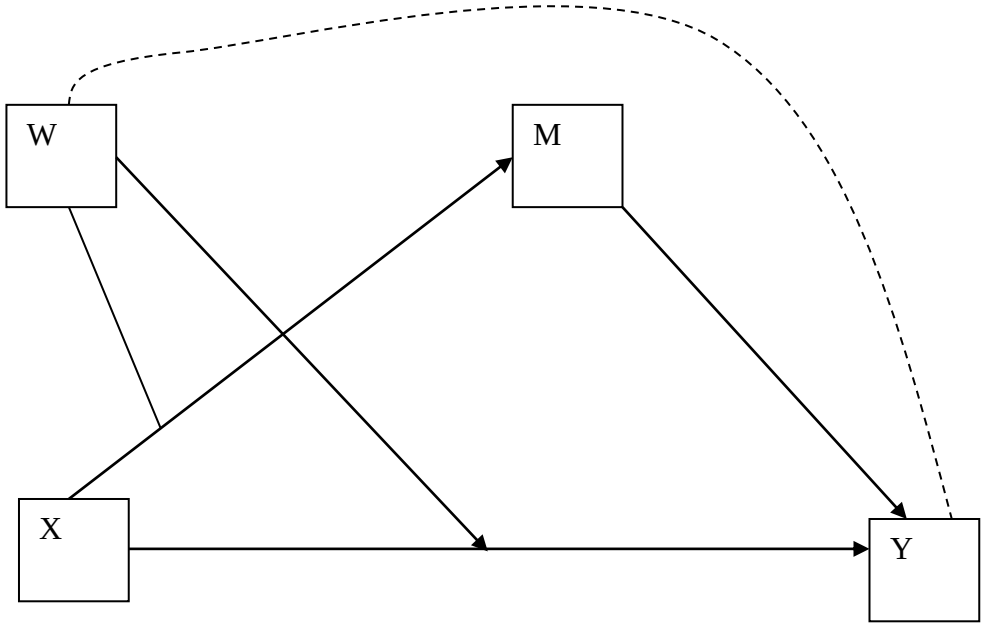

Figure 3. 1: Hierarchical Regression Model for Testing Direct

i) $Y = \beta_0 + \beta_1 X + \varepsilon$ $Ho_1 = R^2$

ii) $Y = \beta_0 + \beta_1 X + \beta_2 M + \varepsilon$ $Ho_2 \Delta R^2$

iii) $Y = \beta_0 + \beta_1 X + \beta_2 M + \beta_3 W + \varepsilon$ $Ho_3 \Delta R^2$

Model 2: For mediation Hypothesis

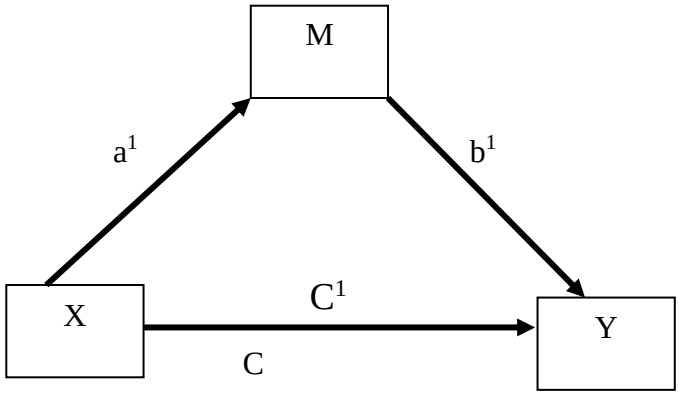

Figure 3. 2: For mediation Hypothesis

'X' must have a sign effect 'M' $M = a_1X + \varepsilon$

i) 'M' must have a sign effect 'Y' $Y = b_1M + \varepsilon$

ii) $Y = b_1M + C^0X + \varepsilon$ = Partial Mediation

iii) Mediation = a_1 X b_1 or C (Total effect) – C^0 (Direct effect)

Model 3: Moderation

Statistical Model

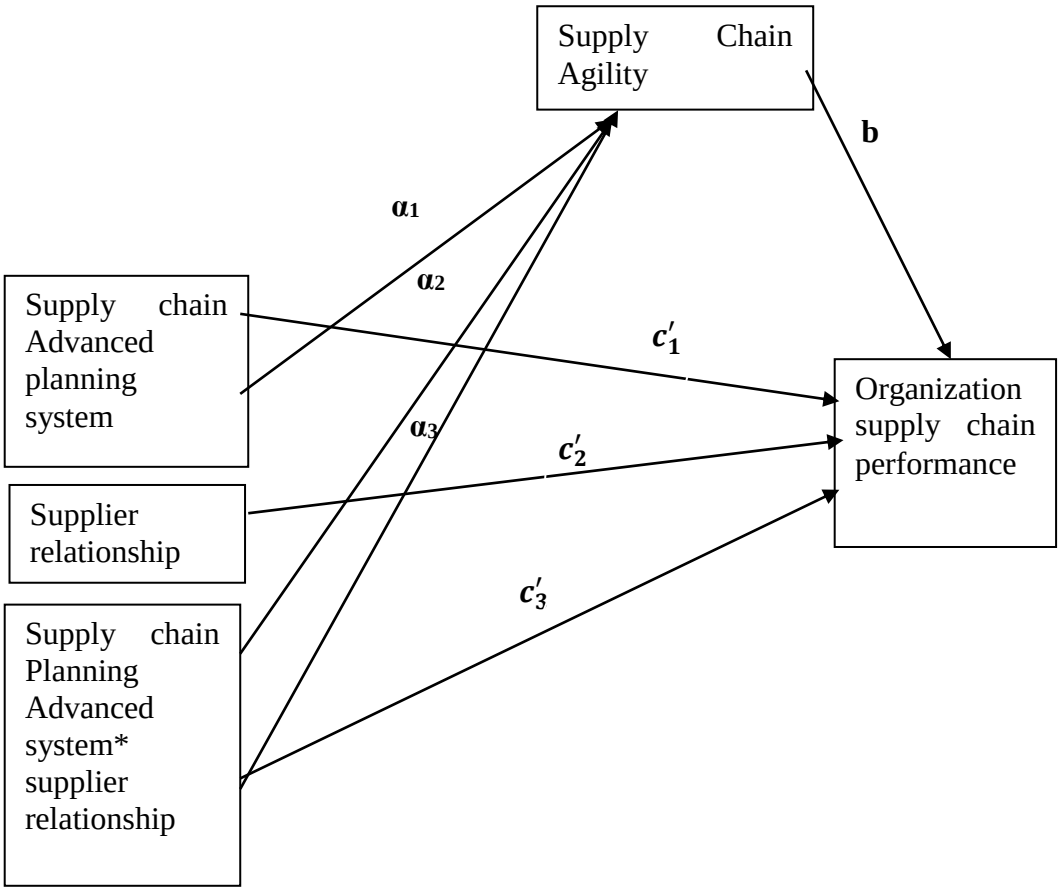

Figure 3. 3: Moderation

Source; researcher 2019

$M = a_1x + a_2w + a_3x.w + \varepsilon \quad = H0_5$

$Y = c_1x + c_2w + c_3x.w + \varepsilon \quad = H0_6$

Model 4: Moderation mediation

$a_1b_1 + a_3b_1w = (a_1+a_3w)\, b_1$

Where α is the intercept, $\beta_1 \ldots \beta_3$ are regressions coefficients, PS = Supply chain supply chain planning systems, AG= Agility, SR= Supplier relation, SCOP = Supply chain Performance, ε = Error Term

3.10.1 Data Screening

The first step was to compare the original data to the digital data. The researcher checked the data output for accuracy and graphic presentation of each variable studied. The screening process also looked at means and standard deviations for accuracy.

3.10.2 Descriptive statistics

For example, descriptive statistics summarise the target population's demographic profile using tables and written explanations as well as central tendency assessment of constructs such as frequencies, mean, and standard deviation. Demographic data include employment experience, education, gender, and age. The results were shown in a frequency distribution table.

3.10.3 Inferential Statistical Analysis

Multiple regression modelling and bivariate correlation analysis were employed for inferential statistical analysis. To evaluate the link between a single dependent variable and several independent variables, inferential statistics such as ANOVA, Pearson correlation coefficients, and multiple regression analysis were used (Hair et al., 2005).

3.10.4 Test of Mediation

A dozen approaches for testing mediation theories have been proposed (MacKinnon et al., 2002; Gu et al., 2015). The most often used technique, popularised by Baron and Kenny (1986), is the causal steps strategy, in which the investigator estimates the model's routes. Mediation theories speculate on the mechanism by which an independent variable (X) affects a dependent variable (Y) via one or more mediators

(M) (Azen, 2003). Simple mediation refers to mediation processes that involve only one mediating variable.

According to Baron and Kenny (1986), full mediation occurs when there is an indirect effect but no direct effect. Partially mediated effects have both indirect and direct effects.

When all experiments are correctly completed and reported, most articles conclude with ‘partial mediation.' Mediation generally has a direct effect. To test mediation, regress the mediator on the independent variable, the dependent variable on both the independent and mediator variables. The independent variable must first effect the first mediator, then the dependent variable, and ultimately the third mediator. After Sobel's test for the mediating effect, a bootstrap test for the indirect impact is utilised since it is nearly always more powerful than Sobel's test (Preacher and Hayes 2013).

3.10.5 Test of Moderation mediation

Moderated mediation occurs when an indirect impact is influenced by a moderator's level (Preacher et al., 2007; Edwards & Lambert, 2007; Preacher et al., 2007; Peñarroja et al., 2015). In the causal system linking X (independent variable) to Y (dependent variable) through M (mediator), there must be statistically significant moderation of at least one path (Muller et al., 2005). To test mediation moderation, the independent and dependent variables must be mediated. In this situation, supply chain agility binds advanced supply chain planning and organisational supply chain performance together (Hayes, 2012). Process macro was used to test moderate mediation at 95% confidence. The following equations will be used to test mediation moderation

$$M = i_M + a_1X + a_2W + a_3XW + e_M \ldots\ldots i$$

$Y = i_Y + c_1 X + c_2 + c_3$ ii

M: represent the mediator variable (supply chain agility)

$i_{M:}$ represent the mediator intercept

a_1: represent the effect of independent variable (advanced supply chain planning system) on the mediator (supply chain agility)

a_2: represent the effect of the moderator (supplier relationship) on the mediator (supply chain agility)

a_3: represent the effect of the of the interaction of the independent variable (advanced supply chain planning system) and the moderator (supplier relationship) on the mediator (supply chain agility)

X: represent the effect of independent variable (advanced supply chain planning system)

W: represent the moderator variable (supplier relationship)

XW: Represent the product of the interaction of the independent variable (advanced supply chain planning system) and the moderator (supplier relationship)

Y: represent the intercept of the dependent variable (organizational supply chain performance)

$c_{1:}$ represent the effect of independent variable (advanced supply chain planning system) on the dependent variable (organizational supply chain performance)

$c_{2:}$ represent the effect of the moderator (supplier relationship) on the dependent variable (organizational supply chain performance)

$c_{3:}$ represent the effect of the interaction of the independent variable (advanced supply chain planning system) and the moderator (supplier relationship) on the dependent variable (organizational supply chain performance).

3.11 Test of Multiple Regression Assumptions

The following assumptions were checked before the data is subjected to parametric tests. These tests include test for normality, test for homoscedasticity, test for multicollinearity and the examination of the independence of errors**.**

3.11.1 Test for Normality

The normality test determines if the data sets are regularly distributed (Saunders et al., 2007). The test distribution is bell-shaped, with a mean of 0, and a standard deviation of 1, resulting in a symmetric bell-shaped curve. Variable residuals are assumed to be normal. That is, the errors in predicting Y (the dependent variable) follow a normal distribution. It is impossible to derive accurate and reliable judgments about reality when the premise of normality is violated (Ghasemi & Zahediasl, 2012). Furthermore, if normality is compromised, interpretation and inference may be invalid (Razali &Wah, 2011). These tests determine if the data is regularly distributed and allows for further investigation.

3.11.2 Test of Homoscedasticity

The inverse of heteroscedasticity is homoscedasticity, which shows that the variability of the dependent variable is constant across independent variable values (Schutzenmeister *et al.,* 2012). Heteroscedasticity can be reduced or eliminated by ensuring that the data used to test the hypothesis are normally distributed and appropriately transformed. If the data is discovered to be heteroscedastic, it must be transformed using logs or Z scores.

3.11.3 Test for Multicollinearity

Multicollinearity occurs when correlated independent and dependent variables. Indeterminate regression coefficients and endless standard errors occur from failing to

account for perfect multicollinearity (William et al. 2013). Large standard errors affect the precision and accuracy of null hypothesis rejection. During estimate, the issue is not multicollinearity, but its intensity. The variance inflation factor (VIF) was used to test for multicollinearity (Field, 2009).

3.11.4 Outliers

Outliers are observations with extreme values that distort the result and limit generalisation to just scenarios with similar outliers (Tabachnik and Fidell, 2007). In multiple regressions, an outlier is a case with a large residual because the equation failed to forecast its value (Hair, et al., 2003). The researcher looked for outliers and checked whether all statistical assumptions were met at each level. To reduce outlier effects, the method assures data input accuracy by replacing missing data. It also uses probability random sampling from the target population and high sample sizes when available.

3.12 Ethical Considerations

Kombo and Tromp (2006) state that researchers who use humans or animals as subjects must examine the ethical problems involved in their research. This study used humans as subjects so, the researcher assured respondents' privacy. The researcher considered volunteer participation in research consequently, the researcher took time to explain the study's value to the respondents and ask them to participate by providing pertinent information. The researcher will try to establish rapport with the individuals.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

4.1 Overview

This chapter presents data analysis based on the objectives of the study. This chapter presents in detailed data cleaning procedure, data coding, removal of outliers, and reliability of constructs in the research instrument. Descriptive statistics such as maximum, minimum, mean, standard deviation and frequency distributions are presented in this chapter. Presentation of moderation and mediation is also done in this chapter. The last section presents of this chapter presents diagnostic checks such as normality, multicollinearity, and heteroscedasticity.

4.2 Data Cleaning, Coding, Check and Removal of Outliers

Outliers are minority of observations in a data set which shows different patterns from most of the observations in the data set (Taha, & Hadi, 2019). Such values which appear exceptionally higher or lower than most data observations. To test for outliers, this study employed several techniques. First, frequency analysis with minimum and maximum values were run. The values where cross-checked to identify any exceptionally high or low values beyond the Likert scale values that might have been erroneously input. As noted by (Donovan & Sanders, 2005) data coding entails the process of transformation of data collected into categories that can be analyzed for meaningful information. Data coding done by assigning codes 1-strongly agree to 5-strongly disagree to each of the construct's data using excel sheet. It was then exported to SPSS software for analysis.

4.3 Response Rate

Hair *et al.,* (2010) and Holbrook *et al.,* (2008) noted that response rate in survey studies is crucial as it ensures that the questionnaires used in are valid for analysis. Response rate in a study is defined as the percentage of the respondents who participated in a particular survey from the determined sample size of the research (Hamilton, 2008). In this study, response rate was obtained by dividing the total number of questionnaires well filled by the total number eligible in the sample chosen. After the questionnaires were filed, they were cross-checked by the researcher to ascertain its completeness and accuracy. It was identified that only 221 out of 233 of questionnaires were well filled. Out of the 12 available questionnaires, 4 questionnaires were partially filled while 8 were incorrectly filled and had inconsistent information and therefore they could not be used in data analysis and thus they were excluded from the study.

Table 4. 1: Response Rate

Questionnaires	**Response**	**Percent**
Well-filled	221	94.85
Incorrect Correctly filled	12	5.15
Total	**233**	

Source: Survey Data, 2021

Therefore, the response rate of the study was obtained by dividing the total correctly filled questionnaires by the total number of questionnaires drawn from the sample size. The response rate for this study was therefore 94.85 percent as shown in Table 4.1. The high response was as results of face-to-face interaction of the enumerators with the respondents which helped to improve the clarity of the questions thus decreased limited response bias and thus confidence of the results. The high response rate was because of well-trained enumerators and finally it was a result of items for

each of the questions in the questionnaires. This supported the previous studies of (Holbrook *et al.,* 2008). Response rate of 94.85 percent was higher than the 67 percent acceptable response rate required for further analysis in surveys (Ndinda, 2019).

4.4 Reliability Analysis

Reliability test was carried out to establish reliability of the research instrument used. According to (Ursachi, Horodnic & Zait, 2015) a cut-off alpha coefficient of 0.7 is sufficient to prove that the item scales are consistent and dependable. The reliability index was assessed and presented in Table 4.2. This was done by estimating Cronbach's alpha value. All the constructs utilized were exceptionally reliable with Cronbach alpha value above 0.7 as suggested by (Roller, 2020). Supply chain organizational performance had 8 items and a Cronbach alpha value of 0.848, supplier relation had 5 items in the scale and Cronbach alpha of 0.811. Further, the supply chain agility had 5 items indicated Cronbach alpha value of 0.955. Finally, supply chain advanced planning system was measured using 5 constructs record a Cronbach alpha value of 0.782

Table 4. 2: Reliability Test Results

Variable	**Number of items in the scale**	**Cronbach alpha**
Supply Chain Organizational Performance (SCOP)	8	0.848
Supplier Relation (SR)	5	0.811
Supply Chain Agility (SCA)	5	0.955
Supply Chain Advanced Planning System (SCAPS)	5	0.782

Source: Survey Data, 2021

Mohajan (2017) and Joppe (2000) argued that reliability as the extent to which results are consistent over time and shows a true picture of the total population. If the

responses of the people to different items are not the same or are not correlated with each other, then it could no longer make sense to claim that they are all measuring the same underlying constructs. Internal consistency can be assessed by collecting and analyzing the data. It is a measure of scale reliability. The results revealed that all the coefficients were within the accepted thresholds of 0.7 as postulated by Lee *Cronbach* in 1951. Therefore, it was concluded that the constructs used were reliable (Hair *et al*., 1995) for analysis.

4.5 Demographic Descriptive Statistics

In this section, descriptive statistics such as gender of the respondents, age of the respondents, level of education level, duration the respondent has worked in the company and the number of the years the company has in operation. This was done to show the general characteristics of the sample and results are presented by Table 4.3 below. It is shown that most of the gender distribution of the respondents were male which accounted for 57.92 percent (n = 128). Majority of the supply chain firms prefers to employ more men as compared to women because of their high commitment to work in a homogenous group and low rates of absenteeism. The almost equal distribution between men and women in supply chain management reflects gender diversity that generates better public image and thus improves performance. Of the total sampled respondents, females accounted for 42.08 percent (n = 93).

Table 4. 3: Demographic Descriptive Statistics

Variables	Categories	Frequency	Percent	Cumulative Percent
Gender	Female	93	42.08	42.08
	Male	128	57.92	100.0
Age Categories	21 -30	1	0.45	0.45
	31 – 40	6	2.72	3.17
	41 – 50	133	60.18	63.35
	51 years	81	36.65	100.00
Level of Education	Postgraduate	58	26.24	26.24
	Undergraduate level	82	37.10	63.34
	Higher Diploma Level	26	11.76	75.10
	Diploma Level	16	7.24	82.34
	Secondary level	25	11.31	93.65
	Others	14	6.35	100.0
Work Experience	Less than 5 Years	21	9.50	9.50
	6 - 10 Years	67	30.32	39.82
	11 – 15 Years	49	22.17	61.99
	Above 16 Years	84	38.01	100.00
Duration of the Company in Operation	Less than 5 Years	5	2.26	2.26
	6 - 10 Years	33	14.93	17.19
	11 – 15 Years	49	22.17	39.36
	Above 15 Years	134	60.64	100.00
Position of the Respondents	Chief Executive Officer	86	38.91	38.91
	Supply Chain Officer	79	35.75	74.76
	Finance Manager	56	25.34	100.0

Source: Survey Data, 2021

From the table above the majority of females work for shorter periods as necessitated by their gender roles such as general housekeeping and childcare. Torri & Martinez (2014) opines that women empowerment, social skills, analytics and their distinctive personalities have a played a key role in business.

It also shows that age distribution of the respondents. According to the results, majority of the respondents, 60.18 percent were aged between 41-50 years. Majority of the respondents were found to be in this category because at this age, the employees make good leaders, have better communication skills as compared to their younger counterparts. This could also be associated with the fact that at this age the employees are more loyal since they may not be looking for other opportunities given that majority of them may be satisfied with their job status. Further, 36.65 percent of the respondents were 51 years and above and this can be associated with the fact that the person in this age category are deemed more comfortable with authorities and value conformity and rules (Tolbize, 2008).

Literature also suggests that age is a good measure of knowledge and experience. Those between the age of 31 –40 were 2.72 percent while the least category were 0.45 percent. The two categories have the least employees are still job hoppers since they majority of them are still youth who may still be looking for better job opportunities. It is shown further regarding educational level that majority of the respondents have a first degree (undergraduate) were 37.10 percent (n = 82). This implies that majority of the supply chain management organizations in Kenya employs persons who are educated enough to understand the concepts and of supply chain management performance of organizations. Those with postgraduate were 26.24 percent (n = 58). Those with higher diploma were 11.76 percent (n = 26) and this was followed closely by those who had secondary level at 11.31 percent (n = 25) and those with diploma level were 7.24 percent (n = 16) and others were 6.35 percent (n = 14).

The respondents were asked how long they had worked in supply chain management. From the results in Table 4.3, it is clearly indicated that majority of the respondents; 84 (38.01 percent) had worked for over 16 years. This was followed by those who had

worked for a period between 6 – 10 years, which accounted for 67 respondents (30.32 percent). The two categories constitute approximately 60 percent of the total respondents. The two age categories are composed of active and energetic employees who are full of experience and understands the dynamics of a given organizations. Employers prefers this category because their experience and expertise meet the ever changing and changing demands especially in supply chain management.

Employers may prefer these kinds of employees because the higher number of years worked (work experiences) reduces organization costs that would have otherwise been used in training of staff members who have worked for fewer years. Those who had worked for a period between 11 – 15 years were 49 (22.17 percent) while the least group were those who had worked for less than 5 years, which were 21 (9.50 percent). The two categories constitute a slightly over 30 percent of the total respondent interviewed. This reflects relative inexperienced new entrants into job market who possess low expertise in supply chain management.

Further, the study required the respondents to reports the number of years the supply chain firms have been in operation. Cumulative, it is shown that majority of the firms have in operation for more than 15 years (n = 134, 60.64 percent) while those that have operated between 11 and 15 years were 22.17 percent (n = 49). Cumulatively, these two categories show that majority of the firms have operated for longer years.

Age of the firm is an important factor supply chain industry since older firm's benefits from accumulated knowledge in all the important aspects in terms of technology, better-coordinated supply channels, and well-established customer relations, easy access to resources and increased capital accumulation and lowering of costs. As

firms stay in certain industry to enjoy the benefits of learning, skills and better abilities and these can lead to improved performance.

The number of firms that had stayed in supply chain industry for the period between 6 – 10 years were 33 (14.93 percent) while those supply chain that they had operated for less than 5 years were only 5 (2.26 percent). This group could be associated with low capital accumulation to expand its operation and low number of customers.

The respondents were asked to indicate the position they hold in the organization. Table 4.3 also reports the positions hold by the respondents in the organization. It is shown that majority of the respondents holds the position of chief executive officer at 38.91 percent (n = 86). Majority of the supply chain firms in Kenya have chief executive officers as the ones in charge of restructuring business operations, product line designing and enhancing debt recovery among other designated duties. This was followed by those who holds the position of supply chain officers at 35.75 percent (n = 79) and the least group were those that hold the position of finance manager at 25.34 percent (n = 56).

4.6 Descriptive Statistics Constructs

This section examined descriptive statistics for each variable.

The mean scores, standard deviation, skewness, and kurtosis of each item utilised in this example were descriptive statistics (dependent variable), supply chain advanced planning system (independent variable), supplier agility (mediating variable) and supplier relationship the moderating variable.

4.6.1 Descriptive on Supply Chain Organizational Performance

Supply chain organization performance was measured using eight constructs. The response was categorized into five Likert scale as 5=strongly agree, 4 = agree, 3 = neutral, 2 = disagree and 1= strongly disagree.

Table 4. 4: Supply Chain Organizational Performance

Descriptive Statistics (*N=221, 5-Strongly Agree, 4-Agree, 3-Neutral, 2-Disagree, 1-Strongly Disagree)*				
Constructs	**Mean**	**Std. Dev**	**Skewness**	**Kurtosis**
Our company delivers goods on time	4.08	1.179	-1.478	1.465
We deliver quality goods	4.31	.887	-1.316	1.609
Achievement of defect freer deliveries	4.43	1.045	-2.130	3.931
Delivery flexibility	4.51	.829	-2.113	5.042
We have the distribution capability	4.33	.839	-2.044	3.421
Our company quickly reconfigures supply chain operations to address changes in the environment	4.23	.965	-1.664	3.062
Our company meets customers specifications	3.95	1.268	-1.184	.371
The company's profits have increased due to Procurement practices	4.17	1.072	-1.076	.149

Source: Survey Data, 2021

Results showed that on average, the response agreed that the company delivers goods on time (mean of 4.08 and standard deviation of 1.179). Regarding delivering quality goods and flexibility, average responds strongly agreed (mean response approximate to 5 scale). On the other hand, they agreed that company quickly reconfigures supply operations address changes in the environment and have the capability to distribute the goods to the customers. The values for skewness and kurtosis presented in Table

4.4 were below acceptable values of below 3 for skewness and below 10 for kurtosis for variables to follow normal distribution (Kline, 2005).

4.6.2 Descriptive Statistics for Supply Chain Advanced Planning Systems

The study used five constructs scaled on a five Likert scale to describes and measure the supply chain advanced planning systems.

Table 4. 5: Supply Chain Advanced Planning Systems

Descriptive Statistics (*N=221, 5-Strongly Agree, 4-Agree, 3-Neutral, 2-Disagree, 1-Strongly Disagree)*				
Constructs	**Mean**	**Std. Dev.**	**Skewness**	**Kurtosis**
We use collaborative planning, forecasting, and replenishment (CPFR)	3.5	1.577	-0.713	-1.138
We use material requirements planning (MRP) systems	3.77	1.456	-0.936	-0.621
Our organization adopt activity-based costing (ABC) accounting methods	3.7	1.524	-0.745	-1.028
We use enterprise resource planning (ERP) system	3.86	1.378	-0.92	-0.548
We use Vendor Managed Inventory (VMI) to manage work-in-process inventories	3.8	1.427	-0.953	-0.514

Source: Survey Data, 2021

Results presented in Table 4.5 showed that the respondents who were chief executive officers, supply chain manager and finance manager agreed on the constructs relating supply chain advanced planning system that they collaborate planning, forecasting and replenishment (mean = 3.5). Further, they agreed that material requirements planning systems enhances the supply chain (mean = 3.77, standard deviation of 1.456). Organization adopts activity-based costing accounting methods (ABC), use of enterprise resource planning (ERP) and use of vendor managed inventory (VMI) to manage work in process inventories had on average responds in regard to the five-scale rating of 3.70, 3.86 and 3.80 respectively. Their standard deviations are small

(approximate 1) indicates that variation responses were around their means (agree). The distribution of skewness and kurtosis of the items were all less than 3 for skewness and less than 10 kurtoses as per Kline (2005) to measure normal distribution.

