# SUPPLY CHAIN INTEGRATION, COMPETITIVE ADVANTAGE, ENVIRONMENTAL DYNAMISM AND PERFORMANCE OF LARGE-SCALE MANUFACTURING FIRMS IN KENYA

**BY**

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# DECLARATION

I declare that this research thesis is my original work and has not been submitted for examination for a degree in this or any other university.

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# QUOTE

"A journey of a thousand miles begins with the first step." Chinese Proverb

"Magikesu ng'omnon." Kalenjin Proverb

Translated as:

"Knowledge acquisition is endless."

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# DEDICATION

This doctoral dissertation is dedicated to my late grandmother Kogo Susan ‘Mayor’ Kob Cheruto Kimoi, parents, wife and children who have been great pillars of my academic life.

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# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| **AVE** | Average Variance Extracted |
| **BSC** | Balanced Scorecard |
| **CA** | Competitive Advantage |
| **CFA** | Confirmatory Factor Analysis |
| **CIN** | Condition Index Number |
| **CRM** | Customer Relationship Management |
| **ED** | Environmental Dynamism |
| **EFA** | Exploratory Factor Analysis |
| **GDP** | Gross Domestic Product |
| **HTMT** | Heterotrait-Monotrait |
| **ICT** | Information and Communication Technology |
| **KAM** | Kenya Association of Manufacturers |
| **KMED** | Kenya Manufacturers and Exporters Directory |
| **KNBS** | Kenya National Bureau of Statistics |
| **LPI** | Logistic Performance Index |
| **MSME** | Micro, Small and Medium Enterprise |
| **PLS-SEM** | Partial Least Squares Structural Equation Modelling |
| **RBV** | Resource Based View |
| **RDT** | Resource Dependence Theory |
| **SCI** | Supply Chain Integration |
| **SCM** | Supply Chain Management |
| **SEM** | Structural Equation Modelling |
| **SME** | Small and Medium Enterprise |
| **SRMS** | Standardised Root Mean Square |
| **VIF** | Variance Inflation Factor |

# ABSTRACT

Intense competitive pressures have forced firms to go beyond their neighbourhoods to achieve competitive advantage. A feasible course of action for firms is embracing supply chain integration. However, there is concern on whether implementing supply chain integration results in enhanced firm performance. Hence, the major aim of this research was to investigate the link connecting supply chain integration implementation and performance of large manufacturing companies in Kenya. In particular, the study examined the link connecting supply chain integration, competitive advantage, environmental dynamism to firm performance. The study was anchored on four theories; resource-based view, resource dependence theory, systems theory and network theory. The objectives of the study were attained through four main hypotheses. The study used positivist research lens. A cross-sectional descriptive research design was applied with primary data. The respondents of the study were persons overseeing supply chain functions in the sampled firms. From a sample size of 200 firms, 94 usable questionnaires were obtained resulting in a response proportion of 47%. The main data analysis method was partial least squares structural equation modelling (PLS-SEM). The outcomes of the study are that; first, supply chain integration has a positive and significant effect on organizational performance. Next, there was a significant partial complementary mediating influence of competitive advantage on the connection linking supply chain integration and company performance. The study also found that environmental dynamism has an overall significant and negative moderating effect on the link connecting supply chain integration to firm performance. Both customer uncertainty and government policy had significant negative moderating effect on the connection linking supply chain integration to firm performance while supplier uncertainty, competitive intensity and technological uncertainty had no moderating effect. Finally, the study found that supply chain integration, competitive advantage and environmental dynamism had a significant combined effect on firm performance. The study affirms that the performance of manufacturing firms in Kenya can be strengthened by implementation of supply chain integration. This helps to settle the debate to some extent on whether it is fruitful for organizations to integrate their supply chain operations. The results are consistent with the resource dependence theory that supply chain integration reduces uncertainty via integration with suppliers and customers leading to improved performance. These outcomes are also in congruence with resource-based perspective in the sense that integrating internal operations can be regarded as a rare, non-substitutable, valuable and imperfectly imitable resource. The study findings will also be useful to policy makers in developing appropriate legislations such as protection of copyrights and patents. Moreover, the findings of the study are expected to provide directions to scholars on the possible influence of supply chain integration on organisational performance with the possibility of competitive advantage and environmental dynamism acting as mediation and moderation variables respectively. This is particularly pertinent in the context of the developing world where such studies are scarce.

**Key words**: supply chain integration, competitive advantage, environmental dynamism, firm performance, PLS-SEM

# CHAPTER ONE: INTRODUCTION

## 1.1 Background to the Study

Intense competitive pressures have forced enterprises to go beyond their neighbourhoods to achieve competitive advantage. Sroka and Szántó (2018) argue that organisations have found themselves working in an environment which is rapidly changing due to globalization, vicious competition, diversification, rising demands and rising expectations of consumers and greater demand on corporate social responsibility. Fawcett, Magnan, and McCarter (2008) argue that the day may come when firms will have to choose which supply chain they are going to participate in since competition will be between supply chains. To succeed in this, organisations will require close collaboration among the participants in the interfirm activities within the supply chain. A means of achieving this is for them to integrate their operations; hence the concept of supply chain integration (SCI). Studies linking supply chain integration to some aspects of performance such as organisational performance and competitive advantage are on the rise (Adnan, Abdullah, & Ahamad, 2016; Muddaha, Khar, & Sulaiman, 2018; Reklitis, Sakas, Trivellas, & Tsoulfas, 2021; Itang, Sufyati, Suganda, Shafenti, & Fahlevi, 2022). Some studies have also considered the effect of environmental elements on the connection between SCI and performance (Koufteros, Voderembse, & Jayaram, 2005; Zhang, Tse, Dai, & Chan, 2017; Ahmed, Kristal, Pagell, & Gattiker, 2019; Beka Be Nguema, Bi, Akenroye, & El Baz, 2021).

This research is anchored on four management theories which are deemed to be the most relevant in explaining the rationale of an organisation embracing supply chain integration. These are resource-based view (RBV), resource dependence theory (RDT), systems theory and network theory. The resource-based perspective considers supply chain integration as an asset that can enhance competitiveness of a firm (Shook, Adams, Ketchen, & Craighead, 2009). Resource dependence theory posits that organisations depend on one another for success (Pfeffer & Salancik, 2003; Drees & Heugens, 2013). Supply chain integration is such a form of organisations depending on one another to enhance their performance. Systems theory avers that the entire supply chain should be considered holistically since the sum of the individual parts is less than sum of the whole

entity (Laurikkala, Vilman, Ek, Koivisto, & Xiong, 2003). Network theory posits that the performance of an organisation is not only dependent on how effectively it collaborates with their immediate partners; it is also contingent on how these other partners effectively collaborate with their own partners (Halldórsson, Kotzab, Mikkola, & Skjøtt-Larsen, 2007).

Manufacturing is a key contributing sector to the economy of Kenya. According to Kenya National Bureau of Statistics, KNBS (2021) report, it contributed 6.5 percent to the Gross Domestic Product (GDP) in the year 2020. It also accounted for 18.9 percent of total wage employment (KNBS, 2021). Despite its importance, the sector faces some challenges. The sector's contribution to the GDP has virtually stalled at approximately ten percent since independence, and has actually reduced to below 10 percent in recent years, according to Kenya Association of Manufacturers (KAM, 2018). Some of these challenges include poor quality, counterfeit goods in the supply chain flooding the market (KAM, 2018), poor coordination by government agencies (Were, 2016) and generally poor and inadequate infrastructure and logistics (World Bank Group, 2018). Policy interventions to spur growth in the sector have been launched from time to time by the Kenyan government, of which the ongoing ones are 'Vision 2030' and 'The Big 4 Agenda' (KNBS, 2020). A firm that has an integrated supply chain is expected to manufacture at lower costs hence be more competitive than its rivals.

### 1.1.1 Supply Chain Integration

Integration of the supply chain can be described as the development of alliances between industries and other organisations in the supply chain so as to generate an efficient and effective movement of information, resources, parts and materials to create valuable services and products for customers speedily and at low cost (Flynn, Huo, & Zhao, 2010). Koufteros, Verghese, and Lucianetti (2014) argue that supply chain integration can be used to achieve better behavioural response to some kinds of uncertainty through facilitation of lateral relations which advance coordination, collaboration and control of materials and information between supply chain members.

It is generally acknowledged that there are three aspects of supply chain integration. These are integration of suppliers, integration of internal operations and integration of customers (Wong, Wong, & Boon-Itt, 2013). Supplier integration has been defined by Kim (2013) as an organisational process where purchasing and supplying entities apply and share strategic, operational and financial knowledge so as to create value for the participants. Pakurar, Haddad, Nagy, Popp, and Oláh (2019) contend that the key aim of integration of suppliers is to surpass any one organisation's boundaries in order to easily synchronise processes. Internal integration has been defined by Zhao, Huo, Selen, and Yeung (2011) as the collaboration and synchronisation of processes among functional departments of an organisation to meet expectations of customers. Wong, Lai, and Cheng (2011) note that integration of internal processes tears down functional departmental barriers, thus fostering sharing of information and strategic partnership, which in turn collaboratively develop and maintain measurement systems. Kim (2013) defines customer integration as the organisational practice of realising, explaining and using customers to create products which maximise customer expectations and satisfaction. Lau, Tang, and Yam (2010) assert that the customer is the only person who has the ability to decide and to evaluate a product. This is because the customer has the probable buying power. In this hence the customer is a decision maker from a marketing viewpoint.

Scholars have operationalised the supply chain integration construct in various ways. Some have taken it as a unidimensional construct (Beheshti, Oghazi, Mostaghel, & Hultman, 2014a; Hanif, Hamid, & Gangouei, 2018). Others have broken it down into two types of integration; external and internal (Zhao, Feng, & Wang, 2015; Yuen & Thai, 2017). Other researchers used only a subset of supply chain integration. Huo (2012) used external integration alone. Danese and Romano (2011) had customer integration only while Huang, Yen, and Liu (2014) used supplier integration alone. The vast majority of researchers have, however, used the three dimensions of supply chain integration (Baharanchi, 2009; Ganbold, 2017; Uwamahoro, 2018; Iranban, 2019; Subburaj, Sriram, & Mehrolia, 2020). This study used all the three dimensions of supply chain integration so as to get a complete estimation of their effects on firm performance.

### 1.1.2 Competitive Advantage

Competitive advantage can be described as the disparity between two or more participants on any possible dimension that enables one to create better value for the customer than the other (Ma, 2000). Ma (2000) further argues that this definition extends on Porter (1985) in underscoring the significance of value creation for the customer. It drills down from the general kinds of competitive advantage such as cost and differentiation to a more elementary level, which facilitates operationalization. Competitive advantage acted as mediating variable on the relationship between SCI and firm performance as proposed by researchers in supply chain management (Dikshit & Trivedi, 2012; Le & Ikram, 2022). Tracey, Vonderembse, and Lim (1999) contend that high quality and reliability, timely delivery, fast new product introduction, enhanced customer service and enhanced deployment of capital, and not just cost reduction, are the main sources of competitive advantage in the post-industrial environment.

In the field of operations and supply chain management, the literature has consistently identified quality, cost/price, speed, flexibility and dependability as vital dimensions of competitive advantage (Ploenhad, Laoprawatchai, Thongrawd, & Jermsittiparsert, 2019; Shakkya, 2013; Feng, Sun, & Zhang, 2010; Zubir & Sundram, 2014). Production at low cost assures low product pricing relative to the competition whereas a high-quality product is one produced according to specification with no defects. Speed on the other hand refers to reduced lead times while dependability is delivery of a product or service the way the customer was promised. Finally, flexibility is an organization's capability to counter fluctuations in the volume of production, time taken to manufacture, the product mix and invent and introduce novel services or products at short notice. This is exhibited in Table 1.1.

**Table 1. 1: Operations and Competitive Factors**

| Operational excellence in… | Provides the capability to compete on … |
|---|---|
| Cost | Low pricing |
| Quality | High quality |
| Speed | Speedy delivery |
| Dependability | Reliable delivery |
| Flexibility | Frequent new services / products |
| | Wide range of products/services |
| | Changing the volume of product/service deliveries |
| | Changing the timing of product/service deliveries |

Adapted from: Shakkya (2013)

These indicators of competitive advantage have been used in SCM research in various combinations. For example, Vencataya, Seebaluck, and Doorga (2016) adopted all the five measures. On the other hand, some researchers: Lucas (2015), Li, Ragu-Nathan, Ragu-Nathan, and Subba Rao (2006) and Wijetunge (2017) used the five measures but substituted the term 'flexibility' with the term 'product innovation'. Baah and Jin (2019) used four measures: price/cost, quality, delivery and flexibility as did Timilsina (2017) who changed 'delivery' to 'time'. Saber, Bahraami, and Haery (2014) used innovation, quality, cost/price and time to market while Feng et al. (2010) had cost, flexibility, quality, customer service and dependability. This study adopted the five measures as outlined by Shakkya (2013) as it provides comprehensive sources of competitive advantage in the firm.