4.6.3 Descriptive Statistics for Supplier Relationship

Supplier relationship a moderating variable in this research was measured using five constructs. Under the constructs, CEO, supply chain managers and finance managers agreed (mean = 4.6, skew of -1.344 <3 and kurtosis 1.001<10 according to Kline 2005) that the success of the firms supply chain can be attributed to long term strategic partner relation with key suppliers. They also on average agreed (mean = 4.24, standard deviation of 1.145) that organization desired quality of goods and services can be achieved and maintained by suppliers. The firm can strategically prepare for, and manage all relationships with third party organisations that offer goods and services, and eventually decided that the organisation interacts with suppliers to recognise risks in the procurement process. The values for skewness and kurtosis were within the threshold of being less than 3 for skewness and less than 10 for kurtosis to exhibit a normal distribution.

Table 4. 6: Supplier Relationship (SR)

Descriptive Statistics (*N=221, 5-Strongly Agree, 4-Agree, 3-Neutral, 2-Disagree, 1-Strongly Disagree)*				
Constructs	**Mean**	**Std. Dev.**	**Skewness**	**Kurtosis**
The success of the firms supply chain can be attributed to long term strategic partner relationships with key suppliers	4.11	1.156	-1.344	1.001
The organizations desired quality of goods and services has been achieved and maintained by suppliers	4.24	1.145	-1.436	1.08
The organization has uncovered and realized new value from collaborative relations with suppliers	4.12	1.036	-1.201	0.557
The organization strategically plan for, and manages all interactions with third party organizations that supply goods and/or services	3.94	1.223	-1.081	0.158
The organization collaborates with suppliers to detect risks in the procurement process	4.11	1.258	-1.418	0.925

Source: Survey Data, 2021

4.6.4 Descriptive Statistics for Supplier Agility

This section of the analysis shows the descriptive statistics on supplier agility. Results are presented in Table 4.7 It was also measured on five Likert scale. The statistics used to describe the measures of central tendency are mean, standard deviation, skewness, and kurtosis. From the results, respondents agreed that the organization can response to changes in production and services, company is responsive to processing market demand on new products, that there is a great degree of dependability among partners in the supply chain, firms improve product and volume flexibility along the supply chain and finally that companies acquire and disseminate information as part

organization learning. Skewness and kurtosis were below 3 and 10 respectively. This in accordance with Kline (2005) is acceptable.

Table 4. 7: Supplier Agility

Descriptive Statistics (*N=221, 5-Strongly Agree, 4-Agree, 3-Neutral, 2-Disagree, 1-Strongly Disagree)*				
Constructs	**Mean**	**Std. Dev.**	**Skewness**	**Kurtosis**
Our organization can response to changes in production and services	4.36	1.006	-1.441	0.978
Our company is responsive to processing market demand on new products.	4.27	1.098	-1.627	1.881
There is a great degree of dependability among partners in the supply chain	4.3	1.125	-1.635	1.785
We improve product and volume flexibility along the supply chain	4.37	1.034	-1.927	3.167
We acquire and disseminate information as part organization learning	4.26	1.064	-1.701	2.229

Source: Survey Data, 2021

4.7 Chi Square Test of Independence

The existence of independent association between two categorical variables can be determined through calculating Chi square test. The variables in this study were scaled in a five Likert scale; 5-Strongly Agree, 4-Agree, 3-Neutral, 2-Disagree and finally 1-Strongly Disagree. Chi square test has null hypothesis that there is no association between the two variables against the alternative that there is association between the variables. The null hypothesis is always rejected wherever the p-value is less than the specified 0.05 level of significance.

Table 4. 8: Chi Square Test of Independence

Variable		Supply Chain Organizational Performance (SCOP)						Pearson Chi2	df	p
		SD	D	N	A	SA	**Total**			
Supply Chain Advanced Planning System (SCAPS)	SD	0	0	1	3	6	**10**	23.774	12	0.022
	D	0	0	0	17	10	**27**			
	N	0	1	2	25	13	**41**			
	A	0	10	4	23	41	**78**			
	SA	0	4	3	24	34	**65**			
Total							**221**			
Supply Chain Agility (SCA)	SD	0	3	1	2	0	**6**	126.319	12	0.000
	D	0	8	1	5	0	**14**			
	N	0	2	1	11	3	**17**			
	A	0	1	5	34	14	**54**			
	SA	0	1	2	40	87	**130**			
Total							**221**			
Supplier Relation (SR)	SD	0	9	1	2	0	**12**	203.179	12	0.000
	D	0	4	1	4	0	**9**			
	N	0	1	5	17	3	**26**			
	A	0	1	3	44	15	**63**			
	SA	0	0	0	25	86	**111**			
Total							**221**			

Note: SD-Strongly Disagree, D-Disagree, N-Neutral, A-Agree and SA-Strongly Agree

Source: Survey Data, 2021

Table 4.8 shows that the independent association between supply chain advanced planning system and organizational performance had a chi square of 23.774 and significant at probability 0.022. The association between supply agility, supplier relation and organizational performance had significant chi square of 126.319 and 203.179 and their probabilities 0.000, respectively. Because of this significant association, the study concludes by stating there is sufficient evidence to suggest an association between independent variable, mediating variable and the moderating and

dependent variable. Thus, the null hypothesis was rejected and the alternative accepted

4.8 Variable Reduction Using Factor Analysis

To explore the data patterns and to reduce several constructs to a small set that have similar characteristics and that they have much information from the original variables and to confirms whether they represent the underlying constructs then factor analysis is the technique used (Abson, Dougill, & Stringer, 2012). Factor analysis can be estimated using Principal Components Analysis (PCA). PCA account for as much variance as possible among a larger set of observed variables (Mann, 1995). PCA extracts the components or factors from the data using eigen values. The method allows for the extraction of as many components so long as each has an eigen value is greater than one. Before estimating PCA, Kaiser-Meyer-Olkin (KMO) values for all the constructs used in defining the variables must be above 70 percent for factor analysis to proceed as suggested by Kaiser (1974).

4.8.1 Factor Analysis on Supply Chain Organizational Performance

Supply chain organizational performance which is the dependent variable was measured using eight constructs. The Kaiser-Meyer-Olkin measure of sampling adequacy (0.980>0.70) and significant Bartlett's Test of sphericity which is a chi-square test ($p = 0.000$) revealed that data was adequate for extraction using principal components analysis. The total variance explained by two extracted factors (having eigenvalues more than one) is 72.659 % of the total variation (component 1 contributing 58.33 and component 2 contributing 14.33 percent). Only one construct factor extracted below 50 percent (0.260). The construct is our company quickly reconfigures supply chain operation to address changes in the environment. Considering factor 1 and factor 2, the initial eigen values were above 1 (4.667 for

factor 1 and 1. 146 for factor 2) and the rest below 1, the matrix was rotated as evident in Table 4.9. The loadings after rotation confirmed that this construct did not meet the criteria as suggested by Yong & Pearce, (2013). The construct is: "Our company quickly reconfigures supply chain operations to address changes in the environment (-.172)" as presented in Table 4.10 below. Therefore, the study excluded this construct from measuring the supply chain organizational performance.

Each of the constructs had factor loaded above the threshold of 0.5 for example "Our company delivers goods on time" had loadings of 0.838, "We deliver quality goods" 0.740, "Achievement of defect freer deliveries" 0.881, "Delivery flexibility" 0.836, "We have the distribution capability" 0.970, "Our company meets customers specifications" 0.739, "The company's profits have increased due to Procurement practices" 0.652 and they were retained and used to measure supply chain organizational performance.

Table 4. 9: Initial Eigenvalues for Supply Chain organizational Performance

	Total Variance Explained		
	Initial Eigenvalues		
Component	**Total**	**% Of Variance**	**Cumulative %**
1	4.667	58.334	58.334
2	1.146	14.325	72.659
3	.956	11.951	84.610
4	.414	5.179	89.789
5	.372	4.644	94.433
6	.270	3.376	97.809
7	.175	2.191	100.000
8	-1.527E-15	-1.908E-14	100.000

Source: Survey Data, 2021

Table 4.10: Components Extraction for Supply Chain Organizational Performance

	Unrotated Component Extraction	Rotated Component Matrix[a]	
		1	2
Our company delivers goods on time	.728	.838	-.160
We deliver quality goods	.716	.740	-.410
Achievement of defect freer deliveries	.777	.881	-.027
Delivery flexibility	.705	.836	-.081
We have the distribution capability	.978	.970	-.193
Our company quickly reconfigures supply chain operations to address changes in the environment	.260	-.172	.480
Our company meets customers specifications	.805	.739	.509
The company's profits have increased due to Procurement practices	.843	.652	.647
Extraction Method: Principal Component Analysis. a. 2 components extracted.			
KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.980
Bartlett's Test of Sphericity	Approx. Chi-Square		737.348
	df		10
	Sig.		.000

Source: Survey Data, 2021

4.8.2 Factor Analysis on Supply Chain Advanced Planning Systems

The following results are for the constructs used to measure the independent variable, the supply chain advanced planning systems. Five constructs were used, and each construct was rated on a five-Likert scale. The study extracted factors which have similar characteristics to measure the variable. The method used was PCA and before

extraction, KMO which measure the adequacy of the sample first estimated. Table 4.11 below showed that KMO value was 0.774 and was above 0.70 KMO threshold. This means that the sample was 77.4 percent adequate. Bartlett's Test of Sphericity which is a chi-square test was significant (p = 0.000) confirming that PCA extraction technique to extract components (factors) was adequate.

Before then, it was prudent to estimate the eigenvalues to check the variation explained by the factors (components). Since the eigenvalues for component 1 was 2.689 and is above 1, while the rest had eigenvalues below 1 then varimax rotation solution did not take place. This simply indicates that factor loadings considering component 1 was sufficient to be extracted. Results further indicates that this component explained 53.777 percent alone.

Table 4.11: Initial Eigenvalues for Supply Chain Advanced Planning Systems

	Total Variance Explained		
	Initial Eigenvalues		
Component	**Total**	**% of Variance**	**Cumulative %**
1	2.689	53.777	53.777
2	.831	16.618	70.395
3	.618	12.362	82.757
4	.484	9.677	92.434
5	.378	7.566	100.000

Source: Survey Data, 2021

The study retained all since their loading were above 0.50 as explained by Yong & Pearce, (2013). Individually, the loading for “We use collaborative planning, forecasting and replenishment (CPFR)” was 0.737, “We use material requirements planning (MRP) systems” was 0.746, “Our organization adopt activity-based costing (ABC) accounting methods” had 0.698, “We use enterprise resource planning (ERP)

system" was loaded 0.657, whereas "We use Vendor Managed Inventory (VMI) to manage work-in-process inventories" was loaded 0.819 as depicted by Table 4.12.

Table 4.12: Components Extraction for Supply Chain Advanced Planning Systems

		Extraction	Component Matrix[a]
			1
We use collaborative planning, forecasting, and replenishment (CPFR)		.544	.737
We use material requirements planning (MRP) systems		.557	.746
Our organization adopt activity-based costing (ABC) accounting methods		.487	.698
We use enterprise resource planning (ERP) system		.431	.657
We use Vendor Managed Inventory (VMI) to manage work-in-process inventories		.671	.819
Extraction Method: Principal Component Analysis. a. 1 components extracted.			
KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.774
Bartlett's Test of Sphericity	Approx. Chi-Square		299.115
	df		10
	Sig.		.000

Note: Only one component was extracted. The solution cannot be rotated.
Source: Survey Data, 2021

4.8.3 Factor Analysis on Supplier Relationship

The study measured supplier relationship using five constructs. Respondents were supposed to rate the responses using a five Likert scale. Results presented in Table 4.13 showed that components 1 and 2 were retained since the eigenvalues were greater than 1. Cumulatively these two components explained 88.763 percent of the

total variance. Specifically, component 1 explained 68.699 percent while component 2 explained variation amounting to 20.065 percent.

Table 4. 13: Initial Eigenvalues Extraction for Supplier Relationship

	Total Variance Explained		
	Initial Eigenvalues		
Component	**Total**	**% of Variance**	**Cumulative %**
1	3.435	68.699	68.699
2	1.003	20.065	88.763
3	.279	5.576	94.340
4	.233	4.652	98.991
5	.050	1.009	100.000

Source: Survey Data, 2021

Since component 1 and 2 had higher eigenvalues more than 1 compared to other factors (components), components were rotated, and loadings were extracted using Principal Component Analysis and loaded on the constructs. The rotation method used was Varimax with Kaiser Normalization and the convergence was experienced after three iterations. KMO value of 0.78 > 0.70 as per Kaiser 1974 and Bartlett's Test of Sphericity was significant at probability 0.000 confirmed that the factor analysis should proceed. It is clear from the results that the construct “The organization strategically plan for and manages all interactions with third party organizations that supply goods and/or services” after matrix rotation, had factor loaded at -0.010 (below threshold of 0.5 as suggested by Yong & Pearce, 2013).

Table 4. 14: Components Extraction for Supplier Relationship

	Unrotated component Extraction	Rotated Component Matrix[a]	
		1	2
The success of the firms supply chain can be attributed to long term strategic partner relationships with key suppliers	.875	.934	-.053
The organizations desired quality of goods and services has been achieved and maintained by suppliers	.809	.899	.044
The organization has uncovered and realized new value from collaborative relations with suppliers	.935	.966	-.033
The organization strategically plan for, and manages all interactions with third party organizations that supply goods and/or services	.999	-.010	.999
The organization collaborates with suppliers to detect risks in the procurement process	.820	.905	.002

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.780
Bartlett's Test of Sphericity	Approx. Chi-Square	975.636
	df	10
	Sig.	.000

Source: Survey Data, 2021

Therefore, the construct was omitted. Other constructs such as “The success of the firms supply chain can be attributed to long term strategic partner relationships with key suppliers” had factor loadings of 0.934 > 0.50, “The organizations desired quality of goods and services has been achieved and maintained by suppliers” had

0.899>0.50, “The organization has uncovered and realized new value from collaborative relations with suppliers” loadings 0.966>0.50 and finally “The organization collaborates with suppliers to detect risks in the procurement process” had loadings of 0.905>0.50. All these constructs were retained and suitable for measuring supplier relationship.

4.8.4 Factor Analysis on Supplier Agility

To measure supplier agility, a mediating variable five constructs were used. All these constructs were rated under five-Likert scale. There were subjected to factor analysis using PCA extraction method.

Table 4. 15: Initial Eigenvalues Extraction for Supplier Agility

	Total Variance Explained		
	Initial Eigenvalues		
Component	**Total**	**% of Variance**	**Cumulative %**
1	4.241	84.821	84.821
2	.317	6.347	91.168
3	.200	3.997	95.165
4	.175	3.492	98.657
5	.067	1.343	100.000

Source: Survey Data, 2021

The constructs had a desired sampling adequacy of 0.887 and according to Kaiser (1974), the KMO should be above 0.70 for factor extraction to proceed. Further, Bartlett's Test of sphericity was significant (p = 0.000) revealed that data was adequate for extraction using principal components analysis. Table 4.16 showed that the total variance explained by only two factors (components) was 91.168 percent and that factor or component 1 alone explained 84.821 percent. This only component had eigenvalue more than one and therefore, the factor loadings were not rotated.

Table 4. 16: Components Extraction for Supplier Agility

		Component Matrix[a]
	Extraction	**1**
Our organization can response to changes in production and services	.808	.899
Our company is responsive to processing market demand on new products.	.848	.921
There is a great degree of dependability among partners in the supply chain	.845	.919
We improve product and volume flexibility along the supply chain	.793	.891
We acquire and disseminate information as part organization learning	.947	.973
Extraction Method: Principal Component Analysis. a. 1 components extracted.		
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.887
Bartlett's Test of Sphericity	Approx. Chi-Square	1252.610
	df	10
	Sig.	.000

Note: a. Only one component was extracted. The solution cannot be rotated.
Source: Survey Data, 2021

All the constructs were retained because the made the threshold of having factor loadings greater than 0.50. The loadings on each construct were: “Our organization can response to changes in production and services” had loading of 0.899, “Our company is responsive to processing market demand on new products”, 0.921, “There is a great degree of dependability among partners in the supply chain”, 0.919, “We improve product and volume flexibility along the supply chain”, 0.891 and “We

acquire and disseminate information as part organization learning" had factor loadings of 0.973.

4.9 Correlation Analysis

The purpose of correlation analysis is to identify the direction and the magnitude of the correlation between two variables. It shows how variable can influence one another. There are several methods of identifying the correlation. These are Kendal's, Spearman rank and Pearson correlation coefficient. In this study Pearson correlation coefficient was used and results are presented in Table 4.17.

Supplier chain advanced planning system (SCAPS) and supply chain organizational performance (SCOP) have a negative $\rho = -0.051, p = 0.447$ though insignificant correlation with each other. This indicates that SCAPS and SCOP have weak correlation. The correlation between supply chain agility (SCA) and SCOP have a strong positive and significant correlation of 66.9 percent. Further supply relation (SR) and SCOP also had 58.9 percent correlation. However, SCAPS and SCA, SCAPS and SR have weak and negative insignificant correlation with each other respectively. Though insignificant we can say that these variables are identically independent distributed which shows that there is no multicollinearity.

Table 4. 17: Pearson Correlation Analysis

Correlations					
		SCOP	**SCAPS**	**SCA**	**SR**
SCOP	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	221			
SCAPS	Pearson Correlation	-.051	1		
	Sig. (2-tailed)	.447			
	N	221	221		
SCA	Pearson Correlation	.669**	-.023	1	
	Sig. (2-tailed)	.000	.730		
	N	221	221	221	
SR	Pearson Correlation	.589**	-.007	.921**	1
	Sig. (2-tailed)	.000	.913	.000	
	N	221	221	221	221

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

Source: Survey Data, 2021

4.9 Diagnostics Tests

4.9.1 Test for Normality

Figure 4.1 presents the test for normality. In statistical analysis, it is essential to check for normality before making statistical inference because the entire statistical framework is usually grounded on the assumption that population from the sampled data follows a normal distribution.

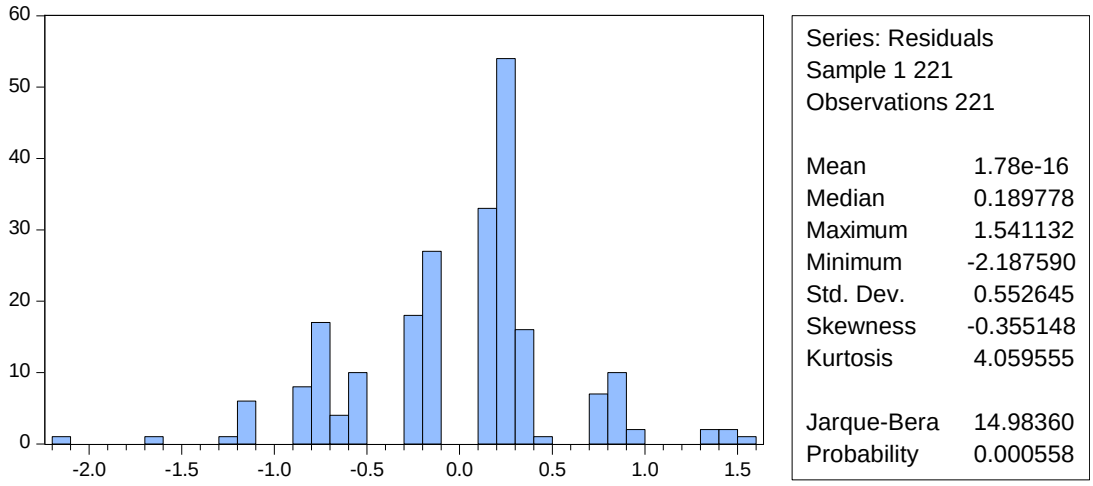

Figure 4. 1: Histogram for Normality Test

Source: Survey Data, 2021

If this assumption is violated, then the inference breaks down. It was therefore paramount to check for normality before making statistical inference. During data analysis, histogram was used to check for normality. This was done by plotting predicted and expected residual. The histogram displays descriptive statistics of residuals in that include Jarque-Bera test for normality. Visual inspection of figure 4.1 shows that the histogram is belled-shaped implying that the sampled data was from a normally distributed population.

4.9.2 Test for Multicollinearity

Table 4.18 presents the output for multicollinearity test. VIF is used to measure the level of collinearity between independent variables in analysis and it shows how much the variance has been inflated. The centered VIF which is numerically identical to the ratio of variance of the coefficient estimates divided by the variance from the coefficient estimate of the equation with only that regressors and the constant while the uncentered omits the constant. The calculated centered value is all below 5, then it was concluded that there was no multicollinearity.

Table 4. 18: Test for Multicollinearity

Variance Inflation Factors
Included observations: 221

		Uncentered	Centered
Variable	**Coefficient variance**	**VIF**	**VIF**
SCAPS	0.001089	11.81962	1.012092
SR	0.004090	53.70045	3.654690
SCA	0.004759	66.53608	3.637856
C	0.041794	29.82993	NA

Source: Survey Data, 2021

4.9.3 Test for Heteroscedasticity

For the assumption of homoscedasticity to be valid, heteroscedasticity must be tested. This was done by applying Breusch-Pagan-Godfrey Test. This test (Breusch-Pagan-Godfrey) test for multicollinearity allows the test of various specifications of heteroscedasticity in the estimated equations. It has the null hypothesis that the there is no heteroscedasticity against alternative that there is heteroscedasticity. It is observed that the probability values are small (less than 0.05) and this rejected the null hypothesis which indicated presence of heteroscedasticity, robust regression was therefore estimated.

Table 4. 19: Breusch-Pagan-Godfrey Test for Heteroscedasticity

F-statistic	8.577261	Prob. F(3,217)	0.0000
Obs*R-squared	23.42802	Prob. Chi-Square(3)	0.0000
Scaled explained SS	34.55403	Prob. Chi-Square(3)	0.0000

Dependent Variable: RESID^2
Method: Least Squares
Included observations: 221

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.865865	0.186430	4.644453	0.0000
SCAPS	-0.012801	0.030097	-0.425342	0.6710
SR	-0.223377	0.058324	-3.829961	0.0002
F-statistic	8.577261	Durbin-Watson statistic		1.935602
Prob(F-statistic)	0.000021			

Source: Survey Data, 2021

4.9.4 Test for Serial Correlation

The Durbin Watson test for serial correlation has a value between 0 and 4. When DW values are between 0 and 1.5 then there is positive serial correlation, values between 1.5 and 2.5, no serial correlation and values between 2.5 and 4, negative serial correlation. From the output in Table 4.19, the Durbin-Watson value is 1.9356 which falls between 1.5 and 2.5 as suggested by Durbin and Watson (1951). This indicates absence of serial correlation.

4.10 Model Estimation

The study had three models. The direct effect of supply chain advanced planning systems and supply chain organizational performance, the mediation analysis of supply chain agility and the moderation of supplier relation and finally the moderated mediation of between the supply chain advanced planning systems and supply chain organizational performance.

4.10.1 Direct Effects

Table 4. 20: Direct Effect of SCAPS on SCOP

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
	(Constant)	-2.193e-15	.038		.000	1.000
	SCAPS	.6769	.038	.626	17.868	.000
			Model summary			
R-sq		.683				
Adj R-sq		.681				
ANOVA						
F		470.970				
P > F		.000				
		B	Std. Error	Beta	t	Sig.
	(Constant)	-2.363e-15	.237		.000	1.000
	SCAPS	.656	.039	.656	16.868	.000
	SCA	.327	.039	.327	8.412	.000
			Model summary			
R-sq		.760				
Adj R-sq		.758				
R-sq change		.077				
ANOVA						
F		345.880				
P > F		.000				
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-2.518e-15	.033		.000	1.000
	SCAPS	.653	.039	.653	16.726	.000
	SCA	.381	.090	.387	4.246	.000
	SR	-.057	.086	-.057	-.666	.506
			Model summary			
R-sq		.761				
Adj R-sq		.758				
R-sq change		.001				
ANOVA						
F		230.147				
P > F		.000				

Source: Research Data, 2021

Table 4.20 presents results for the direct effects. The first part of the table indicates unstandardized and the standardized coefficients. The effect of SCAPS on SCOP was found to be positive ($\beta = .826, p = .000$) and significant at 5 percent significance level.

In the model summary, there was small R-square of .683 indicating the variation of organizational performance can be explained by supply chain advanced planning systems at 68.3 percent. The indicates there are SCAPS is one of the main factors that explain the organizational performance. The analysis of variance (ANOVA) showed and significant F- statistics (F = 470.970, P > F = .000) indicates model fitness and this is implying interpretation of the results are meaningful.

The study investigated the changes in the R-square when the mediating and moderating variables were hierarchically added into the equation. When SCA was added, the R-square as changed to .760 indicating a significant effect of supply chain agility in explaining variation of supply chain organizational performance at about 76% giving an increase of .7.7 percent (R square change of .077). Further, supply chain agility has a direct positive effect on organization performance ($\hat{a} = .327, p = .000$). The last section of the tables shows the summary of the results when the moderator is hierarchically added, and results indicates that supplier relation further enhanced the R-square from .to .761 from .761 implying a significant influence of SR in explaining SCOP. Supplier relation directly affects supply chain organizational performance ($\beta = -.057, p = .506 > .05$).

4.10.2 Mediation Effects of SCA

Mediation involves a minimum of three variables between an independent and dependent variable. In this study, supply chain agility is the intermediate variable,

advanced planning systems are the independent variables, and supply chain organisational performance is the dependent variable. SCA may transmit SCAPS' causative influence to SCOP. That is, can manufacturing businesses' supply chain agility effect supplier agility, and hence performance? The entire effect of SCAPS on SCOP is divided into a direct influence on CSR and an indirect effect on SCOP via the mediator (SCA).

Despite its popularity, causal mediation analysis has been questioned. Mediation is a completed approach since only one of the three variables in the mediation theory can be randomized. Randomization of X does not establish causation between the mediating and dependent variables. Causal mediation analysis is a novel statistical technique developed by MacKinnon and Pirlott (2015). When using within-subjects designs, the same person can participate in both experimental and control groups.

Results indicates that the relationship between the independent variable (SCAPS) and the mediator have a positive significant relationship ($\beta = 5120, p = .000$) this is referred to as path 'a'. SCAPS also positively and significantly affect SCOP with coefficient $\beta = .5371$ ($p = .000$) and referred to path c' in mediation analysis suggested by Zhao et al., (2010). The effect of mediator (SCA) on the dependent variable was positive and significant ($\beta = .2730, p = .000$) the path 'b'. It can be proven according to Barron and Kenney (2012) and Zhao et.al., (2010) that $ab + c' = c$. That is .5120*.2730+5371=.6769. The significance of path ab indicates mediation effect. In this study, the coefficient is -.0118 and insignificant because the bootstraps confidence interval contains zero because the bootLLCI was negative (-.0752) and bootULCI was positive (.0469). We conclude that there was no mediation effect of

SCA on the relationship between supply chain advanced planning systems and the supply chain organizational performance

Table 4. 21: Mediation Analysis Results

OUTCOME VARIABLE						
SCA						
Model Summary						
R	**R-sq**	**MSE**	**F**	**Df1**	**Df2**	**p**
.5218	.2723	.7037	81.9593	1	219	.0000
	Coeff.	**se**	**t**	**p**	**LLCI**	**ULCI**
Constant	4.3093	.0564	76.3675	.0000	4.1981	4.4205
SCAPS	.5120	.0566	9.0531	.0000	.4006	.6235
OUTCOME VARIABLE						
SCOP						
Model Summary						
R	**R-sq**	**MSE**	**F**	**Df1**	**Df2**	**p**
.8720	**.7604**	**.1623**	**345.8803**	**2**	**218**	**.000**
	Coeff.	**se**	**t**	**p**	**LLCI**	**ULCI**
Constant	3.0769	.1425	21.5974	.0000	2.7961	3.3576
SCAPS	.5371	.0318	16.8677	.0000	.4744	.5999
SCA	.2730	.0325	8.4120	.0000	.2091	.3370

Direct Effects of X on Y

	Effect	**se**	**t**	**p**	**LLCI**	**ULCI**
	-.0272	.0382	-.7126	.4768	-.1026	.0481

Indirect effect of X on Y

	Index	**BootSE**	**BootLLCI**	**BootULCI**
SCA	-.0118	.0311	-.0752	.0469

4.10.3 Moderated Mediation of SCA

In the first direct model, where the independent variable insignificantly affected the organizational performance. In this case, SCAPS significantly affects SCOP positively (β = .7519, p = 0.000). Mediating variable (SCA) also showed a significant effects on SCOP ($\beta = 0.3127, p = 0.000$). The moderator further showed a negative insignificant influence on SCOP ($\beta = -.0724, p = .2473$). The interaction term (SCAPS*SR) which measures the moderation effects was significant ($\beta = .0049$)

implies that supplier relation plays an important role in enhancing the supplier chain advanced planning influences the organizational performance, and this can be strengthened further through supplier relation.

The moderated mediation further was positive ($\beta = 0.0451$) and significant. This is because the bootstrap lower limit confidence interval (BootLLCI) and bootsrap upper limit confidence interval (BootULCI) is nonzero or using other method where t-value can be calculated as 0.0451/0.0225 = 2.004 which is greater than 1.96 at 5 percent level of significance. There was no mediating effect of supply chain agility. This is because the confidence interval contains zero (BootLLCI = 0.1640, BootULCI = 0.0021) as shown in the lower part of Table 4.22

Table 4. 22: Moderated Mediation Analysis

Y=SCOP
X=SCAPS
M=SCA
W=SR
Sample 221
OUTCOME VARIABLE
SCA
Model Summary

R	**R-sq**	**MSE**	**F**	**Df1**	**Df2**	**p**
.9290	.8631	.1337	455.8603	3	217	0.000
	Coeff.	**se**	**t**	**p**	**LLCI**	**ULCI**
Constant	1.0996	.1231	8.9322	.0000	.8569	1.3422
SCAPS	.1556	.0752	2.0705	.0396	.0075	.3038
SR	.7475	.0270	27.6573	.0000	.6943	.8008
Int_1	-.0072	.0194	-.3724	.7100	-.0456	.0311

Product terms key:
Int_1: SCAPS*SR

Test (s) of highest order unconditional interaction (s)

	R2-Change	**F**	**Df1**	**Df2**	**p**
X*W	0.0064	9.6838	1	217	0.0021

Conditional effects of the focal predictor at values of the moderator (s)

SR	**Effect**	**se**	**t**	**p**	**LLCI**	**ULCI**
	-.1178	.0405	-2.9076	.0040	-.1976	-.0379

OUTCOME VARIABLE
SCOP
Model Summary

R	R-sq	MSE	F	Df1	Df2	p
.8772	.7695	.1576	180.2648	4	216	.000

Model	Coeff.	se	t	p	LLCI	ULCI
Constant	3.2477	.1563	20.7740	.0000	2.9395	3.5558
SCAPS	.7519	.0824	9.1214	.0000	.5894	.9143
SCA	.3127	.0737	4.2417	.0000	.1674	.4580
SR	-.0724	.0624	-1.1601	.2473	-.1955	.0506
Int_1	.0600	.0211	2.8430	.0049	.1017	.1840

Product terms key:
Int_1: SCAPS*SR

Test (s) of highest order unconditional interaction (s)

	R2-Change	F	Df1	Df2	P
X*W	0.0235	9.6946	1	216	0.0021

Focal predict: SCAPS (X)
Mod var: SR (W)

Conditional direct effect(s) of X on Y

SR	Effect	se	T	p	LLCI	ULCI
3.000	-.1938	.0658	-2.9456	.0036	-.3235	-.0641

Conditional indirect effects of X on Y
INDIRECT EFFECTS

SCAPS -> SCA -> SCOP

SR	Effect	BootSE	BootLLCI	BootULCI
3.000	-.0736	.0425	-.1640	.0021

Index of moderated mediation:

	Index	BootSE	BootLLCI	BootULCI
SR	.0451	.0225	.0040	.0931

Source: Survey Data, 2021

4.11 Test of Hypotheses

The study had seven objectives. To answer these objectives, they were hypothesized and tested using the regression. The first hypothesis was estimated on direct effects. The second, third and fourth object was tested using mediation analysis (model 4 of Hayes 2012). The fifth, sixth and seventh hypothesis were tested using model 8 that is moderated mediation. These hypotheses are, H_{01}: Supply chain advanced planning systems have no significant effect on organization supply chain performance, H_{02} :

Supply chain advanced planning systems have no significant effect on supply chain agility, H_{03}: Supply chain agility has no significant effect on organization supply chain performance, H_{04}:Supply chain agility has no mediating effect on the relationship between supply chain advanced planning systems and organizational supply chain performance, H_{05}**:** There is no statistically significant moderating effect of supplier relationship on the relationship between supply chain planning systems and supply chain agility.H_{06}:Supplier relationship has no moderating effect on the relationship between supply chain advanced planning systems and organizational supply chain performance, H_{07}: Supplier relationship has no moderating effect on the relationship between supply chain planning systems and organizational supply chain performance via agility.

4.11.1 H_{01}: Supply Chain Advanced Planning Systems have no significant effect on Organization Supply Chain Performance

The first objective of the study was to find how supply chain advanced planning system affects organizational supply chain performance. The objective was hypothesized and tested. Results in Table 4.20 shows that the coefficient is $\beta = .6769$ and significant at $p = .000$ which is less than 5 percent significant level. Therefore, H_{01}: Supply chain advanced planning systems have no significant effect on organization supply chain performance was rejected and concluded that the study did have sufficient evidence to justify that supply chain advanced planning does affect organizational performance and therefore the alternative hypothesis holds. This implies that advanced planning systems such as use of ERP to monitor procurement functions and performance ratings, use of collaborative planning, forecasting, and replenishment (CPFR), use of material requirements planning (MRP) systems and

activity-based costing (ABC) accounting methods, and the use of enterprise resource planning (ERP) system significantly enhances performance of supply chain.

4.11.2 H_{02}: Supply Chain Advanced Planning Systems have no significant effect on Supply Chain Agility

The second objective was to investigate how supply chain advanced planning affects the supply chain agility. Results in Table 4.21 on this objective showed that the relationship was significant at 5 percent level with $\beta = .5120,\ (p = .000)$, thus, the hypothesis $H_{02:}$ Supply chain advanced planning systems (SCAPS) have no significant effect on supply chain agility (SCA) was rejected and concluded that the study did have sufficient evidence that supply chain advanced planning systems do affect the supply chain agility. A supply chain's agility is defined by Swafford et al. (2006) as the ability to respond to uncertain demand by restructuring operations, reorganising capabilities, or realigning strategic objectives.

Advanced planning in supply chain firms aims to maximise the use of planning resources by automating where possible and leveraging limited and expensive managerial expertise when needed. The relationship between modern supply chain planning and agility was equivocal. This supports the coordination theory which requires that planning ensures supports relatively and continuous demand in a supply chain (Kaipia, 2009).

4.11.3 H_{03}: Supply Chain Agility has no significant effect on Organization Supply Chain Performance

One of the fundamental objectives of this research was to find out the significant effect of supply chain agility which is the mediating variable on the dependent variable (SCOP). To do this, a model was estimated, and results are presented in

Table 4.21. The coefficient for the outcome is positive ($\beta = .2730$) and significant at 5 percent level ($p = .000$). This means that supply chain agility influences the supply chain organizational performance. Thus, the third hypothesis: H_{03}: Supply chain agility has no significant effect on organization supply chain performance was rejected and concluded that supply chain agility plays a key role in influencing supply chain performance.

It can be claimed that supply chain agility is critical to addressing responsiveness challenges in a highly customised environment and enhancing corporate performance. Overall, supply chain agility improves customer service and differentiation. According to Um (2017), supply chain agility does not directly effect corporate success, but rather improves customer service and differentiation. Customer service differentiation is the most effective approach to improve corporate success, and supply chain agility can help. It is a guide for managers on how to improve their business performance through important agile supply chain management tasks.

The consequences for supply chain management are explored using two related strategic elements, customer service and differentiation. Supply chain agility is necessary in high-customization contexts to manage product variation and innovation concerns. The mediating elements are also thought to increase customer service and distinction. Finally, organisational success is offered as a final outcome (Um, 2017).

SCA, according to Braunscheidel and Suresh (2009), links customers and suppliers. Swafford et al. (2006) and Braunscheidel and Suresh (2009). Both articles underline the relevance of research in supply chain agility while acknowledging the lack of empirical data. SCA improves organisational profitability, competitive position, and competitive behaviours (Lee et al., 2009). (Chi et al., 2010). As stated by

Sambamurthy et al. (2003), effective procurement methods demand intense inspection. Lu and Ramamurthy (2011) found a link between manufacturing skills and organisational agility. As a result of changing market conditions, a firm's positioning and strategy can be modified, and new business techniques might be organised to obtain an early edge.

4.11.4 H_{04}: Supply Chain Agility has no mediating effect on the relationship between Supply Chain Advanced Planning Systems and Organizational Supply Chain Performance

One of the objectives was to evaluate the significant mediating role of the supply chain agility (SCA) on the relationship between supply chain advanced planning system (SCAPS) and supply chain organizational performance (SCOP). In mediation analysis, there are steps suggested by Zhao et al., (2010). The first step is called path 'a' that shows the effect of an independent variable and the mediator. In this case, results indicates that the relationship between the independent variable (SCAPS) and the mediator have a positive and significant relationship ($\beta = .5120, p = .000$). The second is path 'b' where the mediator affects the dependent. Results indicate that the effect of mediator (SCA) on the dependent variable was positive and significant ($\beta = .2730, p = .000$). The last one is path 'c' where the independent variable affects the dependent in the presence of the mediator. Results found that SCAPS also negatively and insignificantly affect SCOP with coefficient $\beta = -.0272$ ($p = .477$).

It can be proven according to Barron and Kenney (2012) and Zhao et.al., (2010) that $ab + c' = c$. That is .5120*.2730+.5371=.6768. The significance of path ab indicates mediation effect. In this study, the coefficient is -.0118 and insignificant because the bootstraps confidence interval contains zero because the bootLLCI was negative (-

.0752) and bootULCI was positive (.0469). We conclude that there was no mediation effect of SCA on the relationship between supply chain advanced planning systems and the supply chain organizational performance. Therefore, the hypothesis H_{04}: Supply chain agility has no mediating effect on the relationship between supply chain advanced planning systems and organizational supply chain performance failed to be rejected and the study concludes that SCA does not intervene the relationship between SCAPS and SCOP. This means that SCAPS does not affect SCOP through SCA. The negative sign can be associated with the fact that SCAPS negative affected SCA.

Achieving supply chain agility, assert Swafford et al. (2008). Ngai et al. (2011) define supply chain agility as the ability to capitalise on market volatility. In addition, Hallgren and Olhager (2009) claim that an agile production system can rapidly introduce new products.

Lean manufacturing is driven by industry competitive intensity, whereas agile manufacturing is driven by industry competitive intensity (Hallgren and Olhager2009). SCA improves daily operations and customer service, increasing profitability and differentiation. According to Van Hoek et al. (2001), Swafford et al. (2006) and Swafford et al (2008). SCA is all about ensuring a firm's external competitiveness (Van Hoek et al. 2001 and Liu et al. (2013). Rather than cutting costs, SCA prioritises customer service and differentiation. Agility ensures customer service, resource efficiency, great company performance, and low cost.

4.11.5 H_{05}: There is no statistically significant moderating effect of supplier relationship on the relationship between supply chain planning systems and supply chain agility.

One of the key objectives of the research was to investigate the significant moderating role of supplier relation. It was found that SR positive and significantly moderated the relationship between the SCAPS and SCA with coefficient $\beta = .0600, p = 0.0049$. It means that supplier relation plays a key moderating role by enhancing the link between SCAPS and SCA. Long-term strategic supplier relationships, the organization's desired quality of goods and services delivered by suppliers, the discovery and realisation of new value through collaborative supplier relationships, the organization's strategic plan and management of all connections with third-party organisations, and the organization's supply chain agility can be attributed to long-term strategic supplier relationships.

The study elucidates that supply chain advanced planning is strategically important and integrates several organizational functions to a company and suppliers. It requires highly experienced managers to drive collaboration, manage relationships and risks, and contribute to the broader company goals. Supply chain according to Pienaar, (2010) is critical to firm’s value chain because it covers inbound logistics, operations, and outbound logistics. SCAPS are systems of integrated planning and controlling of cross-company processes along the entire value chain. SCAPS uses optimization processes. It enables supply chain management reduce costs and increase net profit. It improves customer service, product variety, and quality. Changes in one segment of a supply chain effect overall performance (Lummus, Krumwiede & Vokurka, 2000).

4.11.6 H_{06}: Supplier Relation has no moderating effect on the relationship between Supply Chain Advanced Planning Systems and Organizational Supply Chain Performance

Last part not least, the fifth objective was to investigate and understand the moderating effect of supplier relation (SR) on the direct effect of supply chain advanced planning system on supply chain organizational performance. Results in Table 4.22 shows that SCAPS affects SCOP with a significant coefficient of $\beta = 0.7519, p = 0.000$. The aim of a moderator is to either strengthen or weaken the direct relationship and from this research, it is evident that introducing SR into the relationship between SCAPS and SCOP has been strengthened. Therefore, the hypothesis H06: supplier relationship has no moderating effect on the relationship between supply chain advanced planning systems and organizational supply chain performance was rejected. Any change of SCAPS to influence the performance of the organization can be enhanced by SR.

Moreover, supply chain advanced planning boosts overall value by lowering costs and increasing efficiency through leaner operations. In addition, it controls supply and demand to maximise operational benefits. Supplies and demand are regularly balanced to maximise operational benefits and manage corporate inputs.

The supply chain needs to be more proactive and capable of responding to future consumer demand requirements and operational realities. According to Louw and Pienaar (2011), as organisations increase their supply chain scope, their decision support models shift from descriptive to optimising.

A research work done by Louw and Pienaar (2011), explained the significance of the SCAPS that it enables supply chain decision making and ultimately guide supply

chain execution activities. SCAPS as per explanation by LaLonde (2005) exists and relates to decision layers that is long-term referring to strategic, medium-term (tactical) and short-term referred to operational. Vakurka & Lummus (2003) claimed that supply chain decisions should be grounded in reality. The ability to analyse and make decisions based on factual information requires transparency and quick access across all supply chain segments. Many decision domains can exist within or between supply chain segments/elements.

These areas must work in tandem to ensure the effectiveness of supply networks. SCAPS effectively coordinates the movement of products. This is achieved by following a single transparent demand-supply plan in a coordinated manner. Optimisation and planning must be holistic. Planning optimization must prioritise the entire supply chain above optimising individual functions.

According to Higgins and Hack (2004), SCAPS is suitable if proper planning performance measurements are used for each supply chain planning timeframe. These performance indicators can subsequently be used to examine some of the agreed-upon supply chain objectives. Supply chain planning requires cooperation and coordination. Collaboration requires a climate of trust and cooperation. Collaboration is essential to removing supply chain secrecy and silos.

Supplier interactions assist SCAPS and SCOP work together by sharing ideas, exploring new market prospects, learning more about product raw materials, and working towards continual development (Saeed, Malhotra, and Grover 2011). With more supplier connections, focal enterprises may respond more quickly to changing competitive challenges and opportunities. Material and tool contributions should be made early, reducing revision and rework delays, and increasing process speed

(Vickery et al. 2010 and Lai et al. (2012). Data sharing with suppliers enhances analysis and response time. Building trust and cooperation among supply chain partners leads to collaborative decision making, design teams, and certification programmes. Through Strategic Supplier Relationship, supply chain partners can increase overall supplier responsiveness.

4.11.7 H_{07}: Supplier Relation has no moderating mediation effect on the relationship between Supply Chain Planning Systems and Organization Supply Chain Performance

Lastly, the study investigated the moderated mediation effects of supplier relation on the link between SCAPS and SCOP. First, the relation between SCAPS and SCOP was found to be insignificant. Secondly, the mediation effect of SCA on the relationship between SCAPS and SCOP was also insignificant. Third, the moderation of SR was significant. Finally, the result for the moderated mediation was found to be positive $(\beta = 0.0451)$ significant (bootstrap confidence interval is nonzero). This shows that the hypothesis H_{07}: Supplier relationship has no moderating mediation effect on the relationship between supply chain planning systems and organization supply chain performance was rejected and the conclusion is that supplier relation moderates the mediation link of SCA on the relationship between SCAPS and SCOP.

This insignificant mediation role of SCA and the significance of the moderated mediation can be associated with the fact that SR was a strong moderator. It was a strong moderator because the coefficient has been improved. The researcher can argue that SR influences the SCA which in return influences the SCAPS and thus gives good supply chain performance. When the mediated link between supply chain agility and supply chain advanced systems and organizational performance was dependent on the extent of supplier relationship, a substantial moderated mediation emerged. That

is, when the mediation relationship's strength is dependant on the moderator's level (Preacher, Rucker, and Hayes 2007).

Supplier relation constructively moderates the insignificant mediation effect experienced between advanced planning and organizational performance in several ways. It can be explained that supplier relationships (relationships with customers) facilitate the sharing of information about how a business determines and meets customer requirements (Droge, Vickery, and Jacobs 2012). It assists businesses in analysing client needs, developing competitive strategies, and establishing market connections. Additionally, it can solicit and monitor client feedback and inputs, as well as track customer satisfaction and expectations. As Koufteros, Rawski, and Rupak show, feedback improves information transfer, reduces errors, and boosts delivery time (2010). As a result, the supply chain can react to changing market conditions by changing client specifications and customer demand (Ralston et al. 2015). Supplier partnerships also help SCAPS and SCOP maintain a strong relationship.

Table 4.23 Test of Hypotheses

Hypotheses		Beta Values	P Values	Decision
H_{01}	Supply chain advanced planning systems does not have a significant effect on supply chain organizational performance.	0.6760	0.000	Reject
H_{02}	Supply chain advanced planning systems have no influence on supply chain agility	0.5120	0.000	Reject
H_{03}	Supply chain agility do not have statistically significant on supply chain organizational performance	0.2730	0.000	Reject
H_{04}	There is no statistically significant mediating effect of supply chain agility on the relationship between supply chain advanced planning systems and supply chain organizational performance	LLCI -0.0752 ULCI 0.0469	0.000	Reject
H_{05}	There is no statistically significant moderating effect of supplier relationship on the relationship between supply chain planning systems and supply chain agility.	0.0600	0.0049	Reject
H_{06}	There is no statistically significant moderating effect of supplier relationship on the relationship between supply chain planning systems and supply chain organizational performance	0.7519	0.0000	Reject
H_{07}	There is no statistically significant moderating effect of supplier relationship on the indirect relationship between supply chain advanced planning systems and organizational supply chain performance via supply chain agility.	0.0451	0.000	Reject

CHAPTER FIVE

SUMMARY OF FINDNINGS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Overview

The chapter presents a summary of the results for the key empirical findings of this study. From these findings, conclusions were made and suggestions various policy recommendations that could be implemented by the manufacturing firms to enhance their supply chain organizational performance. Finally, the chapter underscores the possible openings for future research in this area of study.

5.2 Summary of Findings

Before data was analyzed, the study first made clear that the data was cleaned, outliers checked and removed by employing several techniques. First, frequency analysis with minimum and maximum values were run. The values where cross-checked to identify any exceptionally high or low values beyond the Likert scale values that might have been erroneously input. As noted by (Donovan & Sanders, 2005) data coding entails the process of transformation of data collected into categories that can be analyzed for meaningful information.

Results showed that the response rate was high at 94.85%. All the constructs had high reliability above 70 percent, for instance, supply chain organizational performance had 8 items and a Cronbach alpha value of 0.848, supplier relation had 5 items in the scale and Cronbach alpha of 0.811. Further, the supply chain agility which had 5 items indicated Cronbach alpha value of 0.955. Finally, supply chain advanced planning system was measured using 5 constructs record a Cronbach alpha value of 0.782.

Demographic statistics concerning the respondents showed that there was almost equal distribution between men and women in supply chain management reflects gender diversity that generates better public image and thus improves performance. Of the total sampled respondents, male counted for 57.92 percent while female accounted 42.08 percent. Concerning the age of the supply chain respondents in this manufacturing sector, results indicated that majority of the respondents, 60.18 percent were aged between 41-50 years whereas those aged above 51 years accounted for 36.65 percent. Majority of the respondents were found to be in this category because at this age, the employees make good leaders, have better communication skills as compared to their younger counterparts. Education level and experience were also part of the demographics, it was found that supply chain respondents that those who had diploma and above 82.34 percent. Those with 11 and above years of experience accounted for 61.99 percent.

Factor analysis was used to reduce several constructs to a small set that have similar characteristics and that they have much information from the original variables and to confirms whether they represent the underlying constructs then factor analysis is the technique used. There several techniques used for example confirmatory factor analysis (CFA) but, in this case, Principal Component Analysis was adopted (PCA). PCA account for as much variance as possible among a larger set of observed variables (Mann, 1995). Components or factors from the data were extracted using eigen values. PCA allows for the extraction of as many components so long as each has an eigen value is greater than one. Before proceeding with variable reduction using PCA, sampling adequacy must be above 70 percent. This means that the sampling used must be 70 percent adequate and this was done using Kaiser-Meyer-

Olkin (KMO) technique. KMO values for all the constructs used in defining the variables in this study made the criteria of above 0.70 as suggested by Kaiser (1974).

Having done with the factor analysis, the study diagnosed the data and confirmed that the data had a normal distribution, no multicollinearity, no heteroskedasticity and no serial correlation, model was estimated. The finding showed that supply chain agility (SCA), supply chain advanced planning systems (SCAPS) significantly affected the supply chain organizational performance (SCOP). Further, the effect of SR (moderating effect of SR) on relationship between SCAPS and SCOP was strongly positive. Since this relationship was significant implies that supply chain advanced planning influences the organizational performance, and this can be strengthened further through supplier relation. The moderated mediation further was positive while mediating role of supply chain agility became insignificant to influence supply chain organizational performance. The difference association between insignificant mediating effect of SCA and significant moderated mediation effect can be attributed to the strong moderating role of SR on the link between supply chain advanced planning and the organizational performance. Meaning the supplier relation is critical player because of its effect. The supply chain advanced planning showed a significant influence on supply chain agility (mediator).

5.3 Conclusions

Based on results that supply chain advanced planning systems and supply chain agility have a positive and significant influence on supply chain organizational performance when moderated with supplier relation, and that supply relation being a strong moderator (enhanced the coefficients of direct effects), the study made some conclusions that supply chain advanced planning enhances supply chain performance

by lowering costs and increasing efficiency through leaner operations. Additionally, it balances supply and demand tactically and strategically in order to maximise operational benefits and manage timely inputs to business operations.

Usually organizations who execute more of planning systems expect to reap more benefits such cutting cost, increase efficiency, and streamline the workflow. However, the case in the current study seems more relevant and more likely that planning system perceived as a control tool and surveillance used by top management to monitor the employees.

Supply chain agility improves daily operations and customer service, resulting in increased profitability and variety. Supply chain agility is important for addressing service quality concerns and improving business performance in dynamic contexts with high levels of customization. Industry success depends on the ability to innovate, foster creativity, and develop new products. Global competitiveness has developed a dynamic retail climate in which it is impossible for existing brands to boost sales. Change in revenue and market share is increasingly dependent on a producer's ability to expand or penetrate an established demand by providing new goods and services.

5.4 Study Implication

5.4.1 Practical Implication

The study provides empirical evidence in improving organizational supply chain performance, an organizational' objective, by suggesting the significance of supply chain advanced planning, supply chain agility and supplier relation. In particular, the results illustrate the significance of the supplier relation between advanced planning and performance in a high-level customization background and encourage complicated policy making for manufacturers that aim to have high-level

customization of multiple levels of product variety or change their strategy from a low-level to a high-level customization setting in the marketplace.

In terms of optimizing the best selection according to consumer demands and the potential of suppliers, company efficiency ambitions for greater competition should be considered. Achieving supply chain agility is a crucial approach to improving the competitiveness of customer service and marketplace, especially in the sense of a high degree of customization. The results revealed that supplier relation increases organizational performance in a highly competitive and advanced planned environment by moderating the relationship. This research has widespread analytical and managerial consequences for the implementation of agile supply chain techniques to maximize organizational effectiveness through service quality in high-level customized environment.

5.5 Recommendations

The study made the following recommendations regarding the study findings.

It is critical for manufacturing enterprises to improve supply chain organizational performance in order to adapt to competitive challenges in the industry and leverage these talents to acquire a competitive advantage over competitors. Companies must make a strategic decision to sustain their long-term efficacy amid varied and mobile market conditions and to prioritize agility in order to succeed. Agile innovation is defined as adjustments to instruments, processes, and projects that enable the establishment of a facility or business in the face of uncertainty. Agile manufacturing not only promotes a facility to adapt efficiently to changing market demands, but also to react with unpredictable speed in order to respond rapidly to operational and strategic alliance needs. In some circumstances, agile manufacturing also incorporates

idea development to fulfil the particular requirements of individual customers. Agile manufacturing, in a wide sense, refers to the capacity to respond swiftly to technical or environmental unexpected.

REFERENCES

Abd Elmonem, M. A., Nasr, E. S., & Geith, M. H. (2016). Benefits and challenges of cloud ERP systems–A systematic literature review. *Future Computing and Informatics Journal*, *1*(1-2), 1-9.

Abdollahi, M., Arvan, M., & Razmi, J. (2015). An integrated approach for supplier portfolio selection: Lean or agile?. *Expert Systems with Applications*, *42*(1), 679- 690.

Acquaye, A., Genovese, A., Barrett, J., & Koh, S. L. (2014). Benchmarking carbon emissions performance in supply chains. *Supply Chain Management: An International Journal*.

Acs, Z. J., Morck, R., Shaver, J. M., & Yeung, B. (1997). The internationalization of small and medium-sized enterprises: A policy perspective. *Small business economics*, *9*(1), 7-20.