### 1.1.3 Environmental Dynamism

According to Aloulou and Fayolle (2005), environmental dynamism (ED) is the instability of the market for a firm, the unceasing changes that take place in technological situations and the unpredictability of competitors and customers. Environmental dynamism is one among other determinants of environmental uncertainty (the others being munificence, hostility and complexity). This study focused on environmental dynamism since it has been proven to be the most dominant determining factor of environmental uncertainty, as noted by Joshi and Campbell (2003). From the definition of

environmental dynamism, four sources of environmental dynamism can be identified: supplier, customer demand, competitor and technological. Nakku, Nabaweesi, and Namagembe (2013) contend that supplier dynamism is the degree of change and unpredictability of delivery performance and quality of product from the suppliers.

Customer demand uncertainty stems from unpredictability in volume, product mix and delivery which could be occasioned by wrong forecasts and changes in customer tastes and preferences (Luo & Yu 2016; Tachizawa, 2009). Due to the COVID-19 pandemic, the business environment has been affected drastically, with global supply chain networks being severely disrupted (Fernandes, 2020). For many supply chains, supply and demand have drastically dropped, leading to a stop in production (For example, motor vehicle manufacturing) but for others demand has increased sharply such that supply could not cope with it (For example, pharmaceutical and medical equipment sector) (Ivanov & Dolgui, 2020). These are instances of environmental dynamism which this study captured. Environmental competitiveness denotes the degree of stiff competition characterising the external environment (Matusik & Hill, 1998). This is indicated by the number of competitors and the range of competitive areas (Jansen, Van Den Bosh, & Volberda, 2006). Technological uncertainty is the degree of change in technology that cannot be predicted, of which the most dynamic is information communication and technology (ICT) in the sense that it has a high rate of becoming obsolete yet it is key in supply chain integration (Nakku et al., 2013).

Most studies linking integrating of supply chain to firm performance have found environmental dynamism as a moderating variable. However, virtually all these studies have been carried out in environments of institutional certainty such as the Americas, Europe and Asia (Annan, Boso, Mensah, & Eliza, 2016). Li and Atuahene-Gima (2001) argue that patent and copyright violations, dysfunctional or unfair competition and unpredictable changes in government policies are rampant in countries with weak institutional arrangements. Jacoby and Hodge (2004) assert that government decision makers should consider the importance of investment in infrastructure to enhance competitiveness of a country's supply chains. Hence a study in an emerging economy should consider changes in government policy as a variable.

The four dimensions of environmental dynamism (excluding government policy) have been used by various researchers in different combinations. Fynes, Búrca, and Marshall (2004) and Peng and Lin (2019) used customer demand, supplier and technological uncertainty. Ruiz-Ortega, Parra-Requena, Rodrigo-Alarcón, and García-Villaverde (2013) used customer demand, competitor and technological uncertainty while Gonzalez-Zapatero, Gonzalez-Benito, and Lannelongue (2019) used all the dimensions. This study used the five dimensions of environmental dynamism to bring out the full spectrum of the moderating influence of supply chain integration implementation on the performance of the organization.

### 1.1.4 Firm Performance

Firm performance or organizational performance is the extent to which an organization attains its financial and market goals in relation to the industry average, as defined by Green, Zelbst, Meacham, and Bhadauria (2012). It is the firm's performance at the strategic level, in contrast to operational performance which is at the process or work unit level. Shook et al. (2009) argue that a way of improving financial performance is to strategically forge closer relations with partners in supply chains to reduce supply and demand uncertainty.

For this study, the balanced scorecard (BSC) approach was used to capture firm performance. As Bhagwat and Sharma (2017) argue, BSC approach is superior to the traditional-based financial measures since it seeks to augment financial indicators of historical performance with those of desired future performance. BSC seeks to balance short-term versus long-term goals, non-financial versus financial metrics, internal versus external performance and leading versus lagging indicators.

Kaplan and Norton (1992) came up with the BSC, motivated by the need to place emphasis in the role of assets that are intangible in creation of value for a firm. BSC broadens performance measurement into four dimensions: customer, financial, internal, and learning and growth. The dimension of customer is concerned with value delivery to the customers while financial dimension is delivering value to shareholders. Internal dimension promotes effectiveness and efficiency in business processes while learning and

growth is intended to sustain change capabilities and innovation through unceasing improvement and readiness for challenges in the future.

In this study, three dimensions; customer, financial and learning and growth were used since internal perspective is already addressed in competitive advantage. For customer dimension, customer satisfaction measures were used (Banker & Mashruwala, 2007) while for financial dimension, operating income and total assets were used since they show how different managers deploy their strategies to generate profit with the assets they have (Goel & Rhaki, 2013). Finally, for learning and growth, employee motivation was applied since motivated employees are likely to serve customers better.

### 1.1.5 Manufacturing Firms in Kenya

Companies in the segment of manufacturing are one of the key pillars of the economy in Kenya. It is critical for the attainment of Vision 2030 and it is key in job creation due to its backward and forward linkages with other sectors in the economy (Parliamentary Service Commission, 2018). According to the Big 4 agenda, policy interventions should raise the sectors' input to GDP to 15 percent by the year 2022 (KNBS, 2018).

Manufacturing firms in Kenya contributed 7.6 percent to GDP in 2020 (KNBS, 2021). It employs approximately 316,900 people representing 11.56 percent of formal employment and 2,933,900 labourers accounting for 20.22 percent of informal employment (KNBS, 2021). The sector's total employment averaged 18.9 percent, being second to the agriculture industry. According to KAM (2018), manufacturing share of GDP has averaged 10 percent from 1964 to 1973, rising marginally to 13.6 percent from 1990 to 2007 and dipping below 10 percent in recent years. In comparison, countries comparable to Kenya economically at independence like Democratic Republic of Congo, Vietnam, Cameroon, Malaysia and Bangladesh have their manufacturing sector contribution to GDP at 20.9 percent, 16.75 percent, 14.42 percent, 22.31 percent and 18 percent respectively (World Bank Group, 2021). These are all more than double that of Kenya (see Appendix I).

The continued weak performance of the sector is linked to a number of challenges. One of these is trade in illegal, inferior and counterfeit products which is a key hindrance

experienced by manufacturing companies in Kenya today. Manufacturers lose 40 percent of their market share, 50 percent of sales income and 10 percent of goodwill because of the increase of counterfeit goods in the supply chain (KAM, 2018). A World Bank report (2018) on Logistic Performance Index (LPI) ranked logistical attractiveness of Kenya at number 63 in 2018, which is a deterioration from position 42 in 2016 when the World Bank last conducted the survey. Transport and related infrastructure and quality of trade are some of the measures in this index thus indicating infrastructural challenges despite government's recent investment. In this environment of high institutional challenges, a firm that has integrated its supply chain is expected to do better than their competitors. The results of this research are expected to guide government strategy concerning institutional factors affecting manufacturing.

## 1.2 Research Problem

Businesses are increasingly implementing supply chain integration strategies occasioned by tough competition as a result of globalisation, diversification and other organisational drivers (Vencataya et al., 2016). Porter (2019) contends that a recurrent issue in contemporary supply chain researches is that organisations can probably enhance their performance if they embrace, position and integrate supplier, internal and customer information and processes. However, there is a contention as to whether implementation of supply chain integration does indeed result in improved performance as measured by improved market share and profitability (Mask & Works, 2018). For a greater appreciation of the role of integration of supply chain on the performance of organizations, other researchers have called for the consideration of mediator and moderator factors such as competitive advantage and environmental dynamism in that order (Lu, Ding, Asian, & Paul, 2018; Adnan et al., 2016; Cheraghalizadeh, Olya, & Tumer, 2021).

The manufacturing sector in Kenya is bedevilled by a number of problems. These include poor coordination among government agencies (Were, 2016), poor quality, counterfeit goods in the supply chain flooding the market (KAM, 2018), poor and inadequate infrastructure and logistics (Word Bank, 2018). Among these problems faced by the industrial sector in Kenya are supply chain challenges which any policy interventions

such as the government's 'Vision 2030' and the 'Big Four Agenda' (KNBS, 2020) should target. Outcome of research in this area could also inform policy options.

Many studies have been carried out which directly link supply chain integration implementation to firm performance and the outcomes have been contradictory and thus indicating major knowledge gaps. A positive relationship was observed by Yuen and Thai (2017), Uwamahoro (2018), Mask and Works (2018), Subburaj et al. (2020), Wong, Sinnandavar, and Soh (2021) and Hendijani and Saeidi (2021). Other studies found a non-significant relationship (Han, Omta, & Trienekens, 2007; Danese & Romano, 2010) while others found mixed results (positive and negative) dependent upon the supply chain integration variable dimension (Tarifa-Fernandez & De Burgos-Jiménez, 2017; Cao, Huo, Li, & Zhao, 2015). Zhao et al. (2015) found that too little or too much integration of supply chain has negative effect on performance. Such inconsistent outcomes call for further research to resolve them.

Many of the studies reviewed link supply chain integration directly to organizational performance without considering the possibility of mechanisms that either mediate or moderate the relationship. There is evidence proposing that competitive advantage is an intervening variable in the effect of supply chain integration implementation on organizational performance. Vencataya et al. (2016) argue that the best-in-class companies obtain savings from prudent management of company assets and activities resulting in decreased costs and better products and services and this gives the firm an advantage over its competitors. Competitive advantage is then expected to lead to superior firm performance, as noted by Zubir and Sundram (2014). The influence of integration of supply chain on the company performance is rarely direct but is very likely moderated by contingency factors such as environmental dynamism (Liu, Ke, Wei, & Hua, 2013; Lee, Seo, & Dinwoodie, 2016). The influence of COVID-19 pandemic on the link connecting supply chain integration to the company performance should be captured by environmental dynamism. Therefore, more researches on the role of implementation of supply chain integration on company performance that consider mediating and moderating variables are called for. This study had competitive advantage and

environmental dynamism as mediating and moderating variables respectively. These conceptual gaps were addressed in this study.

Methodological gaps were also noted in some of the studies linking supply chain integration to performance. Sukati, Hamid, Baharun, Alifiah, and Anuar (2014) and Mutuerandu and Iravo (2014) used convenience sampling. Some studies such as Mutuerandu and Iravo (2014) used simple analytical techniques such as descriptive statistics only. Other studies used simple regression analysis (Beheshti et al., 2014a). This study carried out stratified random sampling and applied the partial least squares structural equation modelling methodology to analyse the data since it is more rigorous than just descriptive statistics or simple regression. This is because with PLS-SEM different analyses can be carried out simultaneously. Additionally, the context in which a research is carried out is crucial, as noted by Rosenzweig and Singh (1991). The vast majority of the studies connecting implementation of supply chain integration to organizational performance have been carried out in Europe, the Americas and Asia. Studies done in Africa are scarce. They include Mutuerandu and Iravo (2014), Magutu, Aduda, and Nyaoga (2015), Mashiloane (2015) and Vencataya et al. (2016). However, none of these studies connected the four variables as has been done in this research. This scarcity of researches presents a knowledge gap. Hence, more studies connecting integration of supply chain to company performance with mediating and moderating variables contextualised in the region are called for to fill this gap.

From the foregoing discussion, it is evident that there were significant gaps in knowledge that required to be addressed. These included conceptual, contextual and methodological gaps. The study endeavoured to answer the broad research problem: what is the influence of supply chain integration, competitive advantage and environmental dynamism on firm performance?

## 1.3 Objectives of the Research

The goal of the research was to establish the influence of supply chain integration, competitive advantage and environmental dynamism on performance of large-scale manufacturing companies in Kenya. However, the explicit objectives were to:

(i) Determine the effect of supply chain integration on firm performance.

(ii) Determine the effect of competitive advantage on the link connecting supply chain integration to firm performance.

(iii) Determine the effect of environmental dynamism on the link connecting supply chain integration to company performance.

(iv) Establish the combined influence of supply chain integration, competitive advantage and environmental dynamism on firm performance.

## 1.4 Significance of the Study

The findings of this research are likely to help manufacturing company executives. These managers will be able to make strategic decisions about how to strengthen their competitive position once the effect of supply chain integration, competitive advantage, and environmental dynamism on organizational performance has been assessed. They would be able to decide whether to integrate with suppliers, customers, or conduct internal integration, among others.

Researchers and academicians are likely to value the findings of the research. Because there are few researches on integration of supply chain in Kenya and this region, it is expected that this study would expand the discourse in this area. The research should provide a theoretical and methodological knowledge of supply chain integration's potential effect on business performance. The empirical results of this study affirm that supply chain integration leads to competitive advantage which in turn leads to better firm performance. The implication of this is that firms should work on their competitiveness to achieve superior firm performance.