Adams, F.G., Richey, R.G., Autry, C.W., Morgan, T.R. and Gabler, C.B. (2014), "Supply chain collaboration, integration, and relational technology: how complex operant resources increase performance outcomes", *Journal of Business Logistics,* Vol. 35 No. 4, pp. 299-317.

Adams, J. H., Khoja, F. M., & Kauffman, R. (2012). An empirical study of buyer–supplier relationships within small business organizations. *Journal of Small Business Management*, *50*(1), 20-40.

Agarwal, A., & Shankar, R. (2002a). Modeling integration and responsiveness on a supply chain performance: A system dynamics approach. International *Journal System Dynamics and Policy-Making,* XIV(1 & 2), 61−83.

Agrawal, D. K. (2003). *Textbook of Logistics and Supply Chain Management*. Macmillan.

Agus, A., & Hassan, Z. F. (2008). The strategic supplier partnership in a supply chain management with quality and business performance. *International Journal of Business and Management Science*, *1*(2), 129-145.

Ahmed, W., Najmi, A., Mustafa, Y., & Khan, A. (2019). Developing model to analyze factors affecting firms' agility and competitive capability: A case of a volatile market. *Journal of Modelling in Management*.

Akamp, M., & Müller, M. (2013). Supplier management in developing countries. *Journal of Cleaner Production*, *56*, 54-62.

Al-Doori, J. A. (2019). The impact of supply chain collaboration on performance in automotive industry: Empirical evidence. *Journal of Industrial Engineering and Management*, *12*(2), 241-253.

Alftan, A., Kaipia, R., Loikkanen, L., & Spens, K. (2015). Centralised grocery supply chain planning: improved exception management. *International Journal of Physical Distribution & Logistics Management*.

Alharahsheh, H. H., & Pius, A. (2020). A review of key paradigms: Positivism VS

Al-Imamy, S. (2018). *The effect of co-creation through exposure to augmented reality on customer perceived risk, perceived trust and purchase intent* (Doctoral dissertation, University of Otago).

Alvarado, U. Y., & Kotzab, H. (2001). Supply chain management: the integration of logistics in marketing. *Industrial marketing management*, *30*(2), 183-198.

Ambe, I. M. (2009, July). Agile supply chain: strategy for competitive advantage. In *The Proceedings Of 5 Th International Strategic Management Conference* (p. 659).

Anderson, S. W., & Dekker, H. C. (2009). Strategic cost management in supply chains, part 1: Structural cost management. *Accounting Horizons*, *23*(2), 201-220.

Angulo, A., Nachtmann, H., & Waller, M. A. (2004). Supply chain information sharing in a vendor managed inventory partnership. *Journal of business logistics*, *25*(1), 101-120.

Antwi, S. K., & Hamza, K. (2015). Qualitative and quantitative research paradigms in business research: A philosophical reflection. *European journal of business and management*, *7*(3), 217-225.

Argyres, N. S., & Zenger, T. R. (2012). Capabilities, transaction costs, and firm boundaries. *Organization Science*, *23*(6), 1643-1657.

Attaran, M., & Attaran, S. (2007). Collaborative supply chain management: the most promising practice for building efficient and sustainable supply chains. *Business process management journal*.

Aubert, B. A., Rivard, S., & Patry, M. (1996). A transaction cost approach to outsourcing behavior: Some empirical evidence. *Information & management*, *30*(2), 51-64.

Aviv, Y. (2002) 'Gaining benefits from joint forecasting and replenishment processes: the case of auto-correlated demand', *Manufacturing and Service Operations Management*, Vol. 4, No. 1, pp.55–74.

Awino, Z. B. (2011). Strategic management: an empirical investigation of selected strategy variables on firm's performance: a study of supply chain management in large private manufacturing firms in Kenya.

Baihaqi, I., & Sohal, A. S. (2013). The impact of information sharing in supply chains on organisational performance: an empirical study. *Production Planning & Control*, *24*(8-9), 743-758.

Bal, J., Wilding, R. D., & Gundry, J. (1999). *Virtual teaming in the agile supply chain.*

Bandyopadhyay, J. K. (2004). Developing a model for a supply chain management major in a United States university in the new millennium. *International Journal of Management*, *21*(1), 67.

Barney, J. B. (1991). Introduction to the special issue on the resource-based view of the firm. *Journal of management*, *17*(1), 97-99.

Barney, J. B. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of management*, *27*(6), 643-650.

Barratt, M. (2003). Positioning the role of collaborative planning in grocery supply chains. *The International Journal of Logistics Management*, *14*(2), 53-66.

Barratt, M. (2004). Understanding the meaning of collaboration in the supply chain. *Supply Chain Management: an international journal*.

Barratt, M. and Oliveira, A., 2001a. Exploring the experiences of collaborative planning initiatives. *International Journal of Physical Distribution & Logistics Management,* 31 (4), 266- 289.

Barratt, M., & Oke, A. (2007). Antecedents of supply chain visibility in retail supply chains: a resource-based theory perspective. *Journal of operations management*, *25*(6), 1217-1233.

Barratt, M., Oliveira, A. (2001), "Exploring the experiences of collaborative planning initiatives", *International Journal of Physical Distribution & Logistics Management*, Vol. 31 No. 4, pp. 266-289.

Barua, J. J. (2010). *Challenges facing supply chain management in the oil marketing companies in Kenya* (Doctoral dissertation).

Battistella, C., De Toni, A. F., De Zan, G., & Pessot, E. (2017). Cultivating business model agility through focused capabilities: A multiple case study. *Journal of Business Research*, *73*, 65-82.

Baumann, F. (2010). The shelf-connected supply chain: strategically linking CPFR with S&OP at the executive level. *Journal of Business Forecasting-Methods and Systems*, *29*(4), 21.

Baykasoglu, A., Kaplanoglu, V., 2008. Application of activity-based costing to a land transportation company: a case study. *International Journal of Production Economics* 116, 308–324.

Bayraktar, E., Demirbag, M., Koh, S. L., Tatoglu, E., & Zaim, H. (2009). A causal analysis of the impact of information systems and supply chain management practices on operational performance: evidence from manufacturing SMEs in Turkey. *International Journal of Production Economics*, *122*(1), 133-149.

Bayraktar, E., Demirbag, M., Koh, S. L., Tatoglu, E., & Zaim, H. (2009). A causal analysis of the impact of information systems and supply chain management practices on operational performance: evidence from manufacturing SMEs in Turkey. *International Journal of Production Economics*, *122*(1), 133-149.

Bayraktar, E., Demirbag, M., Koh, S. L., Tatoglu, E., & Zaim, H. (2009). A causal analysis of the impact of information systems and supply chain management practices on operational performance: evidence from manufacturing SMEs in Turkey. *International Journal of Production Economics*, *122*(1), 133-149.

Bayraktar, E., Demirbag, M., Koh, S. L., Tatoglu, E., & Zaim, H. (2009). A causal analysis of the impact of information systems and supply chain management practices on operational performance: evidence from manufacturing SMEs in Turkey. *International Journal of Production Economics*, *122*(1), 133-149.

Bealt, J., Fernández Barrera, J. C., & Mansouri, S. A. (2016). Collaborative relationships between logistics service providers and humanitarian organizations during disaster relief operations. *Journal of Humanitarian Logistics and Supply Chain Management*, *6*(2), 118-144.

Beheshti, H. M. (2006). What managers should know about ERP/ERP II. *Management Research News*.

Benzidia, S., & Makaoui, N. (2020, July). Improving SMEs performance through supply chain flexibility and market agility: IT orchestration perspective. In *Supply Chain Forum: An International Journal* (Vol. 21, No. 3, pp. 173-184). Taylor & Francis.

Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. *Social science & medicine*, *51*(6), 843-857.

Bernardes, E. S., & Hanna, M. D. (2009). A theoretical review of flexibility, agility and responsiveness in the operations management literature: Toward a conceptual definition of customer responsiveness. *International Journal of Operations & Production Management*.

Bhagwat, R., & Sharma, M. K. (2007). Performance measurement of supply chain management: A balanced scorecard approach. *Computers & Industrial Engineering*, *53*(1), 43-62.

Bhagwat, R., & Sharma, M. K. (2007). Performance measurement of supply chain management using the analytical hierarchy process. *Production planning and control*, *18*(8), 666-680.

Bhagwat, R., & Sharma, M. K. (2007). Performance measurement of supply chain management: A balanced scorecard approach. *Computers & industrial engineering*, *53*(1), 43-62.

Bieberstein, N., Bose, S., Walker, L., & Lynch, A. (2005). Impact of service-oriented architecture on enterprise systems, organizational structures, and individuals. *IBM systems journal*, *44*(4), 691-708.

Biron, M., Farndale, E., & Paauwe, J. (2011). Performance management effectiveness: lessons from world-leading firms. *The International Journal of Human Resource Management*, *22*(06), 1294-1311.

Blatherwick, A. (1998), "Vendor-managed inventory: fashion fad or important supply chain strategy?", Supply Chain Management: An International Journal, Vol. 3 No. 1, pp. 10-11

Blome, C., Schoenherr, T., & Rexhausen, D. (2013). Antecedents and enablers of supply chain agility and its effect on performance: a dynamic capabilities perspective. *International Journal of Production Research*, *51*(4), 1295-1318.

Boehme, T. (2009). *Supply Chain Integration: A Case-based Investigation of Status, Barriers, and Paths to Enhancement* (Doctoral dissertation, The University of Waikato).

Botta-Genoulaz, V., & Millet, P. A. (2006). An investigation into the use of ERP systems in the service sector. *International journal of production economics*, *99*(1-2), 202-221.

Botta-Genoulaz, V., Millet, P. A., & Grabot, B. (2005). A survey on the recent research literature on ERP systems. *Computers in industry*, *56*(6), 510-522.

Bourque, L., & Fielder, E. P. (2003). *How to conduct self-administered and mail surveys* (Vol. 3). Sage.

Braglia, M., & Frosolini, M. (2014). An integrated approach to implement project management information systems within the extended enterprise. *International Journal of Project Management*, *32*(1), 18-29.

Braunscheidel, M. J., & Suresh, N. C. (2009). The organizational antecedents of a firm's supply chain agility for risk mitigation and response. *Journal of operations Management*, *27*(2), 119-140.

Brewer, P. C. (2000). Using the balanced scorecard to measure supply chain performance Peter C Brewer; Thomas WSpeh. *Journal of Business logistics*, *21*(1), 75.

Brewer, P. C. (2000). Using the balanced scorecard to measure supply chain performance Brewer, Peter CSpeh, Thomas W. *Journal of Business logistics*, *21*(1), 75.

Brusset, X. (2016). Does supply chain visibility enhance agility?. *International Journal of Production Economics*, *171*, 46-59.

Buddas, H. (2014). A bottleneck analysis in the IFRC supply chain. *Journal of Humanitarian Logistics and Supply Chain Management*.

Buyya, R., Abramson, D., Giddy, J., & Stockinger, H. (2002). Economic models for resource management and scheduling in grid computing. *Concurrency and computation: practice and experience*, *14*(13-15), 1507-1542.

Cachon, G. and Fisher, M. (1997), "Campbell soup's continuous replenishment program: evaluation and enhanced inventory decisions rules", Productions and Operations Management, Vol. 6 No. 3, pp. 266-76

Camarinha-Matos, L. M., & Afsarmanesh, H. (2004). Collaborative networked organizations. *A research agenda for emerging business models*.

Cannon, J. P., & Homburg, C. (2001). Buyer–supplier relationships and customer firm costs. *Journal of marketing*, *65*(1), 29-43.

Carr, A. S., & Kaynak, H. (2007). Communication methods, information sharing, supplier development and performance: an empirical study of their relationships. *International Journal of Operations & Production Management*.

Cecez-Kecmanovic, D. (2005). Basic assumptions of the critical research perspectives in information systems. *Handbook of critical information systems research: Theory and application*, 19-46.interpretivism. *Global Academic Journal of Humanities and Social Sciences*, *2*(3), 39-43.

Cegarra-Navarro, J. G., Soto-Acosta, P., & Wensley, A. K. (2016). Structured knowledge processes and firm performance: The role of organizational agility. *Journal of Business Research*, *69*(5), 1544-1549.

Chae, B. K. (2009). Developing key performance indicators for supply chain: an industry perspective. *Supply Chain Management: An International Journal*.

Chakravorti, S. (2009). Extending customer relationship management to value chain partners for competitive advantage. *Journal of Relationship Marketing*, *8*(4), 299-312.

Chan, A. T., Ngai, E. W., & Moon, K. K. (2017). The effects of strategic and manufacturing flexibilities and supply chain agility on firm performance in the fashion industry. *European Journal of Operational Research*, *259*(2), 486-499.

Chan, F. T., & Qi, H. J. (2003). An innovative performance measurement method for supply chain management. *Supply chain management: An international Journal*, *8*(3), 209-223.

Chang, C., Chiang, D., & Pai, F. (2012). Cooperative Strategy in Supply Chain Networks. Industrial Marketing Management, (41), 1114–1124.

Charan, P., Shankar, R., & Baisya, R. K. (2008). Analysis of interactions among the variables of supply chain performance measurement system implementation. *Business Process Management Journal*.

Chen, C. J. (2019). Developing a model for supply chain agility and innovativeness to enhance firms' competitive advantage. *Management Decision*.

Chen, I. J., & Paulraj, A. (2004). Towards a theory of supply chain management: the constructs and measurements. *Journal of operations management*, *22*(2), 119-150.

Chen, P. C., Liu, K. H., & Ma, H. W. (2017). Resource and waste-stream modeling and visualization as decision support tools for sustainable materials management. *Journal of Cleaner Production*, *150*, 16-25.

Chen, P. C., Liu, K. H., & Ma, H. W. (2017). Resource and waste-stream modeling and visualization as decision support tools for sustainable materials management. *Journal of Cleaner Production*, *150*, 16-25.

Chen, P. T., & Hsieh, H. P. (2012). Personalized mobile advertising: Its key attributes, trends, and social impact. *Technological Forecasting and Social Change*, *79*(3), 543-557.

Chiang, C. Y., Kocabasoglu-Hillmer, C., & Suresh, N. (2012). An empirical investigation of the impact of strategic sourcing and flexibility on firm's supply chain agility. *International Journal of Operations & Production Management*.

Chima, C. M. (2007). Supply-chain management issues in the oil and gas industry. *Journal of Business & Economics Research (JBER)*, *5*(6).

Chin, K. S., Rao Tummala, V. M., Leung, J. P., & Tang, X. (2004). A study on supply chain management practices: the Hong Kong manufacturing perspective. *International journal of physical distribution & logistics management*, *34*(6), 505-524.

Chin, T. A., Tat, H. H., & Sulaiman, Z. (2015). Green supply chain management, environmental collaboration and sustainability performance. *Procedia Cirp*, *26*, 695-699.

Chiu, Y. T., Chen, H. G., & Zhu, Y. Q. (2017). Exploring IT/S Risk Management Agility. In *ICIS*.

Chong, A.Y.L. and Ooi, K.B. (2008). 'Adoption of inter organizational system standards in supply chains: an empirical analysis of Rosetta Net standards', Industrial Management and Data Systems, 108 (4), 529–547

Chow, W. S., Madu, C. N., Kuei, C. H., Lu, M. H., Lin, C., & Tseng, H. (2008). Supply chain management in the US and Taiwan: An empirical study. *Omega*, *36*(5), 665-679.

Christopher, M. (2017). Relationships and alliances Embracing the era of network competition. In *Strategic Supply Chain Alignment* (pp. 286-351). Routledge.

Christopher, M., & Towill, D. (2001). An integrated model for the design of agile supply chains. *International Journal of Physical Distribution & Logistics Management*, *31*(4), 235-246.

Christopher, M., & Towill, D. R. (2000). Supply chain migration from lean and functional to agile and customised. *Supply Chain Management: An International Journal*, *5*(4), 206-213.

Christopher, M., & Towill, D. R. (2000). Supply chain migration from lean and functional to agile and customised. *Supply Chain Management: An International Journal*, *5*(4), 206-213.

Cigolini, R., Cozzi, M. and Merona, M. (2004), "A new framework for supply chain management: conceptual mode and empirical test", International Journal of Operations & Production Management, Vol. 24 No. 1, pp. 7-41.

Cigolini, R., Cozzi, M., & Perona, M. (2004). A new framework for supply chain management: conceptual model and empirical test. *International Journal of Operations & Production Management*, *24*(1), 7-41.

Cigolini, R., Cozzi, M., & Perona, M. (2004). A new framework for supply chain management: conceptual model and empirical test. *International Journal of Operations & Production Management*.

Clegg, C. W., Wall, T. D., Pepper, K., Stride, C., Woods, D., Morrison, D., ... & Grote, G. (2002). An international survey of the use and effectiveness of modern manufacturing practices. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *12*(2), 171-191.

Clough, L. (2012). The improved cookstove sector in East Africa: Experience from the developing energy enterprise programme (DEEP). *London, UK: GVEP-Global Village Energy Partnership International*, *108*.

Coelho, P. S., & Henseler, J. (2012). Creating customer loyalty through service customization. *European Journal of Marketing*, *46*(3/4), 331-356.

Colicchia, C., Creazza, A., Noè, C., & Strozzi, F. (2019). Information sharing in supply chains: a review of risks and opportunities using the systematic literature network analysis (SLNA). *Supply chain management: an international journal*.

Conejo, A. J., Morales, J. M., & Baringo, L. (2010). Real-time demand response model. *IEEE Transactions on Smart Grid*, *1*(3), 236-242.

Cook, L. S., Heiser, D. R., & Sengupta, K. (2011). The moderating effect of supply chain role on the relationship between supply chain practices and performance: An empirical analysis. *International Journal of Physical Distribution & Logistics Management*, *41*(2), 104-134.

Cooper, R. G., & Sommer, A. F. (2016). Agile-Stage-Gate: New idea-to-launch method for manufactured new products is faster, more responsive. *Industrial Marketing Management*, *59*, 167-180.

Corsten, D., & Felde, J. (2005). Exploring the performance effects of key-supplier collaboration: An empirical investigation into Swiss buyer-supplier relationships. *International Journal of Physical Distribution & Logistics Management*.

Costa, L. A., Cool, K., & Dierickx, I. (2013). The competitive implications of the deployment of unique resources. *Strategic management journal*, *34*(4), 445-463.

Craighead, C. W., Hult, G. T. M., & Ketchen Jr, D. J. (2009). The effects of innovation–cost strategy, knowledge, and action in the supply chain on firm performance. *Journal of Operations Management*, *27*(5), 405-421.

Croom, S., Romano, P., & Giannakis, M. (2000). Supply chain management: an analytical framework for critical literature review. *European journal of purchasing & supply management*, *6*(1), 67-83.

Croxton, K. L., Garcia-Dastugue, S. J., Lambert, D. M., & Rogers, D. S. (2001). The supply chain management processes. *The International Journal of Logistics Management*, *12*(2), 13-36.

Cuypers, I. R., Hennart, J. F., Silverman, B. S., & Ertug, G. (2021). Transaction cost theory: Past progress, current challenges, and suggestions for the future. *Academy of Management Annals*, *15*(1), 111-150.

Daneshvar Kakhki, M., & Gargeya, V. B. (2019). Information systems for supply chain management: a systematic literature analysis. *International Journal of Production Research*, *57*(15-16), 5318-5339.

Datta, P. (2017). Supply network resilience: a systematic literature review and future research. *The International Journal of Logistics Management*.

Day, M., & Lichtenstein, S. (2006). Strategic supply management: the relationship between supply management practices, strategic orientation and their impact on organisational performance. *Journal of Purchasing and Supply Management*, *12*(6), 313-321.

de Man, J. C., & Strandhagen, J. O. (2018). Spreadsheet application still dominates enterprise resource planning and advanced planning systems. *IFAC-PapersOnLine*, *51*(11), 1224-1229.

de Santa-Eulalia, L. A., D'Amours, S., Frayret, J. M., Menegusso, C. C., & Azevedo, R. C. (2011). Advanced supply chain planning systems (APS) today and tomorrow. *Supply Chain Management Pathways for Research and Practice, InTech, Rijeka, Croatia*, 171-200.

De Waal, A. A. (2003). Behavioral factors important for the successful implementation and use of performance management systems. *Management Decision*.

Dean Jr, J. W., & Bowen, D. E. (1994). Management theory and total quality: improving research and practice through theory development. *Academy of management review*, *19*(3), 392-418.

Dehning, B., Richardson, V. J., & Zmud, R. W. (2007). The financial performance effects of IT-based supply chain management systems in manufacturing firms. *Journal of Operations Management*, *25*(4), 806-824.

Devaraj, S., Krajewski, L., & Wei, J. C. (2007). Impact of eBusiness technologies on operational performance: the role of production information integration in the supply chain. *Journal of operations management*, *25*(6), 1199-1216.

Disney, S.M. and Towill, D.R. (2003a), "The effect of vendor managed inventory (VMI) dynamics on the bullwhip effect in supply chains", International *Journal of Production Economics*, Vol. 85 No. 2, pp. 199-215

Disney, S.M., Naim, M.M. and Potter, A. (2004), "Assessing the impact of e-business on supply chain dynamics", *International Journal of Production Economics*, Vol. 89 No. 2, pp. 109- 18.

Domingo, T. M. (2013). *The adoption of lean techniques to optimise the on-shelf availability of products and drive business performance in the food industry: a South African manufacturing and retail case study* (Master's thesis, University of Cape Town).

Dong, Y., & Xu, K. (2002). A supply chain model of vendor managed inventory. *Transportation research part E: logistics and transportation review*, *38*(2), 75-95.

Donovan, J., & Sanders, C. (2005). Key issues in the analysis of qualitative data in health services research. *Handbook of health research methods*, *515*, 532.

Droge, C., Vickery, S. K., & Jacobs, M. A. (2012). Does supply chain integration mediate the relationships between product/process strategy and service performance? An empirical study. *International Journal of Production Economics*, *137*(2), 250-262.

Dubey, R., Ali, S. S., Aital, P., & Venkatesh, V. G. (2014). Mechanics of humanitarian supply chain agility and resilience and its empirical validation. *International Journal of Services and Operations Management*, *17*(4), 367-384.

Dubey, R., Gunasekaran, A., & Childe, S. J. (2019). Big data analytics capability in supply chain agility: the moderating effect of organizational flexibility. *Management Decision*.

Duchessi, P., & O'Keefe, R. M. (1992). Contrasting successful and unsuccessful expert systems. *European Journal of Operational Research*, *61*(1-2), 122-134.

Duclos, L. K., Vokurka, R. J., & Lummus, R. R. (2003). A conceptual model of supply chain flexibility. *Industrial Management & Data Systems*.

Duffy, R., Fearne, A., Hornibrook, S., Hutchinson, K., & Reid, A. (2013). Engaging suppliers in CRM: The role of justice in buyer–supplier relationships. *International Journal of Information Management*, *33*(1), 20-27.

Easton, L., Murphy, D. J., & Pearson, J. N. (2002). Purchasing performance evaluation: with data envelopment analysis. *European Journal of Purchasing & Supply Management*, *8*(3), 123-134.

Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: a general analytical framework using moderated path analysis. *Psychological methods*, *12*(1), 1.

Ellinger, A.E. (2000). Improving marketing/logistics cross-functional collaboration in the supply chain. *Industrial Marketing Management*, 29, 85-96.

Ellram, L. M. (1991). Supply-chain management: the industrial organisation perspective. *International Journal of Physical Distribution & Logistics Management*, *21*(1), 13-22.

Ellram, L. M., & Cooper, M. C. (2014). Supply chain management: It's all about the journey, not the destination. *Journal of supply chain management*, *50*(1), 8-20.

Ellram, L. M., & Murfield, M. L. U. (2019). Supply chain management in industrial marketing–Relationships matter. *Industrial Marketing Management*, *79*, 36-45.

Elmuti, D. (2002). The perceived impact of supply chain management on organizational effectiveness. *Journal of Supply Chain Management*, *38*(2), 49-57.

Espino-Rodríguez, T. F., & Padrón-Robaina, V. (2006). A review of outsourcing from the resource-based view of the firm. *International journal of management reviews*, *8*(1), 49-70.

Estampe, D., Lamouri, S., Paris, J. L., & Brahim-Djelloul, S. (2013). A framework for analysing supply chain performance evaluation models. *International Journal of Production Economics*, *142*(2), 247-258.

Estampe, D., Lamouri, S., Paris, J. L., & Brahim-Djelloul, S. (2013). A framework for analysing supply chain performance evaluation models. *International Journal of Production Economics*, *142*(2), 247-258.

Fawcett, S. E., & Waller, M. A. (2011). Cinderella in the C-suite: conducting influential research to advanced the logistics and supply chain disciplines. *Journal of Business Logistics*, *32*(2), 115-121.

Fawcett, S. E., Osterhaus, P., Magnan, G. M., Brau, J. C., & McCarter, M. W. (2007). Information sharing and supply chain performance: the role of connectivity and willingness. *Supply Chain Management: An International Journal*.

Feizabadi, J., Gligor, D., & Motlagh, S. A. (2019). The triple-As supply chain competitive advantage. *Benchmarking: An International Journal*.

Ferrer, M., Santa, R., Soosay, C., & Hyland, P. (2009). The critical competences needed for innovative organisational inter-firm and intra-firm integration. In *Enhancing the Innovation Environment: Proceedings of the 10th International CINet Conference* (pp. 248-299). CINet.

Field, J. M., & Meile, L. C. (2008). Supplier relations and supply chain performance in financial services processes. *International Journal of Operations & Production Management*.

Fliedner, G. (2003). CPFR: an emerging supply chain tool. *Industrial Management & data systems*.

Fliedner, G. (2003). CPFR: an emerging supply chain tool. *Industrial Management & data systems*, *103*(1), 14-21.

Flynn, B. B., Huo, B., & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of operations management*, *28*(1), 58-71.

Frohlich, M. T., & Westbrook, R. (2001). Arcs of integration: an international study of supply chain strategies. *Journal of operations management*, *19*(2), 185-200.

Frohlich, M. T., & Westbrook, R. (2002). Demand chain management in manufacturing and services: web-based integration, drivers and performance. *Journal of operations management*, *20*(6), 729-745.

Fu, H. P. (2016). Comparing the factors that influence the adoption of CPFR by retailers and suppliers. *The International Journal of Logistics Management*, *27*(3), 931-946.

Gavrea, C., Ilies, L., & Stegerean, R. (2011). Determinants of organizational performance: The case of Romania. *Management & Marketing*, *6*(2).

Gelo, O., Braakmann, D., & Benetka, G. (2008). Quantitative and qualitative research: Beyond the debate. *Integrative psychological and behavioral science*, *42*(3), 266-290.

Ghoshal, S., & Moran, P. (1996). Bad for practice: A critique of the transaction cost theory. *Academy of management Review*, *21*(1), 13-47.

Giannakis, M. (2012). The intellectual structure of the supply chain management discipline: A citation and social network analysis. *Journal of Enterprise Information Management*.

Giannakis, M., & Louis, M. (2016). A multi-agent based system with big data processing for enhanced supply chain agility. *Journal of Enterprise Information Management*.

Giannakis, M., Spanaki, K., & Dubey, R. (2019). A cloud-based supply chain management system: effects on supply chain responsiveness. *Journal of Enterprise Information Management*.

Giunipero, L. C., Hooker, R. E., Joseph-Matthews, S. A. C. H. A., Yoon, T. E., & Brudvig, S. (2008). A decade of SCM literature: past, present and future implications. *Journal of supply chain management*, *44*(4), 66-86.

Gligor, D. M., & Holcomb, M. C. (2012). Antecedents and consequences of supply chain agility: establishing the link to firm performance. *Journal of Business Logistics*, *33*(4), 295-308.

Gligor, D. M., & Holcomb, M. C. (2012). Understanding the role of logistics capabilities in achieving supply chain agility: a systematic literature review. *Supply Chain Management: An International Journal*.

Gligor, D. M., Holcomb, M. C., & Stank, T. P. (2013). A multidisciplinary approach to supply chain agility: conceptualization and scale development. *Journal of Business Logistics*, *34*(2), 94-108.

Gligor, D. M., Holcomb, M. C., & Stank, T. P. (2013). A multidisciplinary approach to supply chain agility: Conceptualization and scale development. *Journal of Business Logistics*, *34*(2), 94-108.

Gligor, D., Gligor, N., Holcomb, M., & Bozkurt, S. (2019). Distinguishing between the concepts of supply chain agility and resilience: A multidisciplinary literature review. *The International Journal of Logistics Management*, *30*(2), 467-487.

Gligor, D., Gligor, N., Holcomb, M., & Bozkurt, S. (2019). Distinguishing between the concepts of supply chain agility and resilience: A multidisciplinary literature review. *The International Journal of Logistics Management*.

Gold, S., Seuring, S., & Beske, P. (2010). The constructs of sustainable supply chain management–a content analysis based on published case studies. *Progress in Industrial Ecology, an International Journal*, *7*(2), 114-137.

Goldman, S. L. (1994). An agility primer. Agility Forum.

Goldman, S. L., Nagel, R. N., & Preiss, K. (1995). Agile competitors and virtual organizations measuring agility and infrastructure for agility.

Golrizgashti, S. (2014). Supply chain value creation methodology under BSC approach. *Journal of Industrial Engineering International*, *10*(3), 1-15.

Goncalves, D., Bergquist, M., Bunk, R., & Alänge, S. (2020). Cultural aspects of organizational agility affecting digital innovation. *Journal of Entrepreneurship, Management and Innovation*, *16*(4), 13-46.

Gong, Y., & Janssen, M. (2012). From policy implementation to business process management: Principles for creating flexibility and agility. *Government Information Quarterly*, *29*, S61-S71.

Gopal, P. R. C., & Thakkar, J. (2012). A review on supply chain performance measures and metrics: 2000-2011. *International journal of productivity and performance management*.

Gopal, P. R. C., & Thakkar, J. (2012). A review on supply chain performance measures and metrics: 2000-2011. *International journal of productivity and performance management*.

Govindan, K. (2013). Vendor-managed inventory: a review based on dimensions. *International Journal of Production Research*, *51*(13), 3808-3835.

Govindasamy, B. (2006). A supply chain collaboration solution using XQuery.

Green, K. W., Zelbst, P. J., Meacham, J., & Bhadauria, V. S. (2012). Green supply chain management practices: impact on performance. *Supply Chain Management: An International Journal*.

Grover, V., & Malhotra, M. K. (2003). Transaction cost framework in operations and supply chain management research: theory and measurement. *Journal of Operations management*, *21*(4), 457-473.

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical psychology review*, *37*, 1-12.

Gunasekaran, A., Patel, C., & McGaughey, R. E. (2004). A framework for supply chain performance measurement. *International journal of production economics*, *87*(3), 333-347.

Gunasekaran, A., Patel, C., & Tirtiroglu, E. (2001). Performance measures and metrics in a supply chain environment. *International journal of operations & production Management*, *21*(1/2), 71-87.

Gunasekaran, A., Tirtiroglu, E., & Wolstencroft, V. (2002). An investigation into the application of agile manufacturing in an aerospace company. *Technovation*, *22*(7), 405-415.

Gupta, M., & Kohli, A. (2006). Enterprise resource planning systems and its implications for operations function. *Technovation*, *26*(5-6), 687-696.

Haberlandt, K. (2013). ERP-Planning Garbage: Realizing and Preventing. In *Innovation and Future of Enterprise Information Systems* (pp. 31-51). Springer, Berlin, Heidelberg.

Hair, J. F., Anderson, R. E., Babin, B. J., & Black, W. C. (2010). *Multivariate data analysis: A global perspective* (Vol. 7): Pearson Upper Saddle River.

Hakansson, H., & Ford, D. (2002a). How Should Companies Interact in Business Networks. *Journal of Business Research*, 55(2), 133–139

Häkkinen, L., & Hilmola, O. P. (2008). ERP evaluation during the shakedown phase: lessons from an after-sales division. *Information systems journal*, *18*(1), 73-100.

Halawi, L. A., Aronson, J. E., & McCarthy, R. V. (2005). Resource-based view of knowledge management for competitive advantage. *The electronic journal of knowledge management*, *3*(2), 75.

Halldorsson, A., Kotzab, H., Mikkola, J. H., & Skjøtt-Larsen, T. (2007). Complementary theories to supply chain management. *Supply chain management: An international journal*, *12*(4), 284-296.

Hallgren, M., & Olhager, J. (2009). Lean and agile manufacturing: external and internal drivers and performance outcomes. *International Journal of Operations & Production Management*.

Hamister, J. W. (2012). Supply chain management practices in small retailers. *International Journal of Retail & Distribution Management*, *40*(6), 427-450.

Handfield, R. B., & Bechtel, C. (2002). The role of trust and relationship structure in improving supply chain responsiveness. *Industrial marketing management*, *31*(4), 367-382.

Handfield, R. B., Krause, D. R., Scannell, T. V., & Monczka, R. M. (2006). Avoid the pitfalls in supplier development. *Supply chains and total product systems: A reader*, *58*, 25-44.

Hansen, A., & Mouritsen, J. (2007). Management accounting and changing operations management. *Issues in management accounting*, *3*, 3-25.

Harland, C. (1996). Supply Chain Management, Purchasing and Supply Management, Logistics, vertical Integration, Materials Management and Supply Chain Dynamics. Blackwell, UK. : Blackwell Encyclopedic Dictionary of Operations Management.

Harrison, R. T., & Leitch, C. M. (2005). Entrepreneurial learning: Researching the interface between learning and the entrepreneurial context. *Entrepreneurship theory and practice*, *29*(4), 351-371.

Hashemi, A. (2015). *Alignment of supply chain complexities with product demand and product design characteristics* (Doctoral dissertation, RMIT University).

Helo, P., Suorsa, M., Hao, Y., & Anussornnitisarn, P. (2014). Toward a cloud-based manufacturing execution system for distributed manufacturing. *Computers in Industry*, *65*(4), 646-656.

Hennart, J. F. (2010). Transaction cost theory and international business. *Journal of Retailing*, *86*(3), 257-269.

Hervani, A. A., Helms, M. M., & Sarkis, J. (2005). Performance measurement for green supply chain management. *Benchmarking: An international journal*.

Hiete, M., Ludwig, J., & Schultmann, F. (2012). Intercompany energy integration: Adaptation of thermal pinch analysis and allocation of savings. *Journal of industrial ecology*, *16*(5), 689-698.

Higgins, L. & Hack, B. 2004. Measurement in the 21st Century. *APQC White Paper.* [Online]. <http://www.apqc.org/> [Cited 14 February 2006].

Highsmith, J. (2009). *Agile project management: creating innovative products*. Pearson education.

Hill, C. A., Zhang, G. P., & Miller, K. E. (2018). Collaborative planning, forecasting, and replenishment & firm performance: An empirical evaluation. *International journal of production economics*, *196*, 12-23.

Hilton, R. W. (2005). *Managerial accounting*. New York: McGraw-Hill.

Hitomi, K. (2017). *Manufacturing systems engineering: A unified approach to manufacturing technology, production management and industrial economics*. Routledge.

Ho, D. K. Y., & Choi, T. M. (2014). Collaborative planning forecasting replenishment schemes in apparel supply chain systems: Cases and research opportunities. In *Intelligent fashion forecasting systems: Models and applications* (pp. 29-40). Springer, Berlin, Heidelberg.ed retail firm in South Africa. *Journal of Contemporary Management*, *15*(Special Edition1), 87-111.

Holbrook, A. L., Krosnick, J. A., & Pfent, A. (2008). The causes and consequences of response rates in surveys by the news media and government contractor survey research firms. *Advanceds in telephone survey methodology*, *1*, 499-528.

Hollmann, R. L., Scavarda, L. F., & Thomé, A. M. T. (2015). Collaborative planning, forecasting and replenishment: a literature review. *International Journal of Productivity and Performance Management*.

Holmberg, S. (2000). A systems perspective on supply chain measurements. *International Journal of Physical Distribution & Logistics Management*, *30*(10), 847-868.

Holweg, M., Disney, S., Holmström, J., & Småros, J. (2005). Supply chain collaboration:: Making sense of the strategy continuum. *European management journal*, *23*(2), 170-181.

Hoque, D. M. B. A. M. A. M. R., AlBar, A. M., & Bahssas, D. M. (2015). Enterprise Resource Planning (ERP) systems: design trends and deployment. *The International Technology Management Review*, *5*(2), 72-81.

Hsin, C.H., Tsai, Y.-C. and Hsu, C.-H. (2013), "E-procurement and supply chain performance", Supply Chain Management: An International Journal, Vol. 18 No. 1, pp. 34-51.

Huan, S. H., Sheoran, S. K., & Wang, G. (2004). A review and analysis of supply chain operations reference (SCOR) model. *Supply Chain Management: An International Journal*, *9*(1), 23-29.

Huang, S. H., & Keskar, H. (2007). Comprehensive and configurable metrics for supplier selection. *International journal of production economics*, *105*(2), 510-523.

Hubert, M., Rousseeuw, P. J., & Verboven, S. (2002). A fast method for robust principal components with applications to chemometrics. *Chemometrics and Intelligent Laboratory Systems*, *60*(1-2), 101-111.

Hudson, M., Lean, J., & Smart, P. A. (2001). Improving control through effective performance measurement in SMEs. *Production planning & control*, *12*(8), 804-813.

Hult, G. T. M., Ketchen Jr, D. J., & Slater, S. F. (2004). Information processing, knowledge development, and strategic supply chain performance. *Academy of management journal*, *47*(2), 241-253.

Hung Lau, K. (2012). Demand management in downstream wholesale and retail distribution: a case study. *Supply Chain Management: An International Journal*, *17*(6), 638-654.

I. van Hoek, R., Harrison, A., & Christopher, M. (2001). Measuring agile capabilities in the supply chain. *International Journal of Operations & Production Management*, *21*(1/2), 126-148.

Ireland, R. K., & Crum, C. (2005). *Supply chain collaboration: How to implement CPFR and other best collaborative practices*. J. Ross Publishing.

Ittner, C. D., & Larcker, D. F. (2001). Assessing empirical research in managerial accounting: a value-based management perspective. *Journal of accounting and economics*, *32*(1-3), 349-410.

Ivanov, D., Das, A., & Choi, T. M. (2018). New flexibility drivers for manufacturing, supply chain and service operations.

Ivens, B. S., Van de Vijver, M., & Vos, B. (2013). Managing and developing key supplier relationships: An introduction to the special issue, discussion and implications. *Industrial Marketing Management*, *42*(2), 135-138.

Jackson, M., & Johansson, C. (2003). An agility analysis from a production system perspective. *Integrated Manufacturing Systems*, *14*(6), 482-488.

Jacobs, F. R., Berry, W. L., Whybark, D. C., & Vollmann, T. E. (2011). *Manufacturing planning and control for supply chain management: APICS/CPIM Certification Edition*. McGraw-Hill Education.

Jacyna-Gołda, I., Lewczuk, K., Szczepański, E., & Murawski, J. (2015, April). Computer Aided Implementation of Logistics Processes–Selected Aspects. In *International Conference on Transport Systems Telematics* (pp. 67-80). Springer, Cham.

Jain, P. M., & Shandliya, V. K. (2013). A survey paper on comparative study between principal component analysis (PCA) and exploratory factor analysis (EFA). *International Journal of Managment, IT and Engineering*, *3*(6), 415-424.

Jakhar, S. K., Rathore, H., & Mangla, S. K. (2018). Is lean synergistic with sustainable supply chain? An empirical investigation from emerging economy. *Resources, Conservation and Recycling*, *139*, 262-269.

Jespersen, B. D., & Skjott-Larsen, T. (2005). *Supply chain management: in theory and practice*. Copenhagen Business School Press DK.

Jiang, C. X., Chua, R. Y., Kotabe, M., & Murray, J. Y. (2011). Effects of cultural ethnicity, firm size, and firm age on senior executives' trust in their overseas business partners: Evidence from China. *Journal of International Business Studies*, *42*(9), 1150-1173.

Jiang, P. Y., Zhou, G. H., Zhao, G., Zhang, Y. F., & Sun, H. B. (2007). e2-MES: an e-service-driven networked manufacturing platform for extended enterprises. *International Journal of Computer Integrated Manufacturing*, *20*(2-3), 127-142.

Jin, Y., Vonderembse, M., Ragu-Nathan, T. S., & Smith, J. T. (2014). Exploring relationships among IT-enabled sharing capability, supply chain flexibility, and competitive performance. *International Journal of Production Economics*, *153*, 24-34.

Jones, M. C., Cline, M., & Ryan, S. (2006). Exploring knowledge sharing in ERP implementation: an organizational culture framework. *Decision Support Systems*, *41*(2), 411-434.

Jones, M. D., & McBeth, M. K. (2010). A narrative policy framework: Clear enough to be wrong?. *Policy Studies Journal*, *38*(2), 329-353.

Jui-Chin, J., & Kou-Huang, C. (2007). Development of a collaborative manufacturing, planning, and scheduling system: integrating lean and agile manufacturing for the supply chain. *International Journal of Management*, *24*(2), 331.

Kagioglou, M., Cooper, R., & Aouad, G. (2001). Performance management in construction: a conceptual framework. *Construction management and economics*, *19*(1), 85-95.

Kaipia, R. (2009). Coordinating material and information flows with supply chain planning. *The International Journal of Logistics Management*.

Kaipia, R., Holstro¨m, J. and Transkanen, K. (2002), "VMI: What are you losing if you let your customer place orders?", Production Planning and Control, Vol. 13 No. 1, pp. 17-25.

Kald, M., & Nilsson, F. (2000). Performance measurement at Nordic companies. *European Management Journal*, *18*(1), 113-127.

Kang, M., Wu, X., Hong, P., & Park, Y. (2012). Aligning organizational control practices with competitive outsourcing performance. *Journal of Business Research*, *65*(8), 1195-1201.

Kannan, V. R., & Choon Tan, K. (2003). Attitudes of US and European managers to supplier selection and assessment and implications for business performance. *Benchmarking: An international journal*, *10*(5), 472-489.

Kannan, V. R., & Tan, K. C. (2005). Just in time, total quality management, and supply chain management: understanding their linkages and impact on business performance. *Omega*, *33*(2), 153-162.

Kanyoma, K. E., Agbola, F. W., & Oloruntoba, R. (2018). An evaluation of supply chain integration across multi-tier supply chains of manufacturing-based SMEs in Malawi. *The International Journal of Logistics Management*.

Kaplan, R. S., & Norton, D. P. (1996). Using the balanced scorecard as a strategic management system.

Kaplan, R. S., & Norton, D. P. (2001). Transforming the balanced scorecard from performance measurement to strategic management: Part I. *Accounting horizons*, *15*(1), 87-104.

Kaplan, R.S., Cooper, R., 1998. Cost and Effect: Using Integrated Systems to Drive Profitability and Performance. Harvard Business School Press, Boston.

Karungani, P. W. (2019). *Factors Influencing Buyer Supplier Relationships on Supply Chain Performance of Foreign Based Development Agencies in Kenya* (Doctoral dissertation, JKUAT-COHRED).

Katz, N., Lazer, D., Arrow, H., & Contractor, N. (2004). Network theory and small groups. *Small group research*, *35*(3), 307-332.

Kessels, J. W. (2001). Learning in organisations: a corporate curriculum for the knowledge economy. *Futures*, *33*(6), 497-506.

Kidd, P. T. (1995). Agile manufacturing: a strategy for the 21st century.

Kim, D. (2005, August). An integrated supply chain management system: a case study in healthcare sector. In *International Conference on Electronic Commerce and Web Technologies* (pp. 218-227). Springer, Berlin, Heidelberg.

Kim, D. Y. (2013). Relationship between supply chain integration and performance. *Operations Management Research*, *6*(1-2), 74-90.

Kim, J. (2009). Activity-based framework for cost savings through the implementation of an ERP system. *International Journal of Production Research*, *47*(7), 1913-1929.

Kituzi, A. E. (2016). Influence of E-Procurement on Organizational Performance: The Case of Kenya Association of Manufacturers Firms in Nairobi County, Kenya. *Unpublished Thesis, University of Nairobi*.

Klijn, E. H., & Koppenjan, J. (2012). Governance network theory: past, present and future. *Policy & Politics*, *40*(4), 587-606.

Knolmayer, G. F., Mertens, P., & Zeier, A. (2002). *Supply chain management based on SAP systems: order management in manufacturing companies*. Springer Science & Business Media.

Kocaoğlu, B., Gülsün, B., & Tanyaş, M. (2013). A SCOR based approach for measuring a benchmarkable supply chain performance. *Journal of Intelligent Manufacturing*, *24*(1), 113-132.

Koh, S. L., & Simpson, M. (2005). Change and uncertainty in SME manufacturing environments using ERP. *Journal of manufacturing technology management*.

Koh, S. L., Demirbag, M., Bayraktar, E., Tatoglu, E., & Zaim, S. (2007). The impact of supply chain management practices on performance of SMEs. *Industrial Management & Data Systems*.

Koh, S.C.L., (2004). MRP-controlled batch-manufacturing environment under uncertainty. *Journal of the Operational Research Society* 55 (3), 219–232

Kortabarria, A., Apaolaza, U., Lizarralde, A., & Amorrortu, I. (2018). Material management without forecasting: From MRP to demand driven MRP. *Journal of Industrial Engineering and Management*, *11*(4), 632-650.

Koufteros, X. A., Rawski, G. E., & Rupak, R. (2010). Organizational integration for product development: the effects on glitches, on-time execution of engineering change orders, and market success. *Decision Sciences*, *41*(1), 49-80.

Kuk, G. (2004), "Effectiveness of Vendor-managed inventory in the electronics industry: determinants and outcomes", Information & Management, Vol. 41 No. 5, pp. 645-54

Kumar, G., Banerjee, R. N., Meena, P. L., & Ganguly, K. (2016). Collaborative culture and relationship strength roles in collaborative relationships: a supply chain perspective. *Journal of Business & Industrial Marketing*.

Kumar, R., Singh, R. K., & Shankar, R. (2014). Strategy development by Indian SMEs for improving coordination in supply chain: an empirical study. *Competitiveness Review*.

Kuo, Y., Yang, T., Parker, D., & Sung, C. H. (2016). Integration of customer and supplier flexibility in a make-to-order industry. *Industrial Management & Data Systems*.

Kurbel, K. E. (2013). ERP: Enterprise Resource Planning. In *Enterprise Resource Planning and Supply Chain Management* (pp. 95-126). Springer, Berlin, Heidelberg.

Kyengo, E. N. (2012). Supply Chain Strategy and Competitive Advantage of Nation Media Group Ltd. *Unpublished MBA Project*.

Lai, F., Zhang, M., Lee, D. M., & Zhao, X. (2012). The impact of supply chain integration on mass customization capability: an extended resource-based view. *IEEE Transactions on Engineering Management*, *59*(3), 443-456.

Lalmazloumian, M., Wong, K. Y., Govindan, K., & Kannan, D. (2016). A robust optimization model for agile and build-to-order supply chain planning under uncertainties. *Annals of Operations Research*, *240*(2), 435-470.

Lambert, D. M., & Schwieterman, M. A. (2012). Supplier relationship management as a macro business process. *Supply Chain Management: An International Journal*, *17*(3), 337-352.

Larsson, G., & Lind, E. (2019). *Extending the supply chain horizon* (Master's thesis).

Lau, H. C. W., Wong, C. W. Y., Pun, K. F., & Chin, K. S. (2003). Virtual agent modeling of an agile supply chain infrastructure. Management Decision, 41 (7), 625−634.

Lawton, R. (2002), "Balance your balanced scorecard", Quality Progress, Vol. 35 No. 3, pp. 66-71.

Lee, C. J., & Johnsen, R. E. (2012). Asymmetric customer–supplier relationship development in Taiwanese electronics firms. *Industrial Marketing Management, 41*(4), 692-705.

Lee, C. W., Kwon, I. W. G., & Severance, D. (2007). Relationship between supply chain performance and degree of linkage among supplier, internal integration, and customer. *Supply chain management: an International journal*.

Lee, H.L., So, K.C. and Tang, C.S. (2000) 'The value of information sharing in a two-level supply chain', Management Science, Vol. 46, pp.626–643.

Lengnick-Hall, C. A., Lengnick-Hall, M. L., & Abdinnour-Helm, S. (2004). The role of social and intellectual capital in achieving competitive advantage through enterprise resource planning (ERP) systems. *Journal of Engineering and Technology Management, 21*(4), 307-330.

Lengnick-Hall, C. A., Lengnick-Hall, M. L., & Abdinnour-Helm, S. (2004). The role of social and intellectual capital in achieving competitive advantage through enterprise resource planning (ERP) systems. *Journal of Engineering and Technology Management, 21*(4), 307-330.

Li, L. (2007). *Supply Chain Management: Concepts, Techniques and Practices: Enhancing the Value through Collaboration*. World scientific publishing company.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T. S., & Rao, S. S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. *Omega, 34*(2), 107-124.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T. S., & Rao, S. S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. *Omega, 34*(2), 107-124.

Li, S., Rao, S. S., Ragu-Nathan, T. S., & Ragu-Nathan, B. (2005). Development and validation of a measurement instrument for studying supply chain management practices. *Journal of operations management, 23*(6), 618-641.

Li, V. (2006). *Ethical behaviours in e-commerce-based construction procurement process* (Doctoral dissertation, Queensland University of Technology).

Li, X. (2014). Operations management of logistics and supply chain: Issues and directions. *Discrete Dynamics in Nature and Society, 2014*.

Li, X., Chung, C., Goldsby, T. J., & Holsapple, C. W. (2008). A unified model of supply chain agility: the work-design perspective. *The International Journal of Logistics Management*.

Lin L- & Li T- (2010). An integrated framework for supply chain performance measurement using six-sigma metrics. Software Quality Journal, 18(3), 387-406.

Lin, B., Cole, J.C., Shreveport, E., Shreveport, P., Su, R.K., 2001. Supply chain costing: an activity-based perspective. International Journal of Physical Distribution and Logistics Management 31, 702–713.

Lin, C. H., Hwang, S. L., & Min-Yang Wang, E. (2007). A reappraisal on advanced planning and scheduling systems. *Industrial Management & Data Systems*, *107*(8), 1212-1226.

Lin, L. C., & Li, T. S. (2010). An integrated framework for supply chain performance measurement using six-sigma metrics. *Software Quality Journal*, *18*(3), 387-406.

Liu, H., Ke, W., Wei, K. K., & Hua, Z. (2013). The impact of IT capabilities on firm performance: The mediating roles of absorptive capacity and supply chain agility. *Decision support systems*, *54*(3), 1452-1462.

Liu, X., Yang, J., Qu, S., Wang, L., Shishime, T., & Bao, C. (2012). Sustainable production: practices and determinant factors of green supply chain management of Chinese companies. *Business Strategy and the Environment*, *21*(1), 1-16.

Loughrim, M. (2008). Lean Thinking and Vendor Managed Inventory. A working Paper University of Liverpool

Louw, J. J., & Pienaar, W. J. (2011). Framework for Advanced Supply Chain Planning: Large-Scale Petrochemical Companies. *Corporate Ownership & Control*, *8*(4).

Lummus, R.R., Alber, K. & Vokurka, R.J. 2000. Self-assessments: a foundation for supply chain success. Supply Chain Management Review, 4(3): 81-87.

Luthra, S., Qadri, M. A., Garg, D., & Haleem, A. (2014). Identification of critical success factors to achieve high green supply chain management performances in Indian automobile industry. *International Journal of Logistics Systems and Management 1*, *18*(2), 170-199.

Luu, T. (2017). Market responsiveness: antecedents and the moderating role of external supply chain integration. *Journal of Business & Industrial Marketing*.

Luzzini, D., Brandon-Jones, E., Brandon-Jones, A., & Spina, G. (2015). From sustainability commitment to performance: The role of intra-and inter-firm collaborative capabilities in the upstream supply chain. *International Journal of Production Economics*, *165*, 51-63.

Lyytinen, K., Newman, M., & Al-Muharfi, A. R. A. (2009). Institutionalizing enterprise resource planning in the Saudi steel industry: a punctuated socio-technical analysis. *Journal of Information Technology*, *24*(4), 286-304.

Madhani, P. M. (2017). Customer-focused supply chain strategy: Developing business value-added framework. *IUP Journal of Supply Chain Management*, *14*(4), 7-22.

Madhok, A. (2002). Reassessing the fundamentals and beyond: Ronald Coase, the transaction cost and resource-based theories of the firm and the institutional structure of production. *Strategic Management Journal*, *23*(6), 535-550.

Maduekwe, C. C., & Kamala, P. (2016). Performance measurement by small and medium enterprises in Cape Metropolis, South Africa. *Problems and Perspectives in Management*, *14*(2), 46-55.

Maguire, S., Koh, S. C. L., & Magrys, A. (2007). The adoption of e-business and knowledge management in SMEs. *Benchmarking: An International Journal*.

Maguire, S., Koh, S. C. L., & Magrys, A. (2007). The adoption of e-business and knowledge management in SMEs. *Benchmarking: An International Journal*.

Mahdillou, H., & Akbary, J. (2014). E-procurement adoption, its benefits and costs.

Maina, C. M. (2015). *Effect of transaction costs on choice of mango marketing channel and income of small-scale farmers in Makueni County, Kenya* (Doctoral dissertation, Egerton University).

Major, M. (2007). Activity-based costing and management: a critical review. *Issue in Management Accounting, 3rd ed., Prentice Hall, Harlow*, 155-174.

Makarius, E. E., & Srinivasan, M. (2017). Addressing skills mismatch: Utilizing talent supply chain management to enhance collaboration between companies and talent suppliers. *Business horizons*, *60*(4), 495-505.

Margherita, A., Sharifi, H., & Caforio, A. (2021). A conceptual framework of strategy, action and performance dimensions of organisational agility development. *Technology Analysis & Strategic Management*, *33*(7), 829-842.

Markley, M. J., & Davis, L. (2007). Exploring future competitive advantage through sustainable supply chains. *International Journal of Physical Distribution & Logistics Management*.