The outcomes of this research will also aid governments in the establishment and implementation of suitable policies and laws. Regulations to oversee the safeguarding of patents and copyrights can be developed or reinforced. The findings are also likely to provide insight into the importance of maintaining stable government policy. The study's

findings should also contribute in the establishment of strategies to help the manufacturing sector flourish.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1 Introduction

The chapter outlines the literature germane to the research beginning with the theories underpinning the study. This is followed by explanations of the connections among the main variables in the research. A presentation of the conceptual framework and the research hypotheses conclude the chapter.

## 2.2 Theoretical Literature Review

The case for supply chain integration can be made using a variety of theories. The resource-based perspective, resource dependence perspective, systems theory and network theory are the four most significant theories, underpinning this research, with the resource-based perspective as the overarching theory. They provide a theoretical framework to understand the relationship between supply chain integration, competitive advantage, environmental dynamism and firm performance.

### 2.2.1 Resource Based View

The main argument of the resource-based perspective is that competitive advantage can be sustained if an organisation owns resources that are rare, non-substitutable, valuable and imperfectly imitable (Barney, 1991; Halldórsson, Hsuan, & Kotzab, 2015). These resources can be grouped into three main groups: human capital, physical capital and organisational capital resources (Barney, 1991; Thoo, Tan, Sulaiman, & Zakuan, 2017). Human capital resources consist of capabilities of the workforce in terms of intelligence, training, experience, judgment and relationships. Physical capital includes technology, a firm's factory, assets, accessibility to raw materials and geographical location. Organisational capital resources are planning (formal or informal) and coordination systems of the firm, including intra-organisational and inter-organisational relations.

However, that a firm has these resources is no guarantee to competitiveness. It is the capability and decision-making prowess of an entity's management to organise and deploy these resources in an inimitable manner that is key to competitiveness (Boon-itt & Wong, 2011; Thoo et al., 2017). To achieve this internally, Fawcett, Osterhaus, Magnan, Brau, and McCarter (2007) argue that it entails breaking down functional silos, sharing information across functions and deploying cross-functional teams. A number of

researchers have taken the view that external integration is a resource that can be harnessed to the benefit of the focal firm. Rungtusanathan, Salvador, Forza, and Choi, (2003) argue that if an organisation develops linkages with customers and suppliers, the resultant connection should provide competitiveness to the organisation, to the extent that competitors have not formed such linkages. External integration enables cooperation among entities in the supply chain, including development of inter-organisational problem-solving routines, which resolve organisational goals and streamline business processes, leading to better operational performance (Yuen & Thai, 2017).

Halldórsson, Kotzab, Mikkola, and Skjøtt-Larsen (2007) contend that most supply chain management decisions are anchored on RBV, even if not directly. They argue that to counter changes and uncertainties in the external environment, firms establish arrangements among themselves to benefit from resource position barriers via these collaborative initiatives. This is especially true in circumstances of resource scarcity and/or stiff competition which make firms appreciate that depending on internally generated resources only is not sufficient to achieve competitiveness. A critique of this theory is that it does not suggest approaches for organisations to acquire the resources (Lavassani & Movahedi, 2010).

### 2.2.2 Resource Dependence Theory

The basic premise of resource-dependence theory (RDT) is that virtually all organisations are dependent on one another for access to crucial resources and that this dependence is also mutual (Drees & Heugens, 2013). Pfeffer and Salancik (2003) argue that organisations which were formally independent engage in such inter-firm arrangements as joint ventures, board interlocks, acquisitions and mergers, alliances, among others. Many researchers have argued that these interdependencies are essentially adopted in order to attain reduction of uncertainty in the environment (Nienhüser, 2008; Hillman, Withers, & Collins, 2009; Davis & Adam Cobb, 2010) and that as this uncertainty increases, firms seek ever closer relationships with partners (Fink, Edelman, Hatten, & James, 2006).

The major objective of resource dependence theory is therefore to reduce uncertainty in the organisation's environment. This then calls for the development of strategies and tactics to cope with the uncertainty (Mensing, 2013). Furthermore, Shook et al. (2009) believe that the importance of a resource to the focal firm is linked to the activities that must be performed to ensure the resource's dependable acquisition. This considers the resource suppliers when deciding what actions the focal firm should take. As noted already, a way to ensure this is to forge closer relations with suppliers and this can be actualised through integrating the focal company's activities with those of key suppliers.

On the demand side, researchers have argued for the need to decrease uncertainty in the market and manage the resultant dependence by deliberately structuring their exchange relationships with customers through an initiative such as customer relationship management (Salam, Ali, & Kan, 2017). Santos and Eisenhardt (2004) argue that firms prefer dependencies that they can manage rather than the ambiguity that they cannot control; that they pursue a strategy of reducing ambiguity using co-optation alliances. Customer relationship management (CRM) is such a strategic dependence, as argued by Heczková and Stoklasa (2010) thus: CRM is the fundamental business approach that harmonizes internal functions and processes and external networks to generate and deliver value to a target market at a profit. Hence, CRM can be considered a strategic resource consistent with resource dependence theory. A problem with this theory is that it is outward looking hence ignoring internal resources (Lavassani & Movahedi, 2010).

### 2.2.3 Systems Theory

Systems theory considers the supply chain as a complex adaptive system (Carter, Rogers, & Choi, 2015). It challenges the view that organisations are static and proposes an open systems perspective, positing that organisations at organisational, group and/or individual level are influenced by time and environmental factors (Lavassani & Movahedi, 2010); that a dynamic system changes the environment constantly and is also changed by the environment (Holweg, 2001). New and Westbrook (2004), argue that feedback (system concept of entropy) is a necessity across the whole supply chain to prevent decay or debilitation of the system. Supply chain integration is a way of achieving this feedback.

A basic premise of systems theory is that of synergy which postulates that a system is qualitatively different and behaves differently from the aggregate of the systems' individual parts. In particular, the total output of the entire system (such as the organisation) is often higher than the aggregate of the outputs of individual subsystems (for instance the departments in an organisation) (Bertalanffy, 1972; Laurikkala et al., 2003). A major reason for this is provided by Fawcett et al. (2007) who contend that often, the subsystems seek local optima at the expense of the global or the overall systems' optimum. Systems theory suggests that in managing a supply chain, a holistic approach is necessary rather than focussing on the isolated elements; that to achieve the overall organisational goal, individual subsystems have to sacrifice some degree of their autonomy (Jaradat, Adams, Abutabenjeh, & Keating, 2017). This entails breaking down functional silos within the firm, deploying cross-functional teams, sharing information across functions or departments and with suppliers and customers (Fawcett et al., 2007; Thoo et al., 2017).

Systems thinking therefore calls for aligning of efforts by all supply chain partners, having everybody to pull together in the same direction through managerial action to orchestrate and deploy their respective resources appropriately for competitive advantage (Boon-itt & Wong, 2011; Thoo et al., 2017). To the extent that all partners in a given supply chain interact collaboratively as advocated by systems theory relative to another supply chain which does not, this gives it (the collaborating one) a competitive edge. Systems theory has been critiqued as having a functional paradigm view of the organization. Lavassani and Movahedi (2010) argue that this could limit the application of the management philosophy of process view of the organisation.

### 2.2.4 Network Theory

A network can be described as a distinct kind of relation connecting a given set of objects, events or persons; this set can be called actors or nodes in a network (Harland, 1996). Johanson and Hakansson (1992) argue that there are three concepts in a network which are interrelated. These are actors, resources and activities (also called ARA model) in a business network. Actors are usually organisations such as suppliers, manufacturers, distributors, and customers (Li, 2014). A resource is anything that an actor values and can

apply to create greater value for itself and other actors. Activities occur when actors create, develop, combine or exchange resources by applying other resources. The actors are interdependent; they are interlinked; hence exchanges occur and in the process they form ties, links and bonds between them through the combination of resources and activities (Hakanson, 2009). The interdependence is such that the failure of a node may affect the others. Wichmann and Kaufmann (2016) argue that a social network is comprised of many actors such as individuals, organisations and the relationships that link them.

Dubois (1998) contends that the unique composition of activities and resources of an actor distinguishes it from other actors. Halldórsson et al. (2007) argue that organisational performance is not only dependent on how the organisation effectively liaises with its immediate partners; it is also dependent on how effectively these partners collaborate with their own partners. Treiblmaier (2018) weighs in thus: a resource's worth is pegged on its combination with other resources; hence the reason why inter-organisational linkages could become more crucial than possession of resources per se. For success, there has to be a proper alignment between the actors, activities and resources (Fayezi & Zomorrodi, 2015). Thus strategic business networks enable a firm to access resources, new technologies, new knowledge, information and new markets which enhances scope and scale economies, learning and enables organisations to attain their strategic goals (Gulati, Nohria, & Zaheer, 2000).

The supply chain can be construed to be a network of organisations which are interdependent. According to Borgatti and Li (2009), SCM is more complicated than basic dyadic interactions among nodes in a network. Network theory argues that competitive advantage in a supply chain may be gained by harnessing the resource potential in a more effective way and that taking a network perspective can influence competitive behaviour positively (Lavassani & Movahedi, 2010). It is also averred that network theory strives for an understanding of inter-organizational relations dynamics by paying attention to personal relationships among partners, including the reciprocal development of trust through exchange processes and collaborative ties (Van, Phong, & Hanh, 2017). This is consistent with supply chain integration. Network theory is however

limited by its focus on merely connecting the nodes without describing the process perspective of the organization (Stanford-Smith & Chiozza, 2001).

## 2.3 Empirical Literature Review

This section expounds the numerous researches that have been carried out on the subject. It is organised according to the objectives of this research. It brings out the inconsistencies in the studies and hence the research gaps. The literature is based on the premise that supply chain integration leads to competitive advantage which in turn leads to enhanced firm performance. This relationship is moderated by environmental dynamism.

### 2.3.1 Supply Chain Integration and Firm Performance

The direct connection linking integration of supply chain to organizational performance can be argued through RDT. A cause of low firm performance is uncertainty of demand and supply. A way of reducing uncertainty with suppliers is to forge closer relations, which can be actualised through supplier integration (Shook et al., 2009). On the demand side, uncertainty can be reduced through such initiatives as cultivating closer relationships with customers, which should ultimately lead to customer integration (Heczková & Stoklasa, 2010; Salam et al., 2017). Thus, it is expected that reduction of uncertainty or unpredictability in an organisation's supply chain through supply chain integration should result in improved performance.

Many researches have been carried out linking supply chain integration directly to organisational performance and the findings have not been consistent. Integration of supply chain was found to improve company performance in some studies (Aduku & Ayertey, 2015; Yuen & Thai, 2017; Uwamahoro, 2018; Subburaj et al., 2020, Pakurar et al., 2019; Wong et al., 2021, Hendijani & Saeidi, 2021). Other studies established a positive influence for some dimensions of supply chain integration while other dimensions had non-significant effect (Huo, Qi, Wang, & Zhao, 2014; Tarifa-Fernandez & De Burgos-Jiménez, 2017). Yet other studies found the connection linking supply chain integration implementation to performance to be insignificant (Danese & Romano, 2010; Han et al., 2007). Zhao et al. (2015), found that, too little or too much supply chain

integration can have adverse effects on performance. This inconsistency on the role of integration of supply chain on organisational performance is thus a gap in knowledge. Another gap is that a number of researchers used only one or two aspects of supply chain integration as indicators of the explanatory variable (Huang et al., 2014; Kim, 2013, Yu, Huo, & Zhang, 2021). This study, therefore, proposed that introduction of supply chain integration in an organisation will enhance its performance.

### 2.3.2 Supply Chain Integration, Competitive Advantage and Firm Performance

This section presents the link between integration of supply chain, competitive advantage and performance. It is anchored on the premise that introduction of supply chain integration in an organization result in its competitiveness. This is then expected to enhance firm performance.

The connection linking supply chain integration to competitive advantage is mainly underpinned by the RBV (Porter, 1980). Customers and suppliers are the driving forces for competitive advantage in an organisation. An example is supplier and customer participation in developing new products. Feng et al. (2010) argue that this can be a strategic resource for attaining higher quality levels, cost reduction, sufficient flexibility, fast and efficient delivery. The possession and deployment of internal assets such as human, physical and organisational capital should also lead to competitive advantage of an organisation (Thoo et al., 2017).

A number of researches reviewed on integration of supply chain and competitive advantage show a positive association (Lucas, 2015; Wijetunge, 2017; Baah & Jin, 2019). Quynh and Huy (2018) established that customer integration had a positive influence on performance but supplier integration had a negative influence. Hosseini, Aziz, and Sheiki (2012) found that the effect of external and internal integration on competitive advantage were negative and positive respectively while Rattawiboonsom (2016) found the results to be mixed, depending on the measure of competitive advantage. On the other hand, Freije, de la Calle, and Ugarte (2021) found a positive relationship on the customer integration but negative relationships result for internal integration and supplier integration. These contradictory findings present a gap in knowledge. This study,

therefore, proposed that implementation of supply chain integration results in enhanced competitive advantage.