Martel, A. & Vieira, D.R. (2008). Análise e projetos de redes logísticas, São Paulo, Saraiva.

Martel, A., & Klibi, W. (2016). Supply Chain Planning and Execution. In *Designing Value-Creating Supply Chain Networks* (pp. 85-119). Springer, Cham.

Martins, R., Serra, F., Leite, A., Ferreira, M. P., & Li, D. (2010). Transactions Cost Theory influence in strategy research: A review through a bibliometric study in leading journals.

Martinsons, M., Davison, M.R. and Tse, D. (1999): The balanced scorecard: A foundation for the strategic management of information systems. *Decision Support Systems* 25(1):71– 88.

Maskell, B. H. (2013). *Performance measurement for world class manufacturing: A model for American companies*. Productivity Press.

Mason-Jones, R., & Towill, D. R. (1999). Total cycle time compression and the agile supply chain. *International journal of production economics*, *62*(1-2), 61-73.

Masson, R., Iosif, L., MacKerron, G., & Fernie, J. (2007). Managing complexity in agile global fashion industry supply chains. *The International Journal of Logistics Management*.

Mavengere, N. B. (2013). Information technology role in supply chain's strategic agility. *International Journal of Agile Systems and Management*, *6*(1), 7-24.

McAdam, R., & McCormack, D. (2001). Integrating business processes for global alignment and supply chain management. *Business Process Management Journal*.

McGregor, S. L., & Murnane, J. A. (2010). Paradigm, methodology and method: Intellectual integrity in consumer scholarship. *International journal of consumer studies*, *34*(4), 419-427.

McNichols, T., & Brennan, L. (2006). Partner Suitability for Collaborative Supply Networks. Int. J. Networking and Virtual Organizations, 3(2), 220–23

Meade, L. M., & Sarkis, J. J. I. J. (1999). Analyzing organizational project alternatives for agile manufacturing processes: an analytical network approach. *International Journal of Production Research*, *37*(2), 241-261.

Mehralian, G., Zarenezhad, F., & Rajabzadeh Ghatari, A. (2015). Developing a model for an agile supply chain in pharmaceutical industry. *International Journal of Pharmaceutical and Healthcare Marketing*, *9*(1), 74-91.

Mehralian, G., Zarenezhad, F., & Rajabzadeh Ghatari, A. (2015). Developing a model for an agile supply chain in pharmaceutical industry. *International Journal of Pharmaceutical and Healthcare Marketing*, *9*(1), 74-91.

Memia, F. K. (2018). *Influence Of Contemporary Supply Chain Practices On Performance Of Large Manufacturing Firms In Kenya* (Doctoral dissertation, JKUAT-COHRED).

Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., & Zacharia, Z. G. (2001). Defining supply chain management. *Journal of Business logistics*, *22*(2), 1-25.

Mettler, T., & Rohner, P. (2009). Supplier relationship management: a case study in the context of health care. *Journal of theoretical and applied electronic commerce research*, *4*(3), 58-71.

Miclo, R., Lauras, M., Fontanili, F., Lamothe, J., & Melnyk, S. A. (2019). Demand Driven MRP: assessment of a new approach to materials management. *International Journal of Production Research*, *57*(1), 166-181.

Midega, S. S. (2011). Investigation of capacity management strategies and their influence on service quality: case of n a1rob1 su pe rm ark ets.

Mikalef, P., Pateli, A., Batenburg, R., & van de Wetering, R. (2014). Business alignment in the procurement domain: a study of antecedents and determinants of supply chain performance. *International Journal of Information Systems and Project Management*, *2*(1), 43-59.

Min, H., & Yu, W. B. V. (2008). Collaborative planning, forecasting and replenishment: demand planning in supply chain management. *International Journal of Information Technology and Management*, *7*(1), 4-20.

Min, H., & Zhou, G. (2002). Supply chain modeling: past, present and future. *Computers & industrial engineering*, *43*(1-2), 231-249.

Min, S., & Mentzer, J. T. (2004). Developing and measuring supply chain management concepts. *Journal of business logistics*, *25*(1), 63-99.

Mishra, P., & Kumar Sharma, R. (2014). A hybrid framework based on SIPOC and Six Sigma DMAIC for improving process dimensions in supply chain network. *International Journal of Quality & Reliability Management*, *31*(5), 522-546.

Mitra, A. (2016). *Fundamentals of quality control and improvement*. John Wiley & Sons.

Modgil, S., & Sharma, S. (2017). Information systems, supply chain management and operational performance: tri-linkage—an exploratory study on pharmaceutical industry of India. *Global Business Review*, *18*(3), 652-677.

Mogikoyo, L. (2016). Supplier evaluation attributes and supply chain performance of commercial state corporations in Kenya (Doctoral dissertation, School of Business, University Of Nairobi).

Møller, C. (2005). ERP II: a conceptual framework for next-generation enterprise systems?. *Journal of Enterprise Information Management*.

Monteverde, K., & Teece, D. J. (1982). Supplier switching costs and vertical integration in the automobile industry. *The Bell Journal of Economics*, 206-213.

Mora-Monge, C. A., Quesada, G., González, M. E., Mueller, J., & Mueller, R. (2010). Impact of e-procurement on procurement practices and performance. *Benchmarking: An International Journal*.

Mose, J. M., Njihia, J. M., & Magutu, P. O. (2013). The critical success factors and challenges in e-procurement adoption among large scale manufacturing firms in Nairobi, Kenya. *European Scientific Journal*, *9*(13).

Mugo, A. N. (2016). *Challenges facing Kenyan micro and small enterprises in accessing East African markets: A case of manufacturing MSEs in Nairobi* (Doctoral dissertation, United States International University-Africa).

Murillo-Oviedo, A., Pimenta, M., Hilletofth, P., & Reitsma, E. (2019). Achieving market orientation through cross-functional integration. *Operations and Supply Chain Management: An International Journal*, *12*(3), 175-185.

Muriuki, J. I., Guyo, W., Odhiambo, R., & Kinoti, J. (2019). Effect of electronic procurement technical support staff on procurement performance in energy sector state corporations in Kenya. *International Journal of Supply Chain Management*, *4*(1), 20-38.

Muscatello, J. R., & Chen, I. J. (2008). Enterprise resource planning (ERP) implementations: theory and practice. *International Journal of Enterprise Information Systems (IJEIS)*, *4*(1), 63-83.

Muysinaliyev, A., & Aktamov, S. (2014). Supply chain management concepts: literature review. *IOSR Journal of Business and Management (IOSR-JBM)*, *15*(6), 60-66.

Mwangi, N. W. (2019). *Influence of Supply Chain Optimization on the Performance of Manufacturing Firms in Kenya* (Doctoral dissertation, JKUAT-COHRED).

Naidoo, K., & Mbhele, T. P. (2018). Epitome of optimum information sharing in a select

Narasimhan, R., Swink, M., & Kim, S. W. (2006). Disentangling leanness and agility: an empirical investigation. *Journal of operations management*, *24*(5), 440-457.

Narayanan, S., Narasimhan, R., & Schoenherr, T. (2015). Assessing the contingent effects of collaboration on agility performance in buyer–supplier relationships. *Journal of Operations Management*, *33*, 140-154.

Naseer, S. (2017). Supply Chain Management Practices Influencing Organizational Performance: A Study of Consumer Goods Industry in Pakistan. *International Journal of Contemporary Research and Review*, *8*(11).

Ndede-Amadi, A. A. (2004). What strategic alignment, process redesign, enterprise resource planning, and e-commerce have in common: enterprise-wide computing. *Business Process Management Journal*.

Ndinda, N. J. (2019). *Strategic orientation, entrepreneurial innovativeness and financial inclusion among women owned Small and Medium Enterprises in North Rift economic block Counties, Kenya* (Doctoral dissertation, Moi University).

Neubert, G., Ouzrout, Y., & Bouras, A. (2004). Collaboration and integration through information technologies in supply chains. *International Journal of Technology Management*, *28*(2), 259-273.

Ngai, E. W., Chau, D. C., & Chan, T. L. A. (2011). Information technology, operational, and management competencies for supply chain agility: Findings from case studies. *The Journal of Strategic Information Systems*, *20*(3), 232-249.

Ngai, E. W., Chau, D. C., & Chan, T. L. A. (2011). Information technology, operational, and management competencies for supply chain agility: Findings from case studies. *The Journal of Strategic Information Systems*, *20*(3), 232-249.

Nguyen, P., & Nguyễn, L. (2017). Performance measurement of supply chain integration in Manufacturing firms' of Southeast Vietnam. *European Journal of Economic and Management*, *6*(2).

Nielsen, B. B., & Michailova, S. (2007). Knowledge management systems in multinational corporations: Typology and transitional dynamics. *Long Range Planning*, *40*(3), 314-340.

Nimeh, H. A., Abdallah, A. B., & Sweis, R. (2018). Lean supply chain management practices and performance: empirical evidence from manufacturing companies. *International Jounal of Supply Chain Management*, *7*(1), 1-15.

Nishiguchi, S., Yamada, M., Nagai, K., Mori, S., Kajiwara, Y., Sonoda, T., ... & Aoyama, T. (2012). Reliability and validity of gait analysis by android-based smartphone. *Telemedicine and e-Health*, *18*(4), 292-296.

Niu, P. (2021). Customization and Performance of Service-Oriented Manufacturing Information System: The Mediating Effect of Information System Flexibility. *Intelligent Information Management*, *13*(1), 1-30.

Njihia, E., & Mwirigi, F. M. (2014). The effects of enterprise resource planning systems on firm's performance: A survey of commercial banks in Kenya. *International journal of business and commerce*, *3*(8), 120-129.

Noreen, E. (1991). Conditions under which activity-based cost systems provide relevant costs. *Journal of Management Accounting Research*, *3*(4), 159-168.

Nyamasege, O. J., & Biraori, O. E. (2015). Effect of supplier relationship management on the effectiveness of supply chain management in the Kenya public sector. *International Journal of Managing Value and Supply Chains*, *6*(1), 25.

Odhiambo, A. C., & Theuri, F. S. (2015). Effects of Public Procurement Processes on Organization Performance. *International Journal of Scientific and Research Publications*, *5*(9).

Oghazi, P., Rad, F. F., Zaefarian, G., Beheshti, H. M., & Mortazavi, S. (2016). Unity is strength: A study of supplier relationship management integration. *Journal of Business Research*, *69*(11), 4804-4810.

Olson, D. L., & Kesharwani, S. (2009). *Enterprise information systems: contemporary trends and issues*. World Scientific.

Ormston, R., Spencer, L., Barnard, M., & Snape, D. (2014). The foundations of qualitative research. *Qualitative research practice: A guide for social science students and researchers*, *2*(7), 52-55.

Oteki, E. B., Namusonge, G. S., Sakwa, M., & Ngeno, J. (2018). Influence of Electronic Order Processing on Supply Chain Performance of Sugar Processing Firms in Kenya.

Ouma, E., Jagwe, J., Obare, G. A., & Abele, S. (2010). Determinants of smallholder farmers' participation in banana markets in Central Africa: the role of transaction costs. *Agricultural economics*, *41*(2), 111-122.

Pacheco-de-Almeida, G. (2002). Time Compression Diseconomies, Asset Mass Efficiencies, and Strategic Investment Decisions. *Insead Ph. D. dissertation, in progress*.

Panahifar, F., Heavey, C., Byrne, P. J., & Fazlollahtabar, H. (2015). A framework for collaborative planning, forecasting and replenishment (CPFR) state of the art. *Journal of Enterprise Information Management*, *28*(6), 838-871.

Panahifar, Farhad. "Developing Causal Relationships for CPFR Index: A System Dynamics Simulation Approach." *Journal of Advanced Management Science Vol* 4, no. 1 (2016).

Panda, S., & Rath, S. K. (2016). Investigating the structural linkage between IT capability and organizational agility: A study on Indian financial enterprises. *Journal of Enterprise Information Management*.

Panizzolo, R., Garengo, P., Sharma, M. K., & Gore, A. (2012). Lean manufacturing in developing countries: evidence from Indian SMEs. *Production Planning & Control*, *23*(10-11), 769-788.

Paulraj, A., Lado, A. A., & Chen, I. J. (2008). Inter-organizational communication as a relational competency: Antecedents and performance outcomes in collaborative buyer–supplier relationships. *Journal of operations management*, *26*(1), 45-64.

Peck, H. (2005). Drivers of Supply Chain Vulnerability: An Integrated Framework. *International Journal of Physical Distribution & Logistics Management*, 35(4), 210–232.

Peñarroja, V., Orengo, V., Zornoza, A., Sánchez, J., & Ripoll, P. (2015). How team feedback and team trust influence information processing and learning in virtual teams: A moderated mediation model. *Computers in Human Behavior*, *48*, 9-16.

Peteraf, M. A. (1993). The cornerstones of competitive advantage: a resource-based view. *Strategic management journal*, *14*(3), 179-191.

Peteraf, M. A., & Barney, J. B. (2003). Unraveling the resource-based tangle. *Managerial and decision economics*, *24*(4), 309-323.

Petersen, K. J., Handfield, R. B., & Ragatz, G. L. (2003). A model of supplier integration into new product development. *Journal of product innovation management*, *20*(4), 284-299.

Petersen, K. J., Ragatz, G. L., & Monczka, R. M. (2005). An examination of collaborative planning effectiveness and supply chain performance. *Journal of Supply Chain Management*, *41*(2), 14-25.

Petroni, A. (2002). Critical factors of MRP implementation in small and medium-sized firms. *International Journal of Operations & Production Management*, *22*(3), 329-348.

Pi, W. N., & Low, C. (2006). Supplier evaluation and selection via Taguchi loss functions and an AHP. *The International Journal of Advanced Manufacturing Technology*, *27*(5-6), 625-630.

Pienaar, W.J. 2010. Logistics Management Aspects of Planning, Implementing and Controlling Commercial Petroleum Pipeline Operations. *Corporate Ownership & Control,* 8(1): 447-455

Piercy, N., & Rich, N. (2009). Lean transformation in the pure service environment: the case of the call service centre. *International journal of operations & production management*.

Pimenta, M. L., da Silva, A. L., & Tate, W. L. (2016). Characteristics of cross-functional integration processes: Evidence from Brazilian organizations. *The International Journal of Logistics Management*.

Plossl, G. W., & Orlicky, J. (1994). *Orlicky's material requirements planning*. McGraw-Hill Professional.

Power, D. (2005). Supply chain management integration and implementation: a literature review. *Supply chain management: an International journal*.

Power, D. J., Sohal, A. S., & Rahman, S. (2001). Critical success factors in agile supply chain management: An empirical study. *International Journal of Physical Distribution and Logistics*, 31(4), 247−265.

Prajogo, D. and Olhager, J. (2012), "Supply chain integration and performance: the effects of long-term relationships, information technology and sharing, and logistics integration", *International Journal of Production Economics*, Vol. 135 No. 1, pp. 514-522.

Prajogo, D., & Olhager, J. (2012). Supply chain integration and performance: The effects of long-term relationships, information technology and sharing, and logistics integration. *International Journal of Production Economics*, *135*(1), 514-522.

Prater, E., Biehl, M., & Smith, M. A. (2001). International supply chain agility-Tradeoffs between flexibility and uncertainty. *International journal of operations & production management*.

Prater, E., Biehl, M., & Smith, M. A. (2001). International supply chain agility-Tradeoffs between flexibility and uncertainty. *International journal of operations & production management, 21*(5/6), 823-839. *progress, 36*(4), 51.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate behavioral research*, *42*(1), 185-227.

Qrunfleh, S. and Tarafdar, M. (2014), "Supply chain information systems strategy: impacts on supply chain performance and firm performance", *International Journal of Production Economics*, Vol. 147 No. Part B, pp. 340-350

Qrunfleh, S., & Tarafdar, M. (2013). Lean and agile supply chain strategies and supply chain responsiveness: the role of strategic supplier partnership and postponement. *Supply Chain Management: An International Journal*.

Qrunfleh, S., & Tarafdar, M. (2014). Supply chain information systems strategy: Impacts on supply chain performance and firm performance. *International Journal of Production Economics*, *147*, 340-350.

Quiescenti, M., Bruccoleri, M., La Commare, U., Noto La Diega, S., & Perrone, G. (2006). Business process-oriented design of Enterprise Resource Planning (ERP) systems for small and medium enterprises. *International Journal of Production Research*, *44*(18-19), 3797-3811.

Raduan, C. R., Jegak, U., Haslinda, A., & Alimin, I. I. (2009). Management, strategic management theories and the linkage with organizational competitive advantage from the resource-based view. *European Journal of Social Sciences*, *11*(3), 402-418.

Ralston, P. M., Blackhurst, J., Cantor, D. E., & Crum, M. R. (2015). A structure–conduct–performance perspective of how strategic supply chain integration affects firm performance. *Journal of Supply Chain Management*, *51*(2), 47-64.

Ramaa, A., Rangaswamy, T. M., & Subramanya, K. N. (2009, December). A review of literature on performance measurement of supply chain network. In *2009 Second International Conference on Emerging Trends in Engineering & Technology* (pp. 802-807). IEEE.

Ramanathan, U., Gunasekaran, A., & Subramanian, N. (2011). Supply chain collaboration performance metrics: a conceptual framework. *Benchmarking: An international journal*.

Ramdas, K., & Spekman, R. E. (2000). Chain or shackles: understanding what drives supply-chain performance. *Interfaces*, *30*(4), 3-21.

Rantanen, J. T. (2016). *Reducing the Impact of Demand Fluctuations Through Supply Chain Collaboration in the Retail Grocery Sector (Available on Internet)* (Master's thesis, Svenska handelshögskolan).

Rao, P., & Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance? *International journal of operations & production management*, *25*(9), 898-916.

Rato, T. J., & Reis, M. S. (2013). Fault detection in the Tennessee Eastman benchmark process using dynamic principal components analysis based on decorrelated residuals (DPCA-DR). *Chemometrics and Intelligent Laboratory Systems*, *125*, 101-108.

Raub, S. P., & Sthapit, B. (2001). Towards a taxonomy of approaches for measuring organizational knowledge. *Research and practice in human resource management*, *9*(1), 139-155.

Razmi, J., Rad, R. H., & Sangari, M. S. (2010). Developing a two-echelon mathematical model for a vendor-managed inventory (VMI) system. *The International Journal of Advanced Manufacturing Technology*, *48*(5-8), 773-783.

Reid, M. K., & Spencer, K. L. (2009). Use of principal components analysis (PCA) on estuarine sediment datasets: the effect of data pre-treatment. *Environmental pollution*, *157*(8-9), 2275-2281.

Reiner, G. and Trcka, M. (2004), "Customized supply chain design: problems and alternatives for a production company in the food industry. A simulation-based analysis", *International Journal of Production Economics*, Vol. 89 No. 2, pp. 217-29.

Rezaei, J., Wang, J., & Tavasszy, L. (2015). Linking supplier development to supplier segmentation using Best Worst Method. *Expert Systems with Applications*, *42*(23), 9152-9164.

Rhodes, M. L., Biondi, L., Gomes, R., Melo, A. I., Ohemeng, F., Perez-Lopez, G., ... & Sutiyono, W. (2012). Current state of public sector performance management in seven selected countries. *International Journal of Productivity and Performance Management*.

Richey, R. G., Roath, A. S., Adams, F. G., & Wieland, A. (2021). A Responsiveness View of logistics and supply chain management. *Journal of Business Logistics*.

Ritchie, J., Lewis, J., & Elam, R. G. (2013). Selecting samples. *Qualitative research practice: A guide for social science students and researchers*, *111*.

Robinson, H. S., Carrillo, P. M., Anumba, C. J., & Al-Ghassani, A. M. (2005). Knowledge management practices in large construction organisations. *Engineering, Construction and Architectural anagement*, *12*(5), 431-445.

Roh, J. J., Min, H., & Hong, P. (2011). A co-ordination theory approach to restructuring the supply chain: An empirical study from the focal company perspective. *International Journal of Production Research*, *49*(15), 4517-4541.

Roldán, R. F., Basagoiti, R., & Coelho, L. C. (2017). A survey on the inventory-routing problem with stochastic lead times and demands. *Journal of Applied Logic*, *24*, 15-24.

Roller, S. A., Lampley, S. A., Dillihunt, M. L., Benfield, M. P., Gholston, S. E., Turner, M. W., & Davis, A. M. (2020). Development and Initial Validation of the Student Interest and Choice in STEM (SIC-STEM) Survey 2.0 Instrument for Assessment of the Social Cognitive Career Theory Constructs. *Journal of Science Education and Technology*, *29*(5), 646-657.

Rosenfeld, A. H., & Poskanzer, D. (2009). A graph is worth a thousand gigawatt-hours: how California came to lead the United States in energy efficiency (innovations case narrative: the California effect). *Innovations: Technology, Governance, Globalization*, *4*(4), 57-79.

Rugman, A. M., & Verbeke, A. (2002). Edith Penrose's contribution to the resource-based view of strategic management. *Strategic management journal*, *23*(8), 769-780.

Runeson, P., & Höst, M. (2009). Guidelines for conducting and reporting case study research in software engineering. *Empirical software engineering*, *14*(2), 131-164.

Saad, M., & Patel, B. (2006). An investigation of supply chain performance measurement in the Indian automotive sector. *Benchmarking: An International Journal*.

Saeed, K. A., Malhotra, M. K., & Grover, V. (2011). Interorganizational system characteristics and supply chain integration: an empirical assessment. *Decision Sciences*, *42*(1), 7-42.

Sagbanşua, L., & Alabay, M. N. (2010). An MRP model for supply chains. *International Business Research*, *3*(4).

Sahay, B. S., & Mohan, R. (2003). Supply chain management practices in Indian industry. *International Journal of Physical Distribution & Logistics Management*.

Salaheldin, S. I., & Francis, A. (1998). A study on MRP practices in Egyptian manufacturing companies. *International Journal of Operations & Production Management*, *18*(6), 588- 611.

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. *MIS quarterly*, 237-263.

Sampler, J. L. (1998). Redefining industry structure for the information age. *Strategic Management Journal*, *19*(4), 343-355.

Sandberg, B. (2007). Customer-related proactiveness in the radical innovation development process. *European Journal of Innovation Management*, *10*(2), 252-267.

Sandberg, E., & Abrahamsson, M. (2010). The role of top management in supply chain management practices. *International Journal of Retail & Distribution Management*, *38*(1), 57-69.

Sanderson, J., Lonsdale, C., Mannion, R., & Matharu, T. (2015). Towards a framework for enhancing procurement and supply chain management practice in the NHS: lessons for managers and clinicians from a synthesis of the theoretical and empirical literature.

Schneeweiss, C., & Zimmer, K. (2004). Hierarchical coordination mechanisms within the supply chain. *European Journal of Operational Research*, *153*(3), 687-703.

Schneider, G. P., Dai, J., Janvrin, D. J., Ajayi, K., & Raschke, R. L. (2015). Infer, predict, and assure: Accounting opportunities in data analytics. *Accounting Horizons*, *29*(3), 719-742.

Scott, C., & Westbrook, R. (1991). New strategic tools for supply chain management. *International Journal of Physical Distribution & Logistics Management*.

Segerstedt, A. (2017). Cover-Time Planning/Takt Planning: A technique for materials requirement and production planning. *International Journal of Production Economics*, *194*, 25-31.

Seifert, D. (2003)," Collaborative Planning, Forecasting and Replenishment: How to Create a Supply Chain Advantage", AMACOM Div American Mgmt Assn, Hamburg.

Sezen, B. (2008). Relative effects of design, integration and information sharing on supply chain performance. *Supply chain management: An international journal*.

Shahab, S., & Allam, Z. (2020). Reducing transaction costs of tradable permit schemes using Blockchain smart contracts. *Growth and Change*, *51*(1), 302-308.

Shakeel, R., Sajjad, H., & Ramish, A. (2018). Towards A Third Party Logistics (3pl) Based Sustainable Supplier Relationship Management Framework. *Journal of Quality and Technology Management*, *15*(2), 01-36.

Shapiro, J. F. (2004). Challenges of strategic supply chain planning and modeling. *Computers & Chemical Engineering*, *28*(6-7), 855-861.

Sharifi, H., Ismail, H. S., & Reid, I. (2006). Achieving agility in supply chain through simultaneous "design of" and "design for" supply chain. *Journal of Manufacturing Technology Management*.

Sharifi, H., Ismail, H. S., & Reid, I. (2006). Achieving agility in supply chain through simultaneous "design of" and "design for" supply chain. *Journal of Manufacturing Technology Management*, *17*(8), 1078-1098.

Sharma, M. K., & Bhagwat, R. (2007). An integrated BSC-AHP approach for supply chain management evaluation. *Measuring Business Excellence*.

Sharma, M. K., Bhagwat, R., & Dangayach, G. S. (2008). Performance measurement of information systems in small and medium sized enterprises: a strategic perspective. *Production Planning and Control*, *19*(1), 12-24.

Shaul, L., & Tauber, D. (2013). Critical success factors in enterprise resource planning systems: Review of the last decade. *ACM Computing Surveys (CSUR)*, *45*(4), 1-39.

Sheffi, Y. (2007). *The resilient enterprise: overcoming vulnerability for competitive advantage*. Zone Books.

Shepherd, C., & Günter, H. (2010). Measuring supply chain performance: current research and future directions. In *Behavioral Operations in Planning and Scheduling* (pp. 105-121). Springer, Berlin, Heidelberg.

Shepherd, C., & Günter, H. (2010). Measuring supply chain performance: current research and future directions. In *Behavioral Operations in Planning and Scheduling* (pp. 105-121). Springer, Berlin, Heidelberg.

Shin, H., Collier, D. A., & Wilson, D. D. (2000). Supply management orientation and supplier/buyer performance. *Journal of operations management*, *18*(3), 317-333.

Siagian, H., Tarigan, Z. J. H., & Jie, F. (2021). Supply chain integration enables resilience, flexibility, and innovation to improve business performance in COVID-19 era. *Sustainability*, *13*(9), 4669.

Simangunsong, E., Hendry, L. C., & Stevenson, M. (2012). Supply-chain uncertainty: a review and theoretical foundation for future research. *International Journal of Production Research*, *50*(16), 4493-4523.

Simatupang, T. M., & Sridharan, R. (2002). The collaborative supply chain. *The international journal of logistics management*, *13*(1), 15-30.

Simatupang, T. M., Wright, A. C., & Sridharan, R. (2004). Applying the theory of constraints to supply chain collaboration. *Supply chain Management: an international journal*.

Simoens, F., & Erlacher, D. (2018). The Utilisation of Strategic Buyer-Supplier Relationships to Effectively Manage Supplier Quality: A Supplier Categorisation Approach.

Sjoerdsma, M., & van Weele, A. J. (2015). Managing supplier relationships in a new product development context. *Journal of Purchasing and Supply Management*, *21*(3), 192-203.

Skipper, J. B., & Hanna, J. B. (2009). Minimizing supply chain disruption risk through enhanced flexibility. *International Journal of Physical Distribution & Logistics Management*.

Skjoett-Larsen, T., Thernøe, C., & Andresen, C. (2003). Supply chain collaboration: Theoretical perspectives and empirical evidence. *International journal of physical distribution & logistics management*, *33*(6), 531-549.

Slack, M. K., & Draugalis Jr, J. R. (2001). Establishing the internal and external validity of experimental studies. *American Journal of Health-System Pharmacy*, *58*(22), 2173-2181.

Soh, K. L., Jayaraman, K., Yen, T. S., & Kiumarsi, S. (2016). The role of suppliers in establishing buyer-supplier relationship towards better supplier performance. *International Journal of Productivity and Quality Management*, *17*(2), 183-197.

Soosay, C. A., & Hyland, P. (2015). A decade of supply chain collaboration and directions for future research. *Supply Chain Management: An International Journal*.

Soosay, C. A., Hyland, P. W., & Ferrer, M. (2008). Supply chain collaboration: capabilities for continuous innovation. *Supply chain management: An international journal*.

Sower, V.E. and Abshire, R.D., (2003). Successful implementation of advanced manufacturing technology: a cross sectional survey. *Int. J. Com. Appl. in Tech.*, 16, 12–20

Spathis, C., & Constantinides, S. (2004). Enterprise resource planning systems' impact on accounting processes. *Business Process management journal*.

Spender, J. C. (1996). Organizational knowledge, learning and memory: three concepts in search of a theory. *Journal of organizational change management*, *9*(1), 63-78.

Stadtler, H. (2005). Supply chain management and advanced planning—basics, overview and challenges. *European journal of operational research*, *163*(3), 575-588.

Stadtler, H., Stadtler, H., Kilger, C., Kilger, C., Meyr, H., & Meyr, H. (2015). *Supply chain management and advanced planning: concepts, models, software, and case studies*. Springer.

Stevenson, M., & Spring, M. (2007). Flexibility from a supply chain perspective: definition and review. *International journal of operations & production management*.

Stevenson, M., Hendry, L. C., & Kingsman, B. G. (2005). A review of production planning and control: the applicability of key concepts to the make-to-order industry. *International journal of production research*, *43*(5), 869-898.

Stevenson, M., Hendry, L.C. and Kingsman, B.G., 2005. A review of production planning and control: the applicability of key concepts to the make-to-order industry. *International Journal of Production Research*, 43 (5), 869-898

Stoll, R.G. (2010), "Collaborative Planning, Forecasting and Replenishment (CPFR): successful implementation attributes", PhD thesis

Stratton, R., & Warburton, R. D. H. (2003). The strategic integration of agile and lean supply. *International Journal of Production Economics*, 85, 183−198.

Stuart, F. I. (1997). Supply-chain strategy: organizational influence through supplier alliances. *British Journal of management*, *8*(3), 223-236.

Su, Y. F., & Yang, C. (2010). Why are enterprise resource planning systems indispensable to supply chain management? *European Journal of Operational Research*, *203*(1), 81-94

Sui, Z., Gosavi, A., & Lin, L. (2010). A reinforcement learning approach for inventory replenishment in vendor-managed inventory systems with consignment inventory. *Engineering Management Journal*, *22*(4), 44-53.

Sulaimon, A. H. A., Adebisi, S. A., & Odiachi, J. M. (2020). Assessing technological capability, as a competitive advantage in the Nigerian insurance industry. *International Journal of Management Concepts and Philosophy*, *13*(3), 217-235.

Sullivan, G. M. (2011). A primer on the validity of assessment instruments. *Journal of graduate medical education*, *3*(2), 119-120.

Sum, C. C., Quek, S. A., & Lim, H. E. (1999). Analysing interaction effects on MRP implementation using ACE. *International Journal of Production Economics*, *58*(3), 303-318.

Sum, C. C., Yang, K. K., Ang, J. S., & Quek, S. A. (1995). An analysis of material requirements planning (MRP) benefits using alternating conditional expectation (ACE). *Journal of Operations Management*, *13*(1), 35-58.

Svensson, G. (2001). Perceived trust towards suppliers and customers in supply chains of the Swedish automotive industry. *International Journal of Physical Distribution and Logistics Management*, 31(9), 647−662.

Swafford, P. M., Ghosh, S., & Murthy, N. (2006). The antecedents of supply chain agility of a firm: scale development and model testing. *Journal of Operations management*, *24*(2), 170-188.

Swafford, P. M., Ghosh, S., & Murthy, N. (2006). The antecedents of supply chain agility of a firm: scale development and model testing. *Journal of Operations management*, *24*(2), 170-188.

Swafford, P. M., Ghosh, S., & Murthy, N. (2008). Achieving supply chain agility through IT integration and flexibility. *International Journal of Production Economics*, *116*(2), 288-297.

Swafford, P. M., Ghosh, S., & Murthy, N. N. (2006). A framework for assessing value chain agility. *International Journal of Operations & Production Management*, *26*(2), 118-140

Swink, M., Narasimhan, R., & Wang, C. (2007). Managing beyond the factory walls: effects of four types of strategic integration on manufacturing plant performance. *Journal of operations management*, *25*(1), 148-164.

Syahira, S.N. (2017). The Factors that Influence Supply Chain Performance. *Available at SSRN 2971679*.

Taha, A., & Hadi, A. S. (2019). Anomaly detection methods for categorical data: A review. *ACM Computing Surveys (CSUR)*, *52*(2), 1-35.

Takeishi, A. (2001). Bridging inter-and intra-firm boundaries: management of supplier involvement in automobile product development. *Strategic management journal*, *22*(5), 403-433.

Tallon, P. P., & Pinsonneault, A. (2011). Competing perspectives on the link between strategic information technology alignment and organizational agility: insights from a mediation model. *MIS quarterly*, 463-486.

Tan, K. C. (2001). A framework of supply chain management literature. *European Journal of Purchasing & Supply Management*, *7*(1), 39-48.

Tan, K.C., Kannan, V.R. and Handfield, R.B. (1998), "Supply chain management: supplier performance and firm performance", *International Journal of Purchasing and Materials Management*, Vol. 34 No. 3, pp. 2-9.

Tarafdar, M., & Qrunfleh, S. (2017). Agile supply chain strategy and supply chain performance: complementary roles of supply chain practices and information systems capability for agility. *International Journal of Production Research*, *55*(4), 925-938.

Tarn, J. M., Yen, D. C., & Beaumont, M. (2002). Exploring the rationales for ERP and SCM integration. *Industrial Management & Data Systems*.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, *18*(7), 509-533.

Terzi, S., & Cavalieri, S. (2004). Simulation in the supply chain context: a survey. *Computers in industry*, *53*(1), 3-16.

Tesfa, A. (2018). *Assessing Bottled Water Supply Chain Management: The Case of Agmas Water* (Doctoral dissertation, Addis Ababa University).

Thakkar, J., Deshmukh, S. G., Gupta, A. D., & Shankar, R. (2007). Development of a balanced scorecard: an integrated approach of interpretive structural modeling (ISM) and analytic network process (ANP). *International Journal of Productivity and Performance Management*.

Thakur, V., & Anbanandam, R. (2015). Supplier selection using grey theory: a case study from Moeller, S., Fassnacht, M., & Klose, S. (2006). A framework for supplier relationship management (SRM). *Journal of Business-to-Business Marketing*, *13*(4), 69-94.Indian banking industry. *Journal of Enterprise Information Management*, *28*(6), 769-787.

Themido, I., Arantes, A., Fernandes, C., & Guedes, A. P. (2000). Logistic costs case study—an ABC approach. *Journal of the Operational Research Society*, *51*(10), 1148-1157.

Thiga, H. K., & Makau, G. (2016). Factors influencing adoption of electronic procurement in Kenyan public sector: A survey of selected government agencies. *Int. J. Sci. Res. Publ*, 1-7.

Thomas, J. (1999). Why your supply chain doesn't work. *Logistics Management and Distribution Report, 38*(6), 42–44.

Toffel, M. W. (2008). Contracting for servicizing. *Harvard Business School Technology & Operations Mgt. Unit Research Paper*, (08-063).

Tolbize, A. (2008). Generational differences in the workplace. *Research and training center on community living*, *5*(2), 1-21.

Tolone, W. J. (2000). Virtual situation rooms: connecting people across enterprises for supply-chain agility. *Computer-Aided Design, 32*(2), 109-117.

Torri, M. C., & Martinez, A. (2014). Women's empowerment and micro-entrepreneurship in India: Constructing a new development paradigm? *Progress in Development Studies*, *14*(1), 31-48.

Towers, N., Knibbs, A., & Panagiotopoulos, N. (2005). Implementing manufacturing resource planning in a Greek aerospace company: A case study. *International Journal of Operations & Production Management, 25*(3), 277-289.

Tran, T. T. H., Childerhouse, P., & Deakins, E. (2016). Supply chain information sharing: challenges and risk mitigation strategies. *Journal of Manufacturing Technology Management*.

Trent, R. J. (2008). *End-to-end lean management: a guide to complete supply chain improvement*. J. Ross Publishing.

Tsai, W. H., & Hung, S. J. (2009a). A fuzzy goal programming approach for green supply chain optimization under activity-based costing and performance evaluation with a value chain structure. *International Journal of Production Research*, 47, 4991–5017.

Tsai, W. H., & Hung, S. J. (2009b). Treatment and recycling system optimization with activity- based costing in WEEE reverse logistics management: An environmental supply chain perspective. *International Journal of Production Research*, 47, 5391–5420

Tsai, W. H., Lai, C. W., Tseng, L. J., & Chou, W. C. (2008). Embedding management discretionary power into an ABC model for a joint product mix decision. *International Journal of Production Economics*, *115*(1), 210-220.

Tseng, M. L., Tan, R. R., & Siriban-Manalang, A. B. (2013). Sustainable consumption and production for Asia: sustainability through green design and practice. *Journal of Cleaner Production*, *40*, 1-5.

Tsironis, L. K., Dimitriadis, S. D., & Papathanasiou, J. (2019). The essence of supply chain collaboration: a consideration of information sharing types and benefits (SC-Info-Shr). *International Journal of Decision Sciences, Risk and Management*, *8*(4), 292-320.

Tuck, C., Hague, R., & Burns, N. (2007). Rapid manufacturing: impact on supply chain methodologies and practice. *International journal of services and operations management, 3*(1), 1-22.

Tuli, F. (2010). The basis of distinction between qualitative and quantitative research in social science: Reflection on ontological, epistemological and methodological perspectives. *Ethiopian Journal of Education and Sciences*, *6*(1).

Tyan, J. and Wee, H.M. (2003). Vendor managed inventory: a survey of the Taiwanese grocery industry. *Journal of Purchasing & Supply Management*, Vol. 9 No. 1, pp. 11-18.

Ugboma, C., Ogwude, I. C., Ugboma, O., & Nnadi, K. (2007). Service quality and satisfaction measurements in Nigerian ports: an exploration. *Maritime Policy & Management*, *34*(4), 331-346.

Ulusoy, G. (2003), "An assessment of supply chain and innovation management practices in the manufacturing industries in Turkey", *International Journal of Production Economics*, Vol. 86, pp. 251-70.

Um, J. (2017). The impact of supply chain agility on business performance in a high level customization environment. *Operations management research*, *10*(1-2), 10-19.

Ursachi, G., Horodnic, I. A., & Zait, A. (2015). How reliable are measurement scales? External factors with indirect influence on reliability estimators. *Procedia Economics and Finance*, *20*, 679-686.

van Beek, T. A., & Montoro, P. (2009). Chemical analysis and quality control of Ginkgo biloba leaves, extracts, and phytopharmaceuticals. *Journal of Chromatography A*, *1216*(11), 2002-2032.

Van de Valk, L. J., & Constas, M. A. (2011). A methodological review of research on leadership development and social capital: Is there a cause and effect relationship?. *Adult Education Quarterly*, *61*(1), 73-90.

Van Hoek, R. I., Harrison, A., & Christopher, M. (2001). Measuring agile capabilities in the supply chain. *International Journal of Operations & Production Management*.

Van Weele, A. J., & Van Raaij, E. M. (2014). The future of purchasing and supply management research: About relevance and rigor. *Journal of Supply Chain Management*, *50*(1), 56-72.

Verma, D., Dixit, R. V., & Singh, K. (2018). Green Supply Chain Management: A Necessity for Sustainable Development. *IUP Journal of Supply Chain Management*, *15*(1).

Vickery, S. K., Droge, C., Setia, P., & Sambamurthy, V. (2010). Supply chain information technologies and organizational initiatives: complementary versus independent effects on agility and firm performance. *International Journal of Production Research*, *48*(23), 7025-7042.

Vickery, S. K., Jayaram, J., Droge, C., & Calantone, R. (2003). The effects of an integrative supply chain strategy on customer service and financial performance: an analysis of direct versus indirect relationships. *Journal of operations management*, *21*(5), 523-539.

Victor, J., & Kimencu, L. (2017). *Enterprise Resource Planning System and Performance of State Corporations in Kenya.*

Vokurka, R. J., & Lummus, R. R. (2003). Better supply chains with Baldrige. *Quality*

Vonderembse, M. A., & Tracey, M. (1999). The impact of supplier selection criteria and supplier involvement on manufacturing performance. *Journal of supply chain management*, *35*(2), 33-39.

Voß, S., & Woodruff, D. L. (2006). *Introduction to computational optimization models for production planning in a supply chain* (Vol. 240). Springer Science & Business Media.

Wagner, E. L., Moll, J., & Newell, S. (2011). Accounting logics, reconfiguration of ERP systems and the emergence of new accounting practices: A sociomaterial perspective. *Management accounting research*, *22*(3), 181-197.

Wagner, S. M., & Bode, C. (2006). An empirical investigation into supply chain vulnerability. *Journal of purchasing and supply management*, *12*(6), 301-312.

Wakaisuka-Isingoma, J., Aduda, J., Wainaina, G., & Mwangi, C. I. (2016). Corporate governance, firm characteristics, external environment and performance of financial institutions in Uganda: A review of literature. *Cogent Business & Management*, *3*(1), 1261526.

Walker, G., & Poppo, L. (1991). Profit centers, single-source suppliers, and transaction costs. *Administrative science quarterly*, 66-87.

Walker, G., & Weber, D. (1987). Supplier competition, uncertainty, and make-or-buy decisions. *Academy of Management journal*, *30*(3), 589-596.

Waller, M., Johnson, E.M. and Davis, T. (1999), "Vendor managed inventory in the retail supply chain", Journal of Business Logistics, Vol. 20 No. 1, pp. 183-203.

Walton, R. E., & Goldsmith, L. T. (1986). Affective Signatures: Emotional Concomitants of Developmental Change.

Wanjiru, G. M. (2018). *Study on fleet safety in selected beverage industries in Nairobi County, Kenya* (Doctoral dissertation, JKUAT-COHES).

Watson, G. S., & Durbin, J. (1951). Exact tests of serial correlation using noncircular statistics. *The Annals of Mathematical Statistics*, 446-451.

Wei, Y. S., & Wang, Q. (2011). Making sense of a market information system for superior performance: The roles of organizational responsiveness and innovation strategy. *Industrial Marketing Management*, *40*(2), 267-277.

Wellenbrock, M. (2013). Theoretical Basis of Supply Management the Network Theory in Supply Management. University of Twente, Netherlands

Westaby, J. D., Pfaff, D. L., & Redding, N. (2014). Psychology and social networks: A dynamic network theory perspective. *American Psychologist*, *69*(3), 269.

Wieder, B., Booth, P., Matolcsy, Z. P., & Ossimitz, M. L. (2006). The impact of ERP systems on firm and business process performance. *Journal of Enterprise Information Management*.

Wieteska, G. (2016). Building resilient relationships with suppliers in the B2B market. *Management*, *20*(2), 307-321.

Wikner, J., Towill, D.R. and Naim, M.M. (1991), "Smoothing supply chain dynamics", *International Journal of Production Economics*, Vol. 22 No. 2, pp. 231-48.

Wilding, R., Wagner, B., Gligor, D. M., & Holcomb, M. C. (2012). Understanding the role of logistics capabilities in achieving supply chain agility: a systematic literature review. *Supply Chain Management: An International Journal*.

Wilding, R., Wagner, B., Gligor, D. M., & Holcomb, M. C. (2012). Understanding the role of logistics capabilities in achieving supply chain agility: a systematic literature review. *Supply Chain Management: An International Journal*.

Williamson, O. E. (1988). Technology and transaction cost economics: a reply. *Journal of Economic Behavior & Organization*, *10*(3), 355-363.

Williamson, O. E. (2005). Transaction cost economics and business administration. *Scandinavian journal of Management*, *21*(1), 19-40.

Williamson, O. E. (2008). Transaction cost economics. In *Handbook of new institutional economics* (pp. 41-65). Springer, Berlin, Heidelberg.

Wilson, J. M. (2016). The origin of material requirements planning in Frederick W. Taylor's planning office. *International Journal of Production Research*, *54*(5), 1535-1553.

Wisner, J. D. (2003). A structural equation model of supply chain management strategies and firm performance. *Journal of Business logistics*, *24*(1), 1-26.

Wisner, J. D., Tan, K. C., & Leong, G. K. (2014). *Principles of supply chain management: A balanced approach*. Cengage Learning.

Won Lee, C., Kwon, I. W. G., & Severance, D. (2007). Relationship between supply chain *chain management: an international journal*, *12*(6), 444-452.

Wook K. S. (2006). The effect of supply chain integration on the alignment between corporate Competitive capability and supply chain operational capability. *International Journal of Operations & Production Management*, *26*(10), 1084-1107.

Wu, J., Dunn, S., & Forman, H. (2012). A study on green supply chain management practices among large global corporations. *Journal of Supply Chain and Operations Management*, *10*(1), 182-194.

Wu, L., Chuang, C. H., & Hsu, C. H. (2014). Information sharing and collaborative behaviors in enabling supply chain performance: A social exchange perspective. *International Journal of Production Economics*, *148*, 122-132.

Xu, Y., Yen, D. C., Lin, B., & Chou, D. C. (2002). Adopting customer relationship management technology. *Industrial management & data systems*.

Yang, B., Burns, N. D., & Backhouse, C. J. (2004). Postponement: a review and an integrated framework. *International Journal of Operations & Production Management*.

Yang, J. (2014). Supply chain agility: Securing performance for Chinese manufacturers. *International Journal of Production Economics*, *150*, 104-113.

Yang, S. L., & Li, T. F. (2002). Agility evaluation of mass customization product manufacturing. *Journal of Materials Processing Technology*, *129*(1-3), 640-644.

Yao, Y., Dong, Y., & Dresner, M. (2010). Managing supply chain backorders under vendor managed inventory: An incentive approach and empirical analysis. *European Journal of Operational Research*, *203*(2), 350-359.

Yao, Y., Kohli, R., Sherer, S. A., & Cederlund, J. (2013). Learning curves in collaborative planning, forecasting, and replenishment (CPFR) information systems: an empirical analysis from a mobile phone manufacturer. *Journal of operations management*, *31*(6), 285-297.

Youn, S.H., Yang, M., Ga, M., Kim, J.H. and Hong, P. (2014), "Supply chain information capabilities and performance outcomes: an empirical study of Korean steel suppliers", International Journal of Information Management, Vol. 34 No. 3, pp. 369-380.

Yul, S. and Kyu, K. (2015), "Expert systems with applications the impact of knowledge complementarities on supply chain performance through knowledge exchange", *Expert Systems with Applications*, Vol. 42 No. 6, pp. 3029-3040, doi: 10.1016/j.eswa.2014.11.055.

Yusuf, Y. Y., Gunasekaran, A., Adeleye, E. O., & Sivayoganathan, K. J. E. J. O. O. R. (2004). Agile supply chain capabilities: Determinants of competitive objectives. *European journal of operational research*

Yusuf, Y. Y., Gunasekaran, A., Adeleye, E. O., & Sivayoganathan, K. J. E. J. O. O. R. (2004). Agile supply chain capabilities: Determinants of competitive objectives. *European journal of operational research*, *159*(2), 379-392.

Yusuf, Y. Y., Gunasekaran, A., Adeleye, E. O., & Sivayoganathan, K. (2004). Agile supply chain capabilities: Determinants of competitive objectives. *European Journal of Operational Research*, 159, 379−392.

Yusuf, Y. Y., Gunasekaran, A., Musa, A., Dauda, M., El-Berishy, N. M., & Cang, S. (2014). A relational study of supply chain agility, competitiveness and business performance in the oil and gas industry. *International Journal of Production Economics*, *147*, 531-543.

Yusuf, Y. Y., Sarhadi, M., & Gunasekaran, A. (1999). Agile manufacturing:: The drivers, concepts and attributes. *International Journal of production economics*, *62*(1-2), 33-43.

Zachariassen, F., de Haas, H. and Burkland, S. (2014), Vendor Managed Inventory: Why you need to talk to your supplier", *Journal of Industrial Engineering and Management*, Vol.7, No.4, pp.831-856.

Zain, M., Rose, R. C., Abdullah, I., & Masrom, M. (2005). The relationship between information technology acceptance and organizational agility in Malaysia. *Information & management*, *42*(6), 829-839.

Zanello, G., Srinivasan, C. S., & Shankar, B. (2014). Transaction costs, information technologies, and the choice of marketplace among farmers in Northern Ghana. *The Journal of Development Studies*, *50*(9), 1226-1239.

Zhang, Q., Vonderembse, M. A., & Lim, J. S. (2002). Value chain flexibility: a dichotomy of competence and capability. *International journal of production research*, *40*(3), 561-583.

Zhang, X. (2004). *An integrated inventory model for supply chain management*.

Zhao, X., Lynch Jr, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of consumer research*, *37*(2), 197-206.

Zheng, S., Yen, D. C., & Tarn, J. M. (2000). The new spectrum of the cross-enterprise solution: the integration of supply chain management and enterprise resources planning systems. *Journal of Computer Information Systems*, *41*(1), 84-93.

Zhong, R. Y., Newman, S. T., Huang, G. Q., & Lan, S. (2016). Big Data for supply chain management in the service and manufacturing sectors: Challenges, opportunities, and future perspectives. *Computers & Industrial Engineering*, *101*, 572-591.

Zhu, Q., Sarkis, J., & Lai, K. H. (2008). Confirmation of a measurement model for green supply chain management practices implementation. *International journal of production economics*, *111*(2), 261-273.

Zineldin, M. (2006). The quality of health care and patient satisfaction: an exploratory investigation of the 5Qs model at some Egyptian and Jordanian medical clinics. *International journal of health care quality assurance*.

Zsidisin, G. A., Lamming, R., Harland, C., Wynstra, F., Ancarani, A., Tate, W. L., & Knight, L. (2019). Reflecting on the past 25 years of the journal of purchasing and supply management: The editors′ perspectives. *Journal of Purchasing and Supply Management*, *25*(4), 100559.

APPENDICES

Appendix I: Questionnaire

LETTER OF INTRODUCTION TO MANUFACTURING FIRMS IN NAIROBI

Robert Bett Chumba

School of Business and Economics,

Moi University,

P O BOX 3900

Eldoret.

Dear Sir/Madam

I am a student at Moi University School of business and economics, pursuing PHD and carrying out a research study on '*Effects of supply chain advanced planning system, supplier relationship, and supplier agility on firm supply chain performance among manufacturing firms in Nairobi County, Kenya'* you have been selected as a participant in this study and your cooperation will be highly appreciated. Attached is a questionnaire, you are requested to give your honest opinion about the research study. The information will be used for the purpose of this research only and shall be accorded all the confidentiality.

Thank you in advanced,

Yours faithfully

ROBERT BETT CHUMBA

Instructions: Please answer all questions in all the sections provided

SECTION A:

This questionnaire has been designed for the sole purpose of collecting data on **EFFECTS OF SUPPLY CHAIN ADVANCED PLANNING SYSTEM, SUPPLIER RELATIONSHIP, SUPPLIER AGILITY AND FIRM SUPPLY CHAIN PERFORMANCE AMONG MANUFACTURING FIRMS IN NAIROBI COUNTY, KENYA**. The data collected will be treated with a very high degree of confidentiality and it is meant for academic purpose only.

You are kindly asked to fill out this questionnaire by putting an "X" in front of the applicable answer or in the applicable cell.

(Optional)

Name……..