An organisation has competitive advantage if it can price its products lower in the market (due to low production cost), is able to deliver its product faster, has reliable delivery of high-quality products and finally, is flexible, that is, has the ability to react fast to customer changes in terms of new commodities or changes in volume of demand (Vencataya et al., 2016). If a firm has one or more of these characteristics, it will satisfy customers better than the competition and hence it is expected to do well in terms of market and financial indicators. In this regard, competitive advantage can be construed as a rare, strategic resource which is difficult to replicate by new entrants or the competition, consistent with RBV (Barney, 1991).

Many studies have been carried out which link competitive advantage to firm performance and most of those reviewed showed a significant positive relationship (Lucas, 2015; Quynh & Huy, 2018; Baah & Jin, 2019). A study by Ozdemir and Aslan (2011) found the influence of competitive advantage on performance as positive but weak. In this study, it is proposed that competitive advantage of a firm leads to enhanced performance.

As discussed earlier, it is anticipated that implementation of supply chain integration could lead to enhanced competitiveness of a firm and in turn, this competitive advantage could probably lead to better performance. Also, the direct link connecting supply chain integration to performance has been argued out. In some researches, this link was found to be weak or even non-existent (Han et al., 2007; Zhao et al., 2015). This link could be enhanced through competitive advantage as a mediating factor.

Many researches testing the role of supply chain integration implementation on organizational performance with competitive advantage as a mediator have been carried out and the findings are inconsistent. A number of these researches found a positive mediating role (Dikshit & Trivedi, 2012; Akmal, Sinulingga, Napitupulu, & Matondang, 2018; Baah & Jin, 2019; Reklitis, Sakas, Trivellas, & Tsoulfas, 2021; Le & Ikram, 2022). Other studies found a partial mediation (Wijetunge, 2017; Ju, Park, & Kim, 2016).

Swink, Narasimhan, and Wang (2007) findings showed that competitive advantage had a positive mediating effect with supplier and internal integration but no mediation with customer integration. Hatani, Djumahir, and Wirjodirjo (2013) established that competitive advantage had complete mediation with external integration but partial mediation with internal integration. These mixed results in the literature presented a research gap. This study therefore proposed that competitive advantage significantly mediates the role of implementation of supply chain integration on performance.

### 2.3.3 Supply Chain Integration, Environmental Dynamism and Firm Performance

The concept of environment in the study of organisations developed as an extension of systems theory (Akpolat, Soliman, & Schweitzer, 2013) whereby organisations are considered as open systems constantly interacting with their environment (Bertalanfy, 1951). Duran and Akci (2015) argue that as the degree of environmental dynamism increases, there is greater necessity for organisations to form strategic alliances to reduce the uncertainty. Supply chain integration is one such initiative. This is consistent with resource dependence theory, systems theory and network theory. Fynes et al. (2004) contend that organisations situated in environments that are more volatile are bound to have a greater supply chain relationship quality than those in more stable environments. This implies that supply chain integration is expected to be more strongly linked to firm performance in situations of greater environmental dynamism than when the dynamism is lower.

Kamasak, Yavuz, and Altuntas (2016) argue that a turbulent environment can be a major opening for organizations to enhance their current competences and/or create novel ones enabling them to prevail over organizational inertia and myopia of learning. Zahra, Sapienza, and Davidsson (2006) and O'Connor (2008) aver that environments with high uncertainty compel firms to advance better knowledge management skills. This results in the creation and design of novel, situation specific know-how and enhances creative and critical thinking which leads to superior performance. Dynamic environments force firms to improve their information through cross-functional networking, intensive communication with their suppliers and customers supported by IT skills to better their performance (Ambrosini & Bowman, 2009). This is the essence of supply chain

integration implementation and it is consistent with RDT, RBV, systems theory and network theory. In less turbulent context, the moderating role of environmental dynamism on the connection linking supply chain integration to firm performance is projected to be non-existent or even negative.

The researches on the role of integration of supply chain on performance with environmental dynamism as a moderator have been carried out and the results have been mixed. Significant positive moderation was found by Merschamann and Thoneman (2010), Wong, Boon-Itt, and Wong (2011), Duran and Akci (2015), Kamasak et al. (2016), Muddaha et al. (2018), Wamba, Dubey, Gunasekaran, and Akter (2020) and Beka Be Nguema et al. (2021) while significant negative moderation was found by Srinivasan, Mukherjee, and Gaur (2011). Fynes et al. (2004) found a positive moderating effect for supplier and customer uncertainty but no effect on competitor uncertainty. Huang et al. (2014) found a negative moderating effect for customer uncertainty but positive for technological uncertainty. Given that these results are inconsistent, this is an indication of a knowledge gap. It is proposed in this study that environmental dynamism positively moderates the effect of integration of supply chain on performance under highly uncertain environments. For medium level of uncertainty, it is proposed that the moderating influence will not be significant whereas for low level of environmental uncertainty it is projected that the moderating effect will be negative.

The moderating role of individual subcontracts of environmental dynamism on the relationship between supply chain integration and firm performance needed to be studied. This was to gauge their separate influence as their moderating effects may not necessarily move in the same direction and in any case they may require differing strategic interventions (Davis, 1993; Slater & Narver, 1994). On the individual subconstructs of environmental dynamism, various studies have yielded inconsistent results. Significant positive results were found on the effect of integration of the supply chain on organizational performance with supplier uncertainty as a moderating variable (Fynes et al., 2004; Chiao, Xu, Zhan, & Fang, 2018; Ince, Ozkan, & Imamoglu, 2020; Yousuf, Lorestani, Oláh, & Felföldi, 2021). Golgeci and Ponomarov (2015) found a significant negative moderating influence. In the case of customer uncertainty as a moderating

construct on the connection linking supply chain integration to performance, mixed outcomes have also been found. A number of studies have yielded significant positive moderating effect (Fynes et al., 2004; Chiao et al., 2018; Hendijani & Saei, 2020; Yousuf et al., 2021). Other studies found a significant negative moderating effect (Srivastava, Srinivasan, & Iyer, 2015; Liu, 2019; Nenavani & Jain, 2021). Boon-itt and Wong (2011) study yielded a negative moderating influence for supplier integration and internal integration but nonsignificant effect for customer integration.

Ding, Lu and Fan (2017) found a significant moderating effect for supplier integration, significant negative effect for customer integration and no effect for internal integration. With regard to competitive intensity as a moderating construct on the link connecting implementation of supply chain integration to performance, research results have also been mixed. A number of studies found significant positive moderating effect (Chan, He, Chan, & Wang, 2012; Tzempelikos & Kooli, 2018; Liu, 2019; Mazroui Nasrabadi & Eslami, 2019). Ahamed (2015) found a negative moderating effect whereas Abdallah, Obeidat, and Aqqad (2014) found nonsignificant moderating effect for supplier and internal integration versus organizational performance. It established a significant positive moderating influence for customer integration. Studies having technological uncertainty as a moderating variable on the connection linking supply chain integration implementation to organizational performance have also resulted in mixed results. Some studies found significant positive moderating effect (Srivastava et al., 2015; Pham & Doan, 2020). Other studies yielded a nonsignificant moderating effect (Fynes et al., 2004; Tzempelikos & Kooli, 2018). Chavez et al. (2015) study yielded a significant and negative moderating effect.

Boon-itt and Wong (2011) study yielded a significant positive moderating effect for supplier integration, negative moderating effect for internal integration and no effect for customer integration. Finally, on government policy as a moderating factor on the link connecting supply chain integration to firm performance, studies are quite scarce. Only a single study was encountered which found a significant positive moderating effect (Thongrattana & Perera, 2010).

All these mixed outcomes on the moderating influence of the individual subconstructs of environmental dynamism on the link connecting implementation of supply chain integration to firm performance indicate significant knowledge gaps that required to be addressed. It was thus posited in this study that supplier uncertainty, customer uncertainty, competitive intensity, technological uncertainty and government policy each individually positively moderates the effect of supply chain integration on organisational performance under high level of environmental uncertainty. The moderating effects for medium and low levels of environmental uncertainty are expected to be nonsignificant and negative respectively.

### 2.3.4 Supply Chain Integration, Competitive Advantage, Environmental Dynamism and Firm Performance

This section reviews researches on the possible combined effect of supply chain integration, competitive advantage and environmental dynamism on performance. Studies relating these four variables are very few in the literature. Zhang, Tse, Dai, and Chan (2017) found a positive and significant association on the combined influence of green supply chain management, environmental dynamism and social control on financial performance. A significant positive relationship was also found by Arifin and Baihaqi (2012) on the combined effect of environmental dynamism, institutional theory, internal resources and supply chain management practices on firm performance.

Koufteros et al. (2005) found a non-significant combined effect of integration of supply chain, competitive advantage and environmental dynamism on organisational performance. A study by Chi, Kilduff, and Gargeya (2009) examining the combined effect of supply chain structures, competitive priorities and business environment characteristics on business performance had two contexts: high and low performing firms. The effect was negative for high performers while there was no effect for low performers. From these studies, there are knowledge gaps. Firstly, the results are inconsistent. Also, the variables used are different from what this study used. This study therefore proposed that the combined effect of supply chain integration implementation, competitive advantage and environmental dynamism on performance is positive and significant.

## 2.4 Key Studies and Knowledge Gaps Summary

Researches on the effect of supply chain integration, competitive advantage and environmental dynamism on performance have showed mixed findings of positive, negative or no effect. A number of studies have applied supply chain integration as a unidimensional concept while others have used only a subset of its dimensions. Many of the studies do not have mediating or moderating variables.

Another common weakness of the studies is the fact that most of them have been done in the developed world while others have methodological challenges. A summary of these researches is displayed in Table 2.1. The summary outlines the scholar(s), research focus, methodology, key results, research gaps and how this study addressed some of these gaps.

**Table 2. 1: Empirical Review and Research Gaps Summary**

| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| Adnan, Abdallah, and Ahamed (2016) | Moderator role of competitive pressures on the influence of HRM practices on company performance | A survey of 64 R&D companies in Malaysia. Hierarchical regression analysis used | No significant moderation influence of competition intensity on the effect of HRM practices on company performance | No supply chain integration as a variable; no mediating variables; moderating variable has single dimension. Study done in Malaysia | Supply chain integration taken as independent variable; mediating variable included; moderating variable has five dimensions; study done in Kenya. |
| Beheshti, Oghazi, Mostagel, and Hultman (2014a) | Effect of integration of supply chain on financial performance | A survey of 296 manufacturing companies in Sweden; applied simple regression analysis | Supply chain integration had a positive significant effect on performance | Supply chain integration used as a single variable; no mediating nor moderating variables considered; study done in Europe | Supply chain integration decomposed into three constructs; mediating and moderating variables considered; study done in Africa |
| Mutuerandu and Iravo (2014) | Effect of SCM practices implementation on performance | Case study of Haco companies in Kenya; used a convenience sample of 40 employees; used descriptive statistics | Positive effect of SCM practices implementation on performance found | Was a case study; used convenience sampling and weak analytical techniques | Used cross sectional survey and stratified sampling; it applied PLS-structural equation modelling |

| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| Pakurar, Haddad, Nagy, Popp, and Olah (2019) | Effect of supply chain integration on performance | A survey of 249 employees in the Jordanian banking sector. Data analysed using exploratory factor analysis | A significant and positive effect of supply chain integration implementation on performance found. | No mediating nor moderating variables; context is Asia | Mediating and moderating variables were considered; context is Africa |
| Muddaha, Khar, and Sulaiman (2018) | Effect of environmental dynamism and management capabilities on company performance. | A cross sectional survey of 225 SMEs in Katsina state, Nigeria. Applied regression analysis | Found significant positive influence for all independent variables on performance except learning capability which had no effect; environmental dynamism is a key moderator on the effect of management capabilities and performance | Did not explicitly use supply chain integration as the predictor variable; no mediating variables; study done on SMEs | Supply chain integration considered as explanatory variable; mediating variable included; was done in large manufacturing firms. |
| Koufteros, Voderembse, and Jayaram (2005) | Determine whether supply chain integration affects competitive advantage; whether competitive advantage affects profitability; whether certain contextual variables moderate the effect | A survey of 244 manufacturing companies in USA. Structural equation modelling used | Supply chain integration is positively related to competitive advantage; competitive advantage positively affects profitability; equivocality is a moderator on the influence of supply | Competitive advantage had two dimensions only; study done in USA. | Competitive advantage has five dimensions; study done in Kenya. |

| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| | of supply chain integration on organizational performance. | | chain integration on company performance | | |
| Zhang, Tse, Dai, and Chan (2017) | Relationship of green SCM, environmental dynamism and social control on firm performance | A sample of 185 Chinese manufacturers done. Hierarchical multiple regression used | The combined effect of green SCM, environmental dynamism and social control on financial performance is positive | Green SCM is only a part of supply chain integration; competitive advantage not used as mediator | Supply chain integration concept is fully used; competitive advantage is considered as mediator |
| Subburaj, Sriram, and Mehrolia (2020) | To find out the effect of supply chain integration on firm performance | A survey of 250 MSMEs in India; SEM used for data analysis | Integration of supply chain had a positive significant effect on performance | No mediating nor moderating variables. Study done on MSMEs. Study done in Asia. | Mediating and moderating variables included. Study was done on large manufacturing firms; study done in Africa. |
| Magutu, Aduda, and Nyaoga (2015) | Determine if supply chain technology is moderator in the connection linking supply chain strategies to performance of supply chain | Survey of 138 large manufacturing companies in Kenya; descriptive statistics, correlation and regression analysis used | A positive and significant link connecting supply chain strategies to performance; technology is a moderator in the connection linking supply chain strategies to performance | Mediating variables not considered; used only one variable as moderator | Mediating variables and multiple moderators included |

| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| Han, Omta, and Trienekens (2007) | Examine the link connecting supply chain integration, quality management approaches to performance | A survey of 229 Chinese pork slaughterhouses and processors. Structural equation modelling used as the main technique of analysis | Supply chain integration has no direct significant link with firm performance. Supply chain integration has an indirect positive link with firm performance through quality management practices | Quality management practices considered as the mediating variable; no moderating variable; study done in China | Competitive advantage was the mediating variable; moderating variables included. Study done in Kenya |
| Liu, Ke, Wei, and Hua (2013) | To find out the effect of supply chain integration on firm performance | A survey of 246 manufacturing firms and service industries in China. Regression analysis applied. | A significant and positive link for supply chain integration and performance | Market orientation was the only variable applied in measuring performance; study done in China | Firm performance measured by use of financial performance; study done in Kenya |
| Ozdemir and Aslan (2011) | To determine the link connecting supply chain integration, competitive advantage on business performance | A cross sectional survey of 181 in Turkish SMEs. The study employed hierarchical regression model | A significant positive connection for supply chain integration and competitive advantage but a weak positive connection for competitive advantage and firm performance | No moderating variable; studied SMEs in Turkey | The study considered moderating variable and was carried out in Kenya |

| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| Hosseini, Aziz, and Sheiki (2012) | Investigate the effect of supply chain integration on competitive advantage | A survey of 86 food industries in Iran. Structural equation modelling applied | A direct positive influence of supply chain integration on competitive advantage; supplier integration has a negative effect on competitive advantage; internal integration has no direct effect on competitive advantage | Firm performance not used as dependent variable; no moderating and mediating variables; study done in Asia | Firm performance included; moderating and mediating variables considered; study done in Africa |
| Quynh and Huy (2018) | To find the connection of SCM practices, competitive advantage and firm performance | A survey of 72 manufacturing firms, 57 trading firms and 54 service provider firms in Ho Chi Minh, Vietnam. The study employed factor analysis | A nonsignificant connection linking supply chain integration to company performance; a significant positive link connecting competitive advantage and performance | No moderating variables; study focuses only on SMEs. It excludes large firms | Moderating variables included; large manufacturing firms were studied. |
| Huang, Fen, and Liu (2014) | To find the effect of supply chain integration on organizational performance under uncertainty | A survey of 164 suppliers in Taiwanese 'Centre-Satellite Production System'. Hierarchical regression analysis used | Significant positive effect of integration of supply chain on supplier performance; demand and technological uncertainty have negative and positive moderating effects | Has supplier integration as dependent variable; no mediating variable and only two moderating variables. Study done in Asia. | Supplier integration is one of the independent variables; mediating variables considered; five moderating |

| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| | | | respectively. | | variables were used; study done in Africa |
| Ploenhad, Laoprawatchai, Thangrawd, and Jermsittpasert (2019) | Examines the mediating role of competitive advantage on the connection linking SCM and firm performance. | A survey of 560 food industries in Thailand. The study used PLS-SEM applied. | SCM has positive effect on competitive advantage and firm performance; competitive advantage mediates the connection of SCM and firm performance | No moderating variable; Study done in Asia | Moderating variables were included; study done in Africa |
| Wijetunge (2017) | Examines the mediating effect of competitive advantage on the connection linking SCM to firm performance | A survey of 155 SMEs in Colombo, Sri Lanka. Regression analysis used | SCM has positive effect on competitive advantage and firm performance; competitive advantage partially mediates the connection of SCM and firm performance | Study was done only on SMEs in Sri Lanka; no moderators | Same study was done on Kenya. Data collected from large manufacturing firms; moderators were included |
| Swink, Narasimhan, and Wang (2007) | To find out the mediating role of competitive advantage on the connection of SCM and company performance | A survey of 224 manufacturing plants in North America; structural equation modelling approached used | Results mixed for effect of supply chain integration on competitive advantage and on competitive advantage and organizational performance; a positive mediating influence of | Study done in North America. moderating variable not included | Study done in Kenyan setup. Moderators included |

| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| | | | competitive advantage on the connection linking supply chain integration to company performance. | | |
| Hatani, Djumahir, and Wirjodirjo (2013) | Examine the intervening role of competitive advantage on the connection linking supply chain integration to company performance | A cross sectional survey of 42 fishery companies in Sulawesi, Indonesia. regression analysis used | Internal integration positively influences competitive advantage and firm performance; external integration positively influences competitive advantage but has no effect on company performance; competitive advantage positively mediates the link of supply chain integration and company performance | External integration was taken as a single variable; no moderating variables; research done in Indonesia. | External integration is recognized as supplier and customer integration; moderators included; study done in Kenya |
| Reklitis, Sakas, Trivellas, and Tsoulfas (2021) | Assessing the mediating role of competitive advantage on the connection linking supply chain practices to firm performance | A cross sectional survey of 300 enterprises in agri-food sector in Greece; diagnostic-exploratory model, utilizing fuzzy cognitive mapping with agent-based modelling and | Mediating role of quality, flexibility and speed established | Some variables of competitive advantage not included; study done in Europe; no moderating variables | All variables of competitive advantage were included together with moderating variables; study done in Kenya |

| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| | | simulation | | | |
| Tarigan, Siagian, and Jie (2021). | The intervening role of resilience, flexibility and innovation on the link connecting supply chain integration and business performance in Covid-19 era | A cross-sectional survey of 470 manufacturing companies in Indonesia. PLS SEM used in analysis | Mediating effect of resilience, flexibility and innovation largely supported | Moderating variables not included; study not done in Africa | Moderating variables were included; study done in Africa. |
| Doan (2020) | The effect of supply chain drivers on competitive advantage | A cross-sectional study of 205 manufacturing firms in Vietnam; exploratory and multiple regression used | Supply chain drivers; facilities, inventory, transportation, information and pricing are strongly related to competitive advantage. | Did not use supply chain integration as a variable. Ultimate measure of performance (FP) not used; study done in Asia | Supply chain integration was used a variable; firm performance was used and study done in Kenya |
| Ahmed, Kristal, Pagell, and Gattiker (2019) | Explored how various types of intellectual and environmental dynamism affect the outcomes of buyer-supplier relationships | A cross-sectional survey of 163 manufacturing companies in North America; confirmatory factor analysis and regression analysis used | Operation process integration (OPI) and joint knowledge exploration are beneficial in generating higher value from key supply chain relationships. In stable environments, | Supply chain integration, competitive advantage and company performance not used as variables; regression used; study done in | Supply chain integration, competitive advantage and company performance were main constructs. PLS SEM used. Study |

| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| | | | performance is better by concentrating on OPI while in unstable environments, focus on joint knowledge exploration for better results | North America | done in Africa. |
| Hendijani and Saeidi (2021) | To determine the link connecting supply chain integration and demand uncertainty to company performance | Hierarchical regression model was used to analyse 84 sample firms. | Integration in internal and process dimension have positive effect on both operational and financial performance | Environmental dynamism and competitive advantage not applied. Hierarchical regression used. | Environmental dynamism and competitive advantage used. PLS SEM used. |
| Wong, Sinnandavar, and Soh (2021) | To determine the mediating role of supply chain integration between supply environment and operational performance | PLS-SEM analysis was used with 84 haulier companies | Supply chain integration mediates the relationship between supply environment and operational performance | Supply chain integration is used as a mediator. Competitive advantage not included. | Competitive advantage used as mediator. |
| Yu, Huo, and Zhang (2021) | To find out the mediating role of supply chain integration implementation on the connection linking information technology to company performance | A data of 296 cross-border-e-commerce firms in China collected and analysed using SEM with LISREL. | Supplier system and process integration boosted operational performance. | Used two subconstructs of supply chain integration. Study done in China | Used three subconstructs of supply chain integration. Study done in Kenya |

| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| Itang, Sufyati, Suganda, Shafenti, and Fahlevi (2022) | To determine the effect of supply chain management and flexibility on firm performance. Also, the mediating role of competitive advantage | 134 agricultural firms in Indonesia were sampled. PLS SEM tool used for analysis | Supply chain management influenced company performance. Competitive advantage failed to be a mediator in the link connecting supply chain management to firm performance | There was no moderator. Study done in Indonesia. | Environmental dynamism included as moderator. Study done in Kenya |
| Le and Ikram (2022) | Study targeted the establishment of the mediating role of company competitiveness on the link connecting sustainability innovation to company performance | A cross sectional survey of 435 SMEs in Vietnam conducted. SEM analysis done | Significant and positive relationship between sustainability innovation and firm performance. Firm competitiveness was a significant mediator | No moderator. Study done in Vietnam | Environmental dynamism included as moderator. Study done in Kenya |
| Beka Be Nguema, Bi, Akenroye, and El Baz (2021) | To investigate the effect of supply chain finance on firm performance; moderated and mediated by environmental dynamism and supply chain risk respectively. | A survey of 210 companies in China; SEM analysis done | Supply chain finance has positive and significant effect on operational performance. When environmental dynamism is high, relationship between supply chain finance and operational performance is | Supply chain risk used a mediator. Study done in China | Competitive advantage used as mediator. Study done in Kenya |

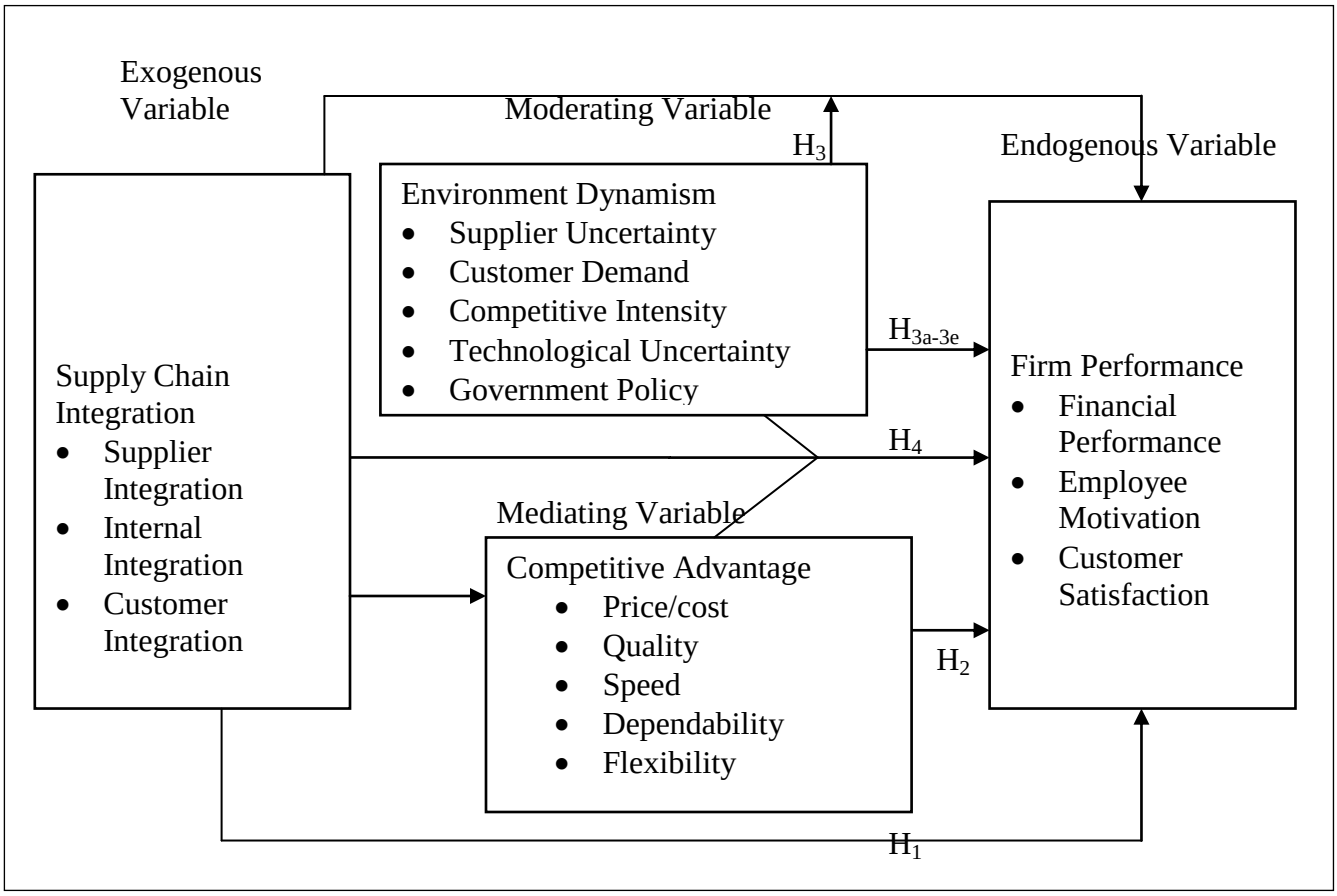
| Scholar(s) | Research Focus | Methodology | Key Results | Knowledge Gaps | Address of Gaps |
|---|---|---|---|---|---|
| | | | stronger. Supply chain risk a positive mediator. Supply chain risk has a negative effect on operational performance. | | |

Source: Researcher (2022)

## 2.5 Conceptual Framework

Supply chain integration is the study's exogenous construct, and it is made up of three indicators, as stated in the previous sections. These are customer, internal, and supplier integrations. Firm performance, as assessed by operating income and total assets, staff motivation, and customer satisfaction, is the response variable. It is proposed that competitive advantage mediates the role of supply chain integration implementation on company performance. Price/cost, quality, speed, dependability and flexibility are the indicators of competitive advantage. Finally, it is hypothesised that environmental dynamism (as measured by supplier uncertainty, customer demand, competitive intensity, technological uncertainty and government policy) moderates the effect of integration of supply chain on performance. The proposed relationships are schematically outlined in Figure 2.1 below.

**Figure 2. 1 Conceptual Model**




Source: Researcher (2022)

## 2.6 Study Hypotheses

From the theoretical and empirical literature, this study advanced the following hypotheses to explain the relationships outlined in the conceptual framework.

$H_1$: Supply chain integration has no significant effect on firm performance.

$H_2$: Competitive advantage has no substantial mediating role on the connection linking supply chain integration to firm performance.

$H_3$: Environmental dynamism has no substantial moderating role on the connection linking supply chain integration to firm performance.

- $H_{3a}$: Supplier uncertainty has no substantial moderating role on the connection linking supply chain integration to firm performance.
- $H_{3b}$: Customer uncertainty has no substantial moderating role on the connection linking supply chain integration to firm performance.
- $H_{3c}$: Competitive intensity has no substantial moderating role on the connection linking supply chain integration to firm performance.
- $H_{3d}$: Technological uncertainty has no substantial moderating role on the connection linking supply chain integration to firm performance.
- $H_{3e}$: Government policy has no discernible moderating role on the connection linking supply chain integration to firm performance.

$H_4$: Supply chain integration, competitive advantage, and environmental dynamism have no significant combined effect on firm performance.

# CHAPTER THREE: RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter focusses on the research strategy that was used in this study. The chapter starts with a description of the study philosophy, then moves on to the research design, population, and sample methodologies. Next are methods of collecting data, then operationalisation of the study variables. This is followed by data analysis methods then reliability and validity tests. Structural model estimation and hypothesis testing methods conclude the chapter.

## 3.2 Research Philosophy

In social science research, two philosophical approaches are dominant; interpretivism and positivism. Interpretivism views reality as socially constructed, hence it is alternatively called social constructivism (Saunders, Lewis, & Thornhill, 2003). Interpretivism considers reality as being established by people as opposed to by objective and external factors (Easterby-Smith, Thorpe, & Lowe, 2002; Irshaidat, 2022). This perspective portends that the researcher and reality are inseparable; hence studies using interpretivism are inductive in nature. These studies tend to be qualitative due to their subjective nature and are evaluated by their ability to discover new themes and explanations rather than generalization (Saunders, Lewis, & Thornhill, 2009).

Positivism approach assumes that reality is external and objective. As Remenyi, Williams, Money, and Swartz (1998: 33) put it, "the researcher is independent of and neither affects nor is affected by the subject of research". Hence, a study ought to be explained by value free objective criteria as opposed to human interests and beliefs (Kulatunga, Amaratunga, & Haigh, 2007). Studies adopting this approach are deductive and designed to test hypotheses that are developed from literature (Crowther & Lancaster, 2008). These studies also tend to be quantitative (Easterby-Smith et al., 2002). This research was premised on a positivist research philosophy, since it is deductive rather than inductive. Also, research hypotheses developed from literature tested the relationship between variables using quantitative data.

## 3.3 Research Design

Descriptive cross-sectional study strategy was applied in this research. This research approach is appropriate if the general aim of the study is to investigate if there are significant or notable associations among the variables at a given point in time (Teo, Wei, & Benbasat, 2003; Mugenda & Mugenda, 2003). The main goal of this research was to find out whether there is a connection linking supply chain integration to firm performance. Data was gathered across sampled firms at essentially the same point in time. Many related studies have adopted this research design successfully (Magutu, 2013; Musuva-Musimba, 2013; Odock, 2016; Zhang et al., 2017; Pakurar et al., 2019;).

## 3.4 Population of the Study

Large manufacturing companies in Kenya formed the population of this research. The research adopted the KAM classification that considered a large manufacturing firm to have one hundred employees or more. According to Kenya Manufacturers and Exporters Directory ((KMED), 2019), there were 679 such firms. The major rationale for choosing large scale manufacturing firms is that they have a high likelihood of exhibiting an elaborate SCM strategy and practice of supply chain integration (Bolo, 2011). This is because they are likely to have existed for a longer period relative to the smaller ones and have experimented with various management styles.

## 3.5 Sampling Techniques

The sampling frame for the research was the list of large-scale manufacturing firms in Kenya (KMED, 2019). This study used Structural Equation Modelling (SEM) in analysing the data. There are various approaches for sample size determination using SEM such as the highest number of arrows directed at a latent variable (Marcoulides & Saunders, 2006) and use of N:q ratio where N is number of cases while q is number of parameters in the model. Hair, Sarstedt, Hopkins, and Kuppelwieser (2014) recommend the use of N:q ratio as it results in the larger sample size. This is the approach used in the study. Jackson (2003) avers that the ideal ratio should be 20:1.

This study has six parameters (see Appendix II) and hence the sample size shall be 20 x 6 = 120. Israel (1992) asserts that on average 10% of respondents cannot be reached while

30% may not respond. Hence, to achieve a usable sample size of 120, the number of firms targeted was 120 divided by 0.6 which results in 200. Proportionate sampling approach was applied to obtain the sample size from the various strata (see Table 3.1). Within each stratum, systematic random sampling was used to pick the specific study firms since there was low risk of data manipulation (Maduekwe & de Vries, 2019).

**Table 3. 1: Sample Size Determination**

| Large-Scale Manufacturing Sectors (Strata) | Stratum Population | Sample Size |
|---|---|---|
| Leather Products and Footwear | 10 | 4 |
| Building, Construction & Mining | 20 | 6 |
| Motor Vehicle Assemblies & Accessories | 24 | 7 |
| Timber, Wood products & Furniture | 27 | 8 |
| Pharmaceutical & Medical Equipment | 32 | 9 |
| Energy, Electrical & Electronics | 45 | 13 |
| Metal and Allied | 68 | 19 |
| Paper and Paperboard | 69 | 21 |
| Textile and Apparels | 70 | 20 |
| Plastics and Rubber | 71 | 20 |
| Chemical and Allied | 80 | 25 |
| Food, Beverages and Tobacco | 163 | 48 |
| **Total** | **679** | **200** |

Source: Researcher (2022)

### 3.6 Data Collection

Primary data was applied in this study and it was gathered by means of a structured questionnaire (see Appendix VII). The questionnaire had five sections; section A sought information on the firm's profile while section B obtained information on supply chain integration. Section C gathered information on competitive advantage while section D covered environmental dynamism and section E obtained information on firm performance. Section E was further divided into $E_I$ (which capture financial performance), $E_{II}$ (employee motivation) and $E_{III}$ (customer satisfaction).

The bulk of the questionnaire (sections A to $E_I$) was administered to a single top manager in charge of SCM function in every firm. This was deemed to be the individual with detailed knowledge of what was being sought as proposed by Saunders et al. (2009). A single respondent is appropriate to avoid possible information duplication as a result of

multiple responses as argued by Odock (2016). Similarly, to capture employee motivation, one employee (not from management) was randomly selected from every firm sampled to fill sub-section $E_{II}$ of the questionnaire. For customer satisfaction, an officer in the marketing department of each firm who deals with customer concerns was identified to fill sub-section $E_{III}$ of the questionnaire. Such an officer is likely to have a collective customer perception on the firm's products/services.

This research used a web-based online questionnaire. The advantages of web-based survey over traditional methods such as "drop and pick later" method include reduced cost and time, access to respondents in distant places and possibility of reaching difficult to contact respondents (Nayak & Narayan, 2019; Wright, 2005). This approach was even more appropriate in the period of COVID-19 pandemic where keeping social distance was encouraged. To improve the number of responses and accuracy, participants were sensitised on the significance of the research findings to their firms. Further, constant reminders to the respondents were carried out through email and telephone.

### 3.7 Operationalisation of Research Variables

The researcher operationalised all the four constructs of the study that is integration of supply chain, competitive advantage, environmental dynamism and financial performance using multi-item indicators. A 5-point Likert scale was used for all constructs. When a construct contains an underlying non discrete variable depicting the respondent's value on attitude, opinion, or a belief, Clason and Dormody (1994) assert that this scale is appropriate because data cannot be acquired definitively, accurately, or categorically. Further, Boone and Boone (2012) contend that when there are four or more Likert-type questions or statements which are combined into one variable or score, a Likert scale can be considered to be of interval level measurement. Further, Jakobowicz and Derquenne (2007) contend that PLS-SEM is appropriate for analysing data when the variables are measured using Likert scale. Table 3.2 summarizes the operationalisation of the variables.

**Table 3. 2: Operationalisation and Measurement of the Research Variables**

| Latent Construct | Indicators | Measurement Items | Measurement Scale | Relevant Literature | Question |
|---|---|---|---|---|---|
| Supply chain integration | Supplier integration | Appendix III (a) | Ordinal scale | Chatzoudes & Chatzoglou, 2011; Flynn et al. 2010; Huang et al., 2014; Ganbold, 2017; Uwamahoro, 2018; Pakurar et al. 2019 | Section B Q1 |
| | Internal integration | Appendix III (b) | | Baharanchi, 2009; Chatzoudes & Chatzoglou, 2011; Danese & Romano, 2013; Annan et al. 2016; Yuen & Thai, 2017; Iranban, 2019 | Section B Q2 |
| | Customer integration | Appendix III (c) | | Flynn et al. 2010; Danese & Romano, 2011; Ganbold, 2017; Uwamahoro, 2018; Pakurar et al. 2019 | Section B Q3 |
| Competitive advantage | Cost | Appendix IV (a) | Ordinal scale | Chatzoudes & Chatzoglou, 2011; Vencataya et al. 2016; Odock, 2016 | Section C Q1 |
| | Quality | Appendix IV (b) | | Chatzoudes & Chatzoglou, 2011; Vencataya et al. 2016; Odock, 2016 | Section C Q2 |
| | Speed | Appendix IV (c) | | Ragu-Nathan et al. 2006; Chatzoudes & Chatzoglou, 2011; Vencataya et al. 2016; Odock, 2016 | Section C Q3 |
| | Dependability | Appendix IV (d) | | Shakkya, 2013; Vencataya et al. 2016 | Section C Q4 |
| | Flexibility | Appendix IV (e) | | Shakkya, 2013; Vencataya et al., 2016; Odock, 2016 | Section C Q5 |
| Environmental dynamism | Supplier uncertainty | Appendix V (a) | Ordinal scale | Tachizawa, 2009; Merschmann & Thonemann, 2010; Luo & Yu, 2016; Ganbold & Matsui, 2017 | Section D Q1 |
| | Customer uncertainty | Appendix V (b) | | Tachizawa, 2009; Merschmann & Thonemann, 2010; Luo & Yu, 2016; Bae, 2017; Peng & Liu, 2019; Gonzalez-Zapatero et al. 2019 | Section D Q2 |
| | Competitive intensity | Appendix V (c) | | Jansen et al. 2006; Tachizawa, 2009; Luo & Yu, 2016; Bae, 2017; Peng & Liu, 2019 | Section D Q3 |
| | Technological uncertainty | Appendix V (d) | | Ruiz-Ortega et al. 2013; Ganbold & Matsui, 2017; Gonzalez-Zapatero et al. 2019 | Section D Q4 |
| | Government policy | Appendix V (e) | | Boon-itt & Wong, 2011; Annan et al. 2016; Bae, 2017 | Section D Q5 |
| Firm performance | Financial performance | Appendix VI (a) | Ordinal scale | Cao & Zhang, 2011; Gayem & Dowlatkhah, 2016; Wijetunge, 2017 | Section $E_I$ Q1 |
| | Employee Motivation | Appendix VI (b) | | Banker & Mashruwala, 2007; Bhagwat & Sharma, 2007 | Section $E_{II}$ Q2 |
| | Customer Satisfaction | Appendix VI (c) | | Banker & Mashruwala, 2007; Bhagwat & Sharma, 2007 | Section $E_{III}$ Q3 |