Company……

Section A: General Information

1. Age of the respondent ……
2. Gender: Male

   Female
3. Level of Education (*select one*)

   Postgraduate ☐

   Undergraduate ☐

   Higher Diploma ☐

   Diploma ☐

   Secondary ☐
4. Duration Company has been in operation

   Less than 5 years ☐

   5-10 years ☐

   11-15 years ☐

   Above15 years ☐

5. What is your position in this organization? (tick)

   i. Chief executive officer ☐

   ii. Supply chain manager ☐

Part 1

1. **Please indicate your level of agreement with the following statements: the categories are**
2. **1= strongly disagree 2= Disagree 3=Neutral 4= agree 5= strongly agree**

Supply Chain organizational Performance	Cycle the appropriate for each				
Our company delivers goods on time	**1**	**2**	**3**	**4**	**5**
We deliver quality goods	**1**	**2**	**3**	**4**	**5**
Achievement of defect freer deliveries	**1**	**2**	**3**	**4**	**5**
Delivery flexibility	**1**	**2**	**3**	**4**	**5**
We have the distribution capability	**1**	**2**	**3**	**4**	**5**
Our company quickly reconfigures supply chain operations to address changes in the environment.(speed response	**1**	**2**	**3**	**4**	**5**
Our company meets customers specifications	**1**	**2**	**3s**	**4**	**5**
The company's profits has increased due to Procurement practices	**1**	**2**	**3**	**4**	**5**

Part II

1. **Please indicate your level of agreement with the following statements: the categories are**

1= strongly disagree 2= Disagree 3=Neutral 4= agree 5= strongly agree

Supplier Relationship	Cycle the appropriate for each				
The success of the firms supply chain can be attributed to long term strategic partner relationships with key suppliers	**1**	**2**	**3**	**4**	**5**
The organizations desired quality of goods and services has been achieved and maintained by suppliers	**1**	**2**	**3**	**4**	**5**
The organization has uncovered and realized new value from collaborative relations with suppliers	**1**	**2**	**3**	**4**	**5**
The organization strategically plan for, and manages all interactions with third party organizations that supply goods and/or services	**1**	**2**	**3**	**4**	**5**
The organization collaborates with suppliers to detect risks in the procurement process	**1**	**2**	**3**	**4**	**5**

Part III

1. **Please indicate your level of agreement with the following statements: the categories are**

1= strongly disagree 2= Disagree 3=Neutral 4= agree 5= strongly agree

Supplier Agility	Cycle the appropriate for each				
Our organization can response to changes in production and services	**1**	**2**	**3**	**4**	**5**
Our company is responsive to processing market demand on new products.	**1**	**2**	**3**	**4**	**5**
There is a great degree of dependability among partners in the supply chain	**1**	**2**	**3**	**4**	**5**
We improve product and volume flexibility along the supply chain	**1**	**2**	**3**	**4**	**5**
We acquire and disseminate information as part organization learning	**1**	**2**	**3**	**4**	**5**

Part IV

1. **Please indicate your level of agreement with the following statements: the categories are**

1= strongly disagree 2= Disagree 3=Neutral 4= agree 5= strongly agree

Supply chain Advanced planning systems	Cycle the appropriate for each				
We use collaborative planning, forecasting, and replenishment (CPFR)	**1**	**2**	**3**	**4**	**5**
We use material requirements planning (MRP) systems	**1**	**2**	**3**	**4**	**5**
Our organization adopt activity-based costing (ABC) accounting methods	**1**	**2**	**3**	**4**	**5**
We use enterprise resource planning (ERP) system	**1**	**2**	**3**	**4**	**5**
We use Vendor Managed Inventory (VMI) to manage work-in-process inventories	**1**	**2**	**3**	**4**	**5**

Appendix II: List of Manufacturing Companies in Kenya

1.AAM Resources
2.ABC packaging co
3.Acces Development Ltd.
4.Acquila Development Co. Ltd.
5.Adafric manufacturing Ltd
6.Adpak International Ltd
7.Africa Spirits Ltd
8.African Banking Corporation Limited (ABC Bank)
9.African Cotton Industries Ltd
10.Auto Spirings Manufacturers Ltd
11.Autolitho electrical Ltd
12.Autosterile (EA)
13.Avery (East Africa) Ltd
14.Avery Dennison
15.Aviano East Africa Ltd
16.Bag and Envelope Converters Ltd
17.Bakers Corner Ltd
18.Bakex Millers Ltd
19.Bamburi Cement Ltd
20.Banbros Ltd
21.Bank of Africa
22.Basco Products (K) Ltd
22.Basf East Africa Ltd
23.Baumann Engineering Ltd
24.Bayer East Africa Ltd
25.Beberavi Collection Ltd
26.Beiersdorf East Africa Ltd
27.Belfast Millers Ltd
28.Beta Healthcare International Ltd
29.Betatrad (K) Ltd
30.Bevarage Services (K) Ltd
31.Bhachu Industries Ltd
32.Bio Food Products Ltd
33.Biodeal Laboratories Ltd
34.Biopharma Ltd
35.Blue Nile Wire Products Ltd
36.Blue Ring Products Ltd
37.Bluekey Software Solutions (K) Ltd
38.BMG Holdings Ltd
39.Bobmil Industries Ltd
40.Boc Kenya Ltd
41.Boyama Building Materials
42.Brand ID Technologies (EA) Ltd
43.Brand Printers
44.Breakfast Cereal Company (K) Ltd
45.Britich American Tobacco Kenya Ltd
46.Broadband Communications Network Limited
47.Broadway Bakery Ltd
48.Brush Manufacturers
49.Budget Furniture
50.Budget Shoes Ltd
51.Bureau Varitas Kenya Ltd
52.Buyline Industries Ltd
53.C & P Shoes Industries ltd
54.C. Dormans Ltd
55.C. CzarnikowSugar (EA) Ltd
56.Cadbury Kenya Ltd
57.Canaaneast Company Ltd
58.Candy Kenya Ltd
59.Canon Chemicals Ltd (former United Food Chemicals Ltd)
60.Capel Food Ingredients
61.Capital Colors Creative Designers Ltd
62.Carbacid (CO2) Ltd
63.Carton Manufacturers Ltd
64.Central Glass Industries Ltd
65.Centurion Systems Ltd
66.Ceven Limited
67.CFC industries
68.CFL manufacturing ltd
69.Chalange Industries Ltd
70.Chandaria Industries Ltd
71.Chase manufacturing Ltd
72.Chemicals and Solvents (EA) Ltd
73.Chirag Kenya Ltd
74.Choda Fabricators Ltd
75.Chrysal Africa Ltd
76.Chryso East Africa Limited
77.Chui Auto Springs Industries Ltd
78.Cica Motors
79.Citigroup industries Kenya
80.City Engineering Works Ltd
81.City Clock (K) Ltd
82.Cityscape Trends Services Ltd
83.CMC Motors Group Ltd
84.Colour Labels Ltd
85.Colour Packaging Ltd
86.Colourprint Ltd
87.C&n manufacturing
88.Complast Industries ltd
89.Compulynx Ltd
90.Coninx Industries Ltd
91.Consumer Options Ltd
92.Control Risk East Africa
93.Cooper K-Brands Ltd
94.Cooperative Bank of Kenya
95.Corn Products Kenya Ltd
96.Corporate Facilities
97.Cosmos Ltd
98.Crop mafucturing Ltd
99.Crown Beverages
100.Crown Paints (Kenya) Ltd
101.Crystal Industries Ltd
102.Danish Cleantech Group

103.Danone industries
104.Davis & Shirtliff Ltd
105.Dawa Ltd
106.De La Rue Currency and Security Print Ltd
107.Decase Chemicals (Ltd)
108.Delegation of German Industries
109.Deloitte & Touche
110.Deluxe Inks Ltd
111.Desbro Kenya Ltd
112.Dharamshi & Co. Ltd
113.Digital Hub Limited
114.Digitech East Africa
115.Dodhia Packaging Ltd
116.Dodi Autotech (K) Ltd
117.DPL industriesLtd
118.Dynaplas Ltd
119.e Management Africa
120.East Africa Packaging Industries Ltd
121.East Africa Spectre Ltd
122.East African Breweries Ltd
123.East African Cables Ltd
124.East African inustries (Kenya)
125.East African Foundry Works (K) Ltd
126.East African Glassware Mart Ltd
127.East African Sea Food Ltd
128.Eastern Produce Kenya Ltd (Kakuzi)
129.Easy manufacturing Ltd
130.Economic industry Group Ltd
131.Economic Industries Ltd
132.Edible Oil Products Ltd
133.Elegant Printing Works Limited
134.Elekea Ltd
135.Elex Products Ltd
136.Elgon Kenya Ltd
137.Elite Tools Ltd
138.Ellams Products
139.Elle Kenya Limited
140.Elys Chemicals Industries Ltd
141.E-Momentum Interactive Systems Ltd
142.English printing Press Ltd
143.Ennsvalley Bakery Ltd
144.Enviro-Hub Holdings Ltd
145.Erdemann Co. (K) Ltd
146.Ernst & Young Ltd
147.Eslon Plastics of Kenya Ltd
148.Essential Manufacturing
149.Ethical Fashion Artisons EPZ Ltd
150.Euro Packaging Ltd
151.Europack Industries Ltd
152.Excel Chemicals Ltd
153.Farm refrigeration & Electrical Systems Ltd
154.Farmers Choice Ltd
155.Fine Engineering
156.Fine Wood Works Ltd
157.Finlay Brushware Ltd
158.Five Star Industries Ltd
159.Flair Kenya Ltd
160.Flamingo Tiles (Kenya) Limited
161.Forces Equipment (Kenya) Ltd
162.Fortunes Printers & Stationers Ltd
163.Foton East Africa Ltd
164.Franciscan Kolbe Press
165.Fresh Produce Exporters Association of Kenya
166.Friendship Container Manufacturers Ltd
167.Frigoken Ltd
168.From Eden
169.Furniture International Ltd
170.Galaxy Paints & Coating Co. Ltd
171.GE East Afrika Service Ltd
172.General Alluminium Fabricators Ltd
173.General Mills East Africa Limited
174.General Motors East Africa Ltd
175.General Plastics Ltd
176. General Printers Ltd
177.Giloil Company Ltd
178.Glaciers Product (Amor Mia,Dairyland,Mio)
179.GlaxoSmithkline Kenya Ltd
180.Global Fresh Ltd
181.Gonas Best Ltd
182.Gone Fishing Ltd
183.Grain Industries Ltd
184.Green Forest Food Ltd
185.GS1 Kenya
186.Guaca Stationers Ltd
187.H.B Fuller Ltd
188.Haco Tiger brands East Africa Ltd
189.Halliday Finch Ltd
190.Harveer Bas Body Builders Ltd
191.Heavy Engineering Ltd
192.Henkel Kenya Ltd
193.Henkel Polymer
194.Highchem East Africa Ltd
195.Highlands Canners Ltd
196.Hi-Plast Ltd
197.Hi- Tech Inks and Coatings
198.Holman Brothers (E.A) Ltd
199.Honda Motorcycle
200.Honey Care Africa Ltd
201.Imani Flowers Ltd
202.Industrial & Commercial Development Corporation
203.Industrial and Scientific Support Services Ltd

204.Industrial Promotion Services
205.Insight Kenya
206.Insight Management Consultants Ltd
207.Insteel Ltd
208.Institute of Packaging Professionals
209.Interconsumer Products Ltd
210.International Energy Technik Ltd
211.International Green Pastures Manufacturing Kenya Ltd
212.International Paper & Board Supplies Ltd
313.International Supply Chain Solutions Ltd
214.Intersoft Ltd
215.Intertek International Ltd
216.Intraspeed Arcpro
217.Iron Art Ltd
218.Jambo Biscuits (K) Ltd
219.Jamlam Industries Ltd
220.JohnsonDiversity East & Central Africa Ltd
221.Josper Occupational Health & Safety
222.Jumbo Chem
223.Jumbo Quality Products
224.Just Plastics
225.Kaizen Institute Africa
226.Kaluworks Ltd
227.KAM Industries Ltd
228.Kamba Manufacturing (1986) Ltd
229.Kamili Packers Ltd
230.Kankam industries Ltd
231.Kanku Kenya Limited
232.Kapa Oil Refineries Ltd
233.Kariran Estate Ltd
234.Kartasi Industries Ltd
235.Kedsta Investment Limited
236.Kema E.A Ltd
237.Kemia International Ltd
238.Ken Nat Ink &Chemical Ltd
239.Kenafric Dairies Manufacturers Ltd
240.Kenafric Industries Ltd
241.Kenbro Industries Ltd
242.Kenchic Ltd
243.Kenpoly Manufacturers Ltd
244.Kens Metal Industries Ltd
245.Kentainers Ltd
246.Kenwest Cables Ltd
247.Kenya Breweries ltd
248.Kenya Builders & Concrete Ltd
249.Kenya Coach Industries Ltd
250.Kenya Fire Appliances Company Ltd
251.Kenya Flower Council
252.Kenya Horticultural Exporters(1977)
253.Kenya National Cleaner Production Centre
254.Kenya Power & Lighting Company Ltd
255.Kenya Stationers Ltd
256.Kenya Sweets Ltd
257.Kenya Tea Development Agency
258.Kenya Trading (EPZ) Ltd
259.Kenya Wines Agencies Ltd
260.Kenya Wood Ltd
261.KhetshiDharamshi & Co.Ltd
262.Kibo Africa Ltd
263.Kikoy Co. Ltd
264.Kim-Fay East Africa Ltd
265.King Finn Kenya
266.Kinpash Enterprises Ltd
267.Kip Melamine Co. Ltd
268.Kirinyaga Flour Millers
269.Knights & Apps Limited
270.Koto Housing Kenya Ltd
271.Kuguru Food Complex Ltd
272.Kwale International Company
273.Kwality Candies & Sweets Ltd
274.L.G.Harris & Co. Ltd
275.L'Oreal East Africa Ltd
276.Label Converters
277.Labh Singh Harran Singh Ltd
278.Laboratory & Allied Ltd
279.Lanneb Plastic Industries Ltd
280.Lean Energy Solutions Ltd
281.Le-Stud Ltd
282.Libya Oil Kenya Ltd(Formerly MobilOil Kenya)
283.Load Trailers
284.Lynxbits Global Limited
285.Machinery and equipment consultants
289.Magnate Ventures Ltd
290.Mahee Flowers
291.Mainport Training and inspection Kenya Limited
292.Malplast Industries Ltd
293.Manchester Outfitters
294.Manipal International Printing Press Ltd
295.Manji Food Industries Ltd
296.Mann Manufacturers Co. Ltd
297.Manufacturers & Supplies (K) Ltd
298.Maroo Polymers Ltd
299.Marshall Fowler (Engineers) Ltd
300.Marubeni Corporation Nairobi Office

301.Marvel Lifestyle Ltd
302.Master Fabricators Ltd
303.Mastermind Tobacco (K) Ltd
304.Match Masters Ltd
305.Matengo Githae & Associates
306.Mecol Ltd
307.Megh Cushion Industries Ltd
308.Meghraj Capital Limited
309.Melvin Marsh International
310.Metal Crowns Ltd
311.Metlex International Ltd
312.Metoxide Africa Ltd
313.Metro Plastics Kenya Ltd
314.Metsec Cables Ltd
315.MFI Ultra Print Ltd
316.Midco Textiles (EA) Ltd
317.Millenium Management Consultants
318.Mills Industries
319.Mini Bakeries (Nbi) Ltd
320.Miritini Kenya Ltd
321.Mitsubishi Corporation Liaison Office
322.Mitsui &Co. Europe PLC
323.Mobius Lithographic (K) Ltd
324.Modulec Engineering Systems Ltd
325.Monwalk Investments Ltd
326.Multvac North Africa Kenya
327.Muriu Mungai & Company
328.Murphy Chemicals Ltd
329.Mustek East Africa
330.Muthaura Mugambi & Njojo millers
331.Nails & Steel Products Ltd
332.Nairobi Bottlers Ltd
333.Nairobi Flour Mills Ltd
334.Nairobi Plastics Ltd
335.Napro Industries Ltd
336.NAS manufacturing Services Ltd
337.nathan industries Ltd
338.Nationwide Electrical Industries Ltd
339.Ndalex Digital Technology
340.Negawatt Limited
341.Nestle industry
342.New Kenya Co-Operatives Creameries Ltd
343.Newlineindustries Ltd
344.Ngecha Industries Ltd
345.Nicole industries Ltd
346.Nicola Farms manufacturing Ltd
347.Nokia Siemens Networks Kenya Ltd
348.Norda Industries Ltd
349.Novaster Ventures
350.Odex Chemicals Ltd
351.Oilzone (E.A) Ltd
352.Optimum Lubricants Ltd
353.Orbit Chemical Industries Ltd
354.Oriental Mills Ltd.
355.Origicheck Company Limited
356.Orbit Engineering Ltd
357.Orbit Enterprises Ltd
358.Osho Chemicals Industries Ltd
359.Oss.Chemie (K) Limited
360.Packaging Masters Limited
361.packaging Industries Ltd
362.Palmy Enterprises
363.Panah Limited
364.Panesar's Kenya Ltd
365.Paper House of Kenya Ltd
366.Paperbags Limited
367.Passion Profit Limited
368.Patco Industries Ltd
369.Patnet Steel Makers Manufacturers
370.Patronics Services Limited
371.PCTL Industries Ltd
372.Pearl Industries Ltd
373.Pembe Flour Mills Ltd
374.Penny Galore Ltd
375.Pentagon Agencies
376.Pernod Ricard Kenya Ltd
377.PG Bison Ltd
378.Pharm Access Africa Ltd
389.Pharmaceutical Manufacturing Co. (k) Ltd
390.Philips EA Ltd
391.Pipe Manufacturing Ltd
392.PKF Consulting
393.Plastic Electricons
394.Plastic & Rubber Industries Ltd
395.Platinum Distillers Limited
396.Polyblend Ltd
397.Polychem East Africa Ltd
398.Polyflex Industries Ltd
399.Polythene Industries Ltd
400.Powerex Lubricants
401.Premier Flour Mills Ltd
402.Premier Industries Ltd
403.Pressmasters Ltd
404.Printing Services Ltd
405.Printpak Multi Packaging Ltd
406.Printwell Industries Ltd
407.Pristine International Ltd
408.Procter & Gamble East Africa Ltd
409.Proctor & Allan (E.A.) Ltd
410.Promasidor (Kenya) Ltd

411.Propack Kenya Limited
412.Prosel Ltd
413.Protea Chemicals Kenya Ltd
414.Protel Studios
415.Punchlines Ltd
416.PZ Cussons EA ltd
417.Qplast Industries Ltd
418.Qesta Care Ltd
419.R.T (East Africa) Ltd
420.Rafiki Millers Ltd
421.Raiser Resource Ltd
422.Ramco Printing Works Ltd
423.Rezco Ltd
424.Reckitt Benckiser (E.A) Ltd
425.Regal Pharmaceuticals ltd
426.Regal Press Kenya Ltd
427.Reliable Concrate Works Ltd
428.Reliable Electricals Engineers (Nrb)Ltd
429.Rentco East Africa Limited
430.Repelectric (k) Ltd
431.Re-Suns Spices Ltd
432.Revolution Stores Ltd
433.Rodl &Partner Ltd
434.Rodwell Press Ltd
435.Rok Industries Ltd
436.Rosewood Furniture Manufactures Ltd
437.Ruidu (Kenya) Company Limited
438.Rumorth EA Ltd
439.Rutuba Bio Agri & Organic Fertilizer Co. Ltd
440.Sadolin Paints (E.A) Ltd
441.Safamitek Ltd
442.sajero packaging Ltd
443.Safechem (K) Ltd
444.Safepak Ltd
445.Saj Ceramics Ltd
446.Salim Wazarani Kenya Company Ltd
447.Samco Holdings Ltd
448.Sameer Africa Ltd
449.Sameer Agriculture & Livestock (Kenya) Ltd
450.Sandstorm Africa Ltd
451.Sanergy
452.Sanpac Africa Ltd
453.SBC Kenya Ltd
454.SC Johnson and Son Kenya
455.Scales and Software (K) Ltd
456.Scania East Africa Limited
457.Semco Business Park
458.Services Shoe Africa Ltd
459.Sevenseas Technology
460.Seweco Paints Ltd
461.SGS Kenya
462.Shah Timber Mart Ltd
463.Shamco Industries Ltd
464.Sheffield Steel Systems Ltd
465.Shneider industries
466.Siera Cables East Africa
467.Sigma industries Ltd
468.Signode Packaging Systems Ltd
469.Silafrica Kenya
470.Singh Retread Ltd
471.Siya Industries (K) Ltd
472.Skanem Interlabels Nairobi Ltd
473.Sketchers Design Promoters Ltd
474.Skyline manufacturing Ltd
475.Socabelec (EA)packaging Ltd
476.Sohansons Ltd
477.SoilexProsolve Ltd
478.Solimpexs Africa Ltd
479.Soloh Worldwide Inter-Enterprises Ltd
480.Solvochem East Africa Ltd
481.SongyiMotorcycles International Ltd
482.Soroya Motors Spares
483.Space & Style Ltd
484.Specialised Engineering Co.(EA) Ltd
485.Specialised Power Systems Ltd
486.Spectrum Network Ltd
487.Sperkjet East Africa Ltd
488.Spice World Ltd
489.Spingbox Kenya Ltd
490.Sproxil East Africa
491.St. Theresa Industries
492.Standard Chartered Bank (K)
493.Standard Group printing Ltd
494.Stanlib industries (Kenya) Ltd
495.Statpack Industries Ltd
496.Stawi Foods and Fruits Limited
497.Steel structures Ltd
498.Steelmakers Ltd
499.Steelwool (Africa) Ltd
500.Straightline Enterprises Ltd
501.Strategic Industries Ltd
502.Strategic packaging Ltd
503.Stratostaff EA Ltd
504.Styloplast Ltd
505.Summit Energy Systems
506.Sunam Shakti
507.Sunflag Textiles & Knitwear Mills Ltd
508.Sunland Roses Ltd
509.Supa Snacks Ltd
510.SupaBrite Ltd
511.Super Manufactures Ltd
512.Suferfit Steelcon Ltd
513.Symbiotic Media Consortium
514.Synergy Lubricants Solutions
515.Synergy-Pro
516.Syngenta East Africa Ltd

517.Synresins Ltd
518.Tarpo Industries Ltd
519.Tata Chemicals Magadi Ltd
520.Taws Ltd
521.Techno Brain Ltd
522.Techno Plast Ltd
523.Technoconstruct Kenya Ltd
524.Technosteel Industries Ltd
525.Techpak Industries Ltd
526.Teita Estate Ltd
527.Tetra Pak Ltd
528.The Copy Cat Ltd
529.The Helios
530.The Print Exchange
531.Theevan Enterprises Ltd
532.Thermopak Ltd
533.Tile &Carpet Centre Ltd
534.TimSales Ltd
535.Tissue Kenya Ltd
536.Tononoka Rolling Mills Ltd
537.Tononoka Steel Ltd
538.Towertech Africa Ltd
539.Toyota Kenya Ltd
540.Toyota Tshusho East Africa Ltd
541.Tracesoft Ltd
542.TreadsettersTyres Ltd
543.Tri-clover Industries (K) Ltd
544.Tropikal Brand (Afrika) Ltd
545.Trfoods Ltd
546.TSS Spinning And Weaving Ltd
547.Twiga Chemical Industries Ltd
548.Twiga Stationers &Printers Ltd
549.Umati Capital (Kenya) Limited
550.Unga Group Ltd
551.Unifilters Kenya Ltd
552.Unilever East Africa Ltd
553.Uni-Plastics
554.United Aryan (EPZ) Ltd
555.United Bags Manufacturers Ltd
556.United Distillers and Vintners(UDV)
557.Unumed Ltd
558.Usafi Services Ltd
559.Vaja's Manufactures Ltd
560.Valuepak Foods
561.Varoma Tech Limited
562.VarsaniBrakelinings Ltd
563.Vava Coffee Ltd
564.Vehicle and Equipment Leasing Ltd
565.Vetcare Kenya Limited
566.Victoria Juice Company Ltd
567.Viking I ndustries Ltd
568.Virji Vishram Patel & Sons
569.Virtual City Ltd
570.Viscar Industrial Capacity Ltd
571.Vitafoam Products Ltd
572.Vivo Energy Kenya Ltd
573.W.E Tilley (Muthaiga) Ltd
574.Wanji Food Industries Ltd
575.Waridi Creations Ltd
576.Warren Enterprises Ltd
577.Warriors Insight Limited
578.Welding Alloys Ltd
579.Westminister Paints and Resins Ltd
580.Winne's Pure Health
581.Wire Product Ltd
582.Wonderpac Industries Ltd
583.Wood Makers (K) Ltd
584.Woodtex Kenya Ltd
585.Wotech Kenya Ltd
586.Wrigley Company (E.A.) Ltd
587.Zain Pharmaceuticals
588.Zaki LLC
589.Zenith Steel Fabricators Ltd
590.Zheng Hong (K) Ltd
591.Zingo Investments Limited

Kenya manufacturers association 2018 6th edition

Appendix III: Time Schedule

Month	**Activity**
2018	-Identification of topic, theoretical framework
	-Presentation of 1st draft of research proposal to supervisor -Presentation of concept paper at the department level on 14/09/2018
April 2019	-Presentation of 2nd draft of research proposal to supervisor
	-Presentation of 3rd draft of research proposal to supervisor
	-Defense of the proposed research at school level
June 2019	-Presentation of the research instruments and piloting
	-Data collection and analysis
	-Presentation of the 1st draft thesis to supervisor
	-Presentation of the 2nd draft thesis to supervisor
	-The researcher defends seminar paper at school level
October 2019	-Presentation of 3rd draft
	-Submission of the final thesis at school level

Appendix IV: Budget Plan

SN	ITEMS	AMOUNT
1	Stationeries (ream of printing papers, pen/pencils, foolscaps, files, folder, rulers/eraser)	4,050.00
2	Equipment (laptop, flash disk, calculator, diskette, modem, floppy)	72,750.00
3	Thesis preparation (photocopy, observation checklist, printing, internet assessing, library, typesetting, transport, technical expenses, binding, research assistant)	81,975.00
	Total	**158,775.00**

Appendix V: Process-Macro Output

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 3.5 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2018). www.guilford.com/p/hayes3

**************************************************************************
Model  : 8
    Y  : SCOP
    X  : SCAPS
    M  : SCA
    W  : SR

Sample
Size:  221

**************************************************************************
OUTCOME VARIABLE:
 SCA

Model Summary
          R         R-sq          MSE            F          df1          df2
p
      .9251         .8558         .1407     429.2741       3.0000     217.0000
.0000

Model
             coeff         se          t          p       LLCI       ULCI
constant    2.1384      .4165     5.1339      .0000     1.3175     2.9594
SCAPS       -.3341      .1052    -3.1764      .0017     -.5414     -.1268
SR           .5261      .0920     5.7169      .0000      .3447      .7074
Int_1        .0721      .0232     3.1119      .0021      .0264      .1178

Product terms key:
 Int_1    :        SCAPS    x        SR

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0064     9.6838     1.0000   217.0000      .0021
----------
    Focal predict: SCAPS    (X)
          Mod var: SR       (W)

Conditional effects of the focal predictor at values of the moderator(s):

         SR    Effect         se          t          p       LLCI       ULCI
     3.0000  -.1178      .0405    -2.9076      .0040     -.1976     -.0379
     5.0000   .0265      .0270      .9804      .3280     -.0267      .0797
     5.0000   .0265      .0270      .9804      .3280     -.0267      .0797

**************************************************************************
OUTCOME VARIABLE:
 SCOP

Model Summary
          R      R-sq        MSE          F        df1        df2          p
      .6908     .4771      .3575    49.2788     4.0000   216.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
constant    3.9752      .7030     5.6544      .0000     2.5895     5.3608
SCAPS       -.5464      .1715    -3.1863      .0017     -.8844     -.2084
SCA          .6252      .1082     5.7782      .0000      .4119      .8384
SR          -.5261      .1573    -3.3439      .0010     -.8361     -.2160
```

```
Int_1         .1175      .0377     3.1136      .0021      .0431      .1919

Product terms key:
 Int_1    :        SCAPS    x        SR

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0235     9.6946     1.0000   216.0000      .0021
----------
    Focal predict: SCAPS    (X)
          Mod var: SR       (W)

Conditional effects of the focal predictor at values of the moderator(s):

         SR    Effect         se          t          p       LLCI       ULCI
     3.0000    -.1938      .0658    -2.9456      .0036     -.3235     -.0641
     5.0000     .0413      .0431      .9570      .3396     -.0437      .1262
     5.0000     .0413      .0431      .9570      .3396     -.0437      .1262

****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Conditional direct effect(s) of X on Y:
         SR    Effect         se          t          p       LLCI       ULCI
     3.0000    -.1938      .0658    -2.9456      .0036     -.3235     -.0641
     5.0000     .0413      .0431      .9570      .3396     -.0437      .1262
     5.0000     .0413      .0431      .9570      .3396     -.0437      .1262

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 SCAPS       ->    SCA         ->    SCOP

         SR     Effect     BootSE   BootLLCI   BootULCI
     3.0000     -.0736      .0425     -.1640      .0021
     5.0000      .0165      .0132     -.0080      .0443
     5.0000      .0165      .0132     -.0080      .0443

      Index of moderated mediation:
        Index     BootSE   BootLLCI   BootULCI
SR      .0451      .0225      .0040      .0931
---

*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

W values in conditional tables are the 16th, 50th, and 84th percentiles.

------ END MATRIX -----
```

Appendix VI: Research License

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 177118

Date of Issue: 08/March/2021

RESEARCH LICENSE

This is to Certify that Mr.. ROBERT BETT CHUMBA of Moi University, has been licensed to conduct research in Nairobi, Uasin-Gishu on the topic: EFFECTS OF SUPPLY CHAIN ADVANCE PLANNING SYSTEM, SUPPLIER RELATIONSHIP, SUPPLIER AGILITY ON FIRM SUPPLY CHAIN PERFORMANCE AMONG MANUFACTURING FIRMS IN NAIROBI COUNTY, KENYA for the period ending : 08/March/2022.

License No: **NACOSTI/P/21/9153**

177118

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.