Source: Researcher (2022)

## 3.8 Data Analysis

This study applied PLS-SEM to analyse the data. Wong (2013) describes PLS-SEM as a soft modelling approach which makes no assumptions on the distribution of the data. The technique is the best alternative to covariance-based Structural Equation Model (SEM) when dealing with a relatively small sample size and yet the model is complex; where normality requirement is not met, if the study is not confirmatory but exploratory and when the main aim of the model is prediction (Kaufman & Gaeckler, 2015; Sarstedt, Ringle, & Hair, 2017). Furthermore, an advantage of SEM over regression analysis is that several analyses such as reliability, validity and hypothesis testing can be conducted (Hair, Hult, Ringle, & Sarstedt, 2021). In this study, the four objectives can be realized using the technique. Also, the PLS-SEM is deemed relevant for this research since the sample size of 200 is comparatively low for covariance-based SEM. This technique has been employed successfully by Oredo (2016) who had sample size of 93 and Odock (2016) with sample size of 67.

## 3.9 Reliability and Validity Tests

Reliability and validity tests were used to ensure the study's results were credible. The indicator's precision, consistency, and repeatability are determined by its reliability (Huck, Cormier, & Bounds, 2012). Internal consistency reliability tests for each item and concept in the study were conducted using Jorestkogs composite reliability statistics and Cronbach's Alpha coefficient. Only items and constructs with Cronbach's alpha values 0.7 and above were picked for further analysis provided content validity was not compromised (Hair, Money, Page, & Samouel, 2007). Composite reliability was established if the score is greater than 0.6 (Hair, Ringle, & Sarstedt, 2011). Likewise, principal component analysis was conducted to assess the reliability of the measurement scale. Byrne (2001) avers that for an item to be part of the latent construct, its variance must be at least 0.3. To measure the convergent validity of the model, average variance extracted (AVE) values and confirmatory factor analysis were used. This was established if AVE is greater than 0.5 (Peng & Lai, 2012). Moreover, confirmatory factor analysis is established if indicators of a particular latent variable loaded more heavily on their constructs than on any other construct.

Validity is the degree to which an instrument measures what it is supposed to measure (Sekaran & Bougie, 2016). For content validity, the questionnaire was pretested on 10 experts who manage the supply chains of the study firms. This was to check on issues like wording, logic and content of the questionnaire (Hair, Black, Babin, & Anderson, 2014). Construct validity refers to whether a measure correlates with the theorised latent construct that it purports to measure (Zeng, Meng, Yin, Tam, & Sun, 2010). This was assessed using exploratory factor analysis (EFA) with varimax rotation. Items with factor loading less than 0.4 were not considered for further analysis. Next, construct validity was determined by examining convergent and discriminant validity. For convergent validity to be established, a minimum outer loading of 0.7 is required for an indicator (Hair et al., 2021). For a construct, convergent validity is established if AVE $\geq 0.5$.

Three criteria were used to evaluate discriminant validity; cross loadings, Fornell-Larcker criterion and HTMT ratio. For cross loadings, it is established if every item loads highest on its related latent variable compared to on any other latent variable. For Fornell-Larcker criterion, the square root of AVE for a given latent variable has to be larger than other correlations in the columns and rows (Fornell & Larcker, 1981). Heterotrait-Monotrait, HTMT statistic was also used to assess discriminant validity (Hair et al., 2021). Discriminant validity was confirmed if HTMT $\leq$ 0.85 and its confidence interval excludes 1. The structural model was tested for collinearity among the constructs. If the tolerance level is more than 0.2 and Variance Inflation Factor (VIF) is less than 5, there is no multicollinearity.

### 3.10 Structural Model Estimation and Hypothesis Testing

The overall model's goodness of fit was examined once the measurement and structural models had been established for reliability and validity. The standardised root mean square (SRMS) was used for goodness of fit since it is appropriate for PLS-SEM analyses (Henseler et al., 2014). SRMS is the root mean square difference among observed correlations and the model predicted correlations and as such a perfect fit is indicated by a value of zero. Consequently, values less than 0.1 indicate that the model has acceptable fit. Next, coefficient of determination, $R^2$ for predictive power was checked for all endogenous variables. $R^2$ values of 0.19, 0.33 and 0.67 indicate low, moderate and large

predictive power in that order (Peng & Lai, 2012). Also, marginal analysis was done to check the effect of an omitted exogenous variable on the value of $R^2$ on an endogenous variable (effect size, $f^2$). $f^2$ magnitudes of 0.35, 0.15 and 0.02 represent large, medium and small effects in that order.

The predictive accuracy and relevance of the model were also evaluated. Path model predictive accuracy is acceptable if Stone-Geiser's, $Q^2 > 0$ (Sarstedt et al., 2017). A $q^2$ value of 0.35, 0.15, or 0.02 for predictive relevance indicates that an exogeneous latent variable has a significant, moderate or small predictive relevance for a given endogenous latent variable, in that order. The relevance of path coefficients was then determined. If the magnitude of $t > 1.96$ or the p-value is less than 0.05 at the 5% threshold of significance, the path coefficient is significant (2-tailed test). Also, the confidence interval should not include zero. These are summarized in Table 3.3 for the various hypotheses.

**Table 3. 3: Data Analysis Techniques Summary**

| Objectives | Hypotheses | Data Analysis Techniques and Model | Interpretation of Path Coefficients |
|---|---|---|---|
| Find out the effect of supply chain integration on firm performance | $H_1$ Supply chain integration has no significant effect on firm performance | PLS-SEM<br>$FP=\beta_0 + \beta_1 SCI + \varepsilon$ | Hypothesis is rejected if p-value < 0.05 or t-value > 1.96 |
| Determine the effect of competitive advantage on the link connecting supply chain integration to firm performance | $H_2$ Competitive advantage has no substantial mediating role on the connection linking supply chain integration and firm performance | PLS-SEM and mediation analysis (Klarner, Sarstedt, Hoeck, & Ringle, 2013; Nitzl, Roldan, & Cepeda, 2018)<br><br>Comparison of significance of direct and indirect effects | Hypothesis is rejected if p-value < 0.05 or t-value > 1.96.<br>Full mediation if indirect effect is significant while direct effect is not significant (refer to Appendix VII) |
| | $H_{2a}$ There is no significant influence of supply chain integration on competitive advantage of a firm | | |
| | $H_{2b}$ Competitive advantage has no significant influence on firm performance | | |
| Determine the effect of environmental dynamism on the link connecting supply chain integration to company performance | $H_3$ Environmental dynamism has no substantial moderating role on the connection linking supply chain integration to firm performance | PLS-SEM and moderation analysis using the two-stage approach (Henseler & Chin, 2010)<br>$FP= \beta_0 + \beta_1 SCI + \beta_2 ED + \beta_3 SCI*ED + \varepsilon$<br>ED = Environmental Dynamism | Hypothesis is rejected if p-value < 0.05 or t-value > 1.96 |
| | $H_{3a}$ Supplier uncertainty has no substantial moderating role on the connection linking supply chain integration to firm performance | | |
| | $H_{3b}$ Customer uncertainty has no substantial moderating role on the connection linking supply chain integration to firm performance. | | |
| | $H_{3c}$ Competitive intensity has no substantial moderating role on the | | |

| Objectives | Hypotheses | Data Analysis Techniques and Model | Interpretation of Path Coefficients |
|---|---|---|---|
| | connection linking supply chain integration to firm performance | | |
| | $H_{3d}$ Technological uncertainty has no substantial moderating role on the connection linking supply chain integration to firm performance | | |
| | $H_{3e}$ Government policy has no discernible moderating role on the connection linking supply chain integration to firm performance | | |
| Establish the combined influence of supply chain integration, competitive advantage and environmental dynamism on firm performance | $H_4$ Supply chain integration, competitive advantage, and environmental dynamism have no significant combined effect on firm performance | PLS-SEM for combined influence $FP= \beta_0 + \beta_1 SCI + \beta_2 CA + \beta_3 ED + Ɛ$ | Hypothesis is rejected if p-value < 0.05 or t-value > 1.96 |

Source: Researcher (2022)

# CHAPTER FOUR: DATA ANALYSIS AND FINDINGS

## 4.1 Introduction

The analyses done in accordance with the research goals are presented in this chapter. It starts with some background information about the companies under investigation. After that, all of the study variables' descriptive statistics are shown. The validity and reliability of the outer (measurement) and inner (structural) models for all of the objectives are next assessed. Within these objectives, path coefficient significance tests are performed.

## 4.2 Background Information

This section discusses the background information for the study. The background consists of the rate of response, firm ownership, number of workers and the length of existence of the organisation.

### 4.2.1 Rate of Response

Out of 200 questionnaires administered to the research participants, 111 were obtained. This represents a response proportion of 55.5%. A response proportion of 70% is excellent, 60% is good and 50% is adequate for the study as argued by Mugenda and Mugenda (2003). However, other researches have indicated that outcomes from studies with rate of response of 20 percent or even lower were not any statistically significant compared to those of larger response rate (Curtin, Presser, & Singer, 2000; Keeter, Kennedy, Dimock, Best, & Craighill, 2006). A detailed analysis of the questionnaires found that 17 of them were not useful for further study (8 had inconsistent responses, 5 had straight lining responses, 3 were not fully filled and 1 indicated more than one sector). Therefore, the useful questionnaires were 94 which represent a revised response rate of 47%. Table 4.1 outlines the details on the rate of response for every manufacturing sub-sector.

**Table 4.1: Rate of Response**

| Sector | Sample Size | Response | Unadjusted response rate | Usable | Adjusted response rate |
|---|---|---|---|---|---|
| Leather Products and Footwear | 4 | 2 | 50% | 2 | 50% |
| Building Construction and Mining | 6 | 3 | 50% | 3 | 50% |
| Motor Vehicle Assemblies & Accessories | 7 | 6 | 86% | 4 | 57% |
| Timber, Wood products & Furniture | 8 | 4 | 50% | 2 | 25% |
| Pharmaceutical & Medical Equipment | 9 | 4 | 44% | 4 | 44% |
| Energy Electrical & Electronics | 13 | 7 | 54% | 6 | 46% |
| Metal & Allied | 19 | 10 | 53% | 8 | 42% |
| Paper & Paperboard | 21 | 11 | 52% | 10 | 48% |
| Textile & Apparels | 20 | 11 | 52% | 10 | 48% |
| Plastics & Rubber | 20 | 12 | 57% | 11 | 52% |
| Chemical & Allied | 25 | 11 | 44% | 11 | 44% |
| Food Beverages & Tobacco | 48 | 30 | 63% | 23 | 48% |
| **Total** | **200** | **111** | **56%** | **94** | **47%** |

Source: Research Data (2022)

As can be observed from Table 4.1, most subsectors had adjusted response rate of greater than 40% with the lowest being 25%. Hence, all manufacturing subsectors were well represented.

### 4.2.2 Ownership of the Firm

Respondents were requested to specify the ownership status of their companies. The outcomes are summarized in Table 4.2. Most of the responding firms are locally owned (55%) followed by joint locally and foreign owned (32%) and finally foreign owned (13%). It can be argued that the competition between the local and foreign firms necessitate them to find new ways of being ahead such as application of supply chain integration.

**Table 4.2: Ownership of the Firm**

| Ownership | Frequency | Percentage |
|---|---|---|
| Locally owned (fully) | 52 | 55% |
| Foreign owned (fully) | 12 | 13% |
| Joint locally and foreign owned | 30 | 32% |
| **Total** | **94** | **100%** |

Source: Research Data (2022)

### 4.2.3 Full Time Employees in the Firm

Participants were requested to show the number of full-time workers in the organisation. The outcomes are indicated in Table 4.3. Majority had 100 to 399 employees (65%), 700 and above employees were 19% while between 400 and 699 were 16%. This would imply that the relatively smaller firms have the incentives to implement strategic initiatives such as integrating their supply chains in order to grow.

**Table 4.3: Full Time Workers in the Firm**

| Number of Workers | Frequency | Percentage |
|---|---|---|
| 100 to 399 | 61 | 65% |
| 400 to 699 | 15 | 16% |
| 700 and above | 18 | 19% |
| **Total** | **94** | **100%** |

Source: Research Data (2022)

### 4.2.4 Length of Existence of the Firm

Study participants were requested to specify the period their firm had been in existence. The outcomes are displayed in Table 4.4. Most of the firms have existed for less than 25 years (38%) while those that have existed for 50 years and above were 31%. Those that have existed between 25 and 49 years are 26%. 5% of the firms did not specify their length of existence. On average, the firms had existed for 34.4 years. This length of period of existence of a firm is likely to have led it to implement competitive strategies such as supply chain integration.

**Table 4.4: Duration of Existence of the Firm**

| Existence | Frequency | Percentage |
|---|---|---|
| Below 25 years | 36 | 38% |
| 25 and 49 years | 24 | 26% |
| 50 and above | 29 | 31% |
| Unspecified | 5 | 5% |
| **Total** | **94** | **100%** |

Source: Research Data (2022)

### 4.3 Sampling Adequacy and Sphericity Test

This section carries out sampling adequacy and sphericity tests to assess whether factor analysis is suitable. To assess sampling adequacy, Kaiser-Meyer-Olkin (KMO) measures were used. According to Kaiser (1974), KMO values <0.5 are not acceptable. Bartlett's test of sphericity is used to assess for dimension reduction. This is possible if p values <0.05. All KMO measures were established to be more than the required minimum and their p values were <0.05. This indicates that all constructs are significant statistically. The outcomes are displayed in Table 4.5.

**Table 4.5: KMO and Bartletts Tests Results**

| Latent Variable | KMO Value | Approx. Chi Square | df | Sig |
|---|---|---|---|---|
| Supplier Integration | .752 | 252.836 | 45 | .000 |
| Internal Integration | .862 | 281.992 | 36 | .000 |
| Customer Integration | .868 | 366.082 | 55 | .000 |
| Cost | .689 | 79.972 | 3 | .000 |
| Quality | .500 | 78.623 | 1 | .000 |
| Speed | .734 | 136.234 | 10 | .000 |
| Dependability | .500 | 32.743 | 1 | .000 |
| Flexibility | .713 | 153.291 | 6 | .000 |
| Supplier Uncertainty | .720 | 70.359 | 15 | .000 |
| Customer Uncertainty | .576 | 42.931 | 6 | .000 |
| Competitive Intensity | .590 | 74.199 | 15 | .000 |
| Technological Uncertainty | .671 | 39.676 | 6 | .000 |
| Government Policy | .734 | 141.494 | 15 | .000 |
| Financial Performance | .500 | 29.202 | 1 | .000 |
| Employee Motivation | .788 | 134.437 | 6 | .000 |
| Customer Satisfaction | .730 | 88.064 | 6 | .000 |

Source: Research Data (2022)

### 4.4 Reliability and Construct Validity

The indicators of the outer model in the study were refined using exploratory factor analysis (EFA). A number of criteria were used to assess the indicators' reliability and construct validity. Principal component analysis (PCA) with varimax rotation was applied to perform EFA. For each construct, factor loadings for all elements were assessed. Items having factor loadings of at least 0.4 were carried forward for additional investigation, unless it jeopardized content validity (Hair et al., 2021). Item to total correlation scores were run to assess reliability and internal consistency for all constructs in the study. Items with item to total correlation values above 0.3 were retained for further analyses provided that content validity was not affected. Internal consistency for a construct will have been established if Cronbach’s Alpha is higher than 0.7. However,

according to Nunally (1994), values of Cronbach's Alpha which are higher than 0.7 represent high reliability level; while values between 0.5 and 0.7 represent acceptable reliability level.

### 4.4.1 Supply Chain Integration

The construct, supply chain integration, had three subconstructs which are supplier, internal and customer integration. The indicators of these subconstructs were each subjected to reliability and construct validity assessments. The outcomes are discussed in detail in the ensuing subsections.

#### 4.4.1.1 Supplier Integration

Supplier integration consisted of ten (10) statements seeking to determine the degree to which the firm had integrated with suppliers. This was done on a 5-point Likert scale which ranged from 1 indicating very small degree to 5 indicating very large degree. The mean scale score ranged from 2.80 to 4.28. The lowest score was for the statement (9) "our vendors largely manage inventory for our firm" (SD=1.241, N=94). The greatest score was for the statement (2) "the firm seeks assurance of quality from suppliers" (SD=0.739, N=94). The overall average rating for this subconstruct was 3.70, indicating that the respondents on average believed that their firms integrated with their suppliers to a large degree.

The scales' Cronbach's Alpha was 0.783 and since this is ≥0.7, internal consistency is established. Except for statements 2 and 3, "the firm seeks assurance of quality from suppliers" and "the firm offers information to suppliers for quality production," which had values of 0.245 and 0.217, respectively, the item-to-total correlations were above 0.3. However, all factor loadings for this construct were higher than the required minimum level of 0.4. Hence, all these indicators were considered for further analysis. Table 4.6 displays the outcomes.

**Table 4.6: Supplier Integration**

| | | N | Mean | Std. Dev | Factor Loadings | Item- Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|---|
| 1 | Strategic alliances with suppliers have been built by the firm | 94 | 4.01 | .796 | .667 | .315 | .778 |
| 2 | The firm seeks assurance of quality from suppliers | 94 | 4.28 | .739 | .719 | .245 | .784 |
| 3 | The company provides information to suppliers for quality production | 94 | 4.18 | .842 | .751 | .217 | .788 |
| 4 | Suppliers are involved when developing a product | 94 | 3.45 | 1.224 | .543 | .537 | .752 |
| 5 | Information exchange through information system integration with suppliers have been established | 94 | 3.49 | 1.134 | .594 | .619 | .740 |
| 6 | Fast ordering systems have been set up with suppliers | 94 | 3.72 | 1.051 | .643 | .595 | .745 |
| 7 | Packaging customisation with suppliers have been achieved | 94 | 3.90 | 1.048 | .592 | .431 | .766 |
| 8 | The gains as a consequence of collaboration with suppliers are shared equally | 94 | 3.38 | 1.219 | .493 | .530 | .753 |
| 9 | Our vendors largely manage inventory for our firm | 94 | 2.80 | 1.241 | .627 | .380 | .776 |
| 10 | Continuous information programs have been achieved | 94 | 3.77 | 1.031 | .599 | .596 | .746 |

Mean = 3.70, Cronbach's Alpha = 0.783,

Source: Research Data (2022)

#### 4.4.1.2 Internal Integration

Internal integration subconstruct was captured by use of nine statements which sought to find out the degree to which the firms had integrated their internal operations. This was done using the 5-point Likert scale. The scale ranged from 1, indicating very small degree to 5 indicating very large degree. As shown in Table 4.7, the average ratings were between 3.85 and 4.19. The lowest rating was for the statement (7) "the degree of data integration information process is great" (SD=0.927, N=94). The highest rating was for the statement (2) "the coordination with marketing team is successful" (SD=0.723, N=94). The grand mean was 3.99 indicating the firms had internally integrated to a large degree.

The Cronbach's Alpha was 0.848 and hence reliability was achieved. Factor loadings for all the indicators were higher than 0.4 except for statement 2 "the coordination with marketing team is successful" which had a value of 0.350. However, all the indicators had item to total correlations higher than 0.3. Thus, all the indicators were carried forward for additional analyses given that they fulfilled the requirement for item to total correlation. The outcomes are exhibited in Table 4.7.

**Table 4.7: Internal Integration**

| | N | Mean | Std. Deviation | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|
| 1 Cross functional management is widely used | 94 | 3.99 | .755 | .528 | .520 | .836 |
| 2 The coordination with marketing team is successful | 94 | 4.19 | .723 | .350 | .446 | .843 |
| 3 There is awareness of strategic plans to the appropriate parties within the firm | 94 | 3.96 | .938 | .682 | .603 | .828 |
| 4 Periodic interdepartmental meetings are commonly utilised | 94 | 4.12 | .878 | .557 | .529 | .835 |
| 5 Sharing of information inside the firm is extensive | 94 | 4.09 | .799 | .525 | .543 | .834 |
| 6 Integration of data among internal functions is attained via ERP systems | 94 | 3.90 | .995 | .702 | .589 | .830 |
| 7 The degree of data integration information process is great | 94 | 3.85 | .927 | .735 | .665 | .820 |
| 8 Alignment of systems across all functional units have been achieved | 94 | 3.88 | .878 | .647 | .611 | .827 |
| 9 There is a visibility of processes inside the firm | 94 | 3.94 | .814 | .567 | .571 | .831 |

Mean = 3.99, Cronbach's Alpha = 0.848

Source: Research Data (2022)

#### 4.4.1.3 Customer Integration

This construct sought to determine whether the companies had integrated with their customers. This was assessed using eleven indicators on a 5-point Likert measure with 1 representing very small degree and 5 representing very high degree. Table 4.8 summarizes the outcomes. The average responses ranged between 3.50 and 4.35. The highest rating was for the statement (8) "the firm utilizes the feedbacks from its customers" with an average of 4.35 (SD=0.683, N=94). The lowest rating was for the statement (3) "periodic meetings with customers are commonly utilized" with an average of 3.50 (N=94, SD= 1.003). The grand mean was 4.02 implying that on average, the participants believed that integration of customers had been executed to a high degree.

The Cronbach's Alpha was determined to be 0.857. This is bigger than the minimum of 0.7, indicating that internal consistency was achieved. Every factor loading is more than the required minimum of 0.4. Furthermore, all item to total correlations were bigger than 0.3. Hence every indicator for this subconstruct was considered for further analyses. The outcomes are displayed in Table 4.8.

**Table 4.8: Customer Integration**

| | | N | Mean | Std. Deviation | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|---|
| 1 | Sharing of information through information and communication technology with customers have been achieved | 94 | 3.82 | .983 | .486 | .531 | .848 |
| 2 | Level of integration with customers through ICT is quite high | 94 | 3.57 | 1.011 | .721 | .505 | .850 |
| 3 | Periodic meetings with customers are commonly utilised | 94 | 3.50 | 1.003 | .539 | .475 | .853 |
| 4 | Our firm is conscious of its customer wants | 94 | 4.24 | .772 | .571 | .650 | .838 |
| 5 | Our company measures satisfaction of its customer regularly | 94 | 4.16 | .780 | .447 | .565 | .844 |
| 6 | Firm activities and processes are aligned with customer needs | 94 | 4.29 | .682 | .615 | .527 | .847 |
| 7 | Customers are encouraged to provide feedbacks | 94 | 4.21 | .717 | .619 | .693 | .836 |
| 8 | The firm utilises the feedbacks from its customers | 94 | 4.35 | .683 | .535 | .615 | .842 |
| 9 | The firm has systematic processes for addressing customer complaints | 94 | 3.96 | .828 | .538 | .532 | .847 |
| 10 | Customers contribute to the firm values | 94 | 4.04 | .775 | .460 | .449 | .852 |
| 11 | The firm has the ability to determine the future expectations of customers | 94 | 4.04 | .828 | .527 | .598 | .842 |

Mean = 4.02, Cronbach's Alpha = 0.857

Source: Research Data (2022)

### 4.4.2 Competitive Advantage

The latent variable competitive advantage had five subconstructs which are cost, quality, speed, dependability and flexibility. To measure these sub-constructs, the 5-point Likert gauge was applied to show the extent to which those measures of competitive advantage had improved in the last 10 years. 1 represented an improvement of 10% and below, 2 stood for improvement between 11% to 20%, 3 represented improvements between 21% and 30%, 4 indicated an improvement from 31% to 40% while 5 represented an improvement over 40%.

Cost subconstruct had three indicators. The greatest improvement was for "capacity utilization" with an average of 3.76 (SD=0.924, N=94), next was "enhanced inventory turnover" which averaged 3.71 (N=94, SD=1.033). The lowest improved was "reduced unit production cost" which averaged 3.14 (N=94, SD=1.275). The overall average was 3.54, meaning that the manufacturing firms had cost indicator improvement of between 31% and 40%. Cronbach's Alpha was 0.773 meaning reliability was realised. All the factor loadings were above 0.6 and item-to-total correlations were between 0.593 and 0.675. Hence, all these indicators of cost were carried out for further analyses as they met the required thresholds. The details are summarised in Table 4.9.

**Table 4.9: Cost**

| | | N | Mean | Std. Deviation | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|---|
| 1 | Reduced unit production cost | 94 | 3.14 | 1.275 | .664 | .594 | .739 |
| 2 | Improved capacity utilisation | 94 | 3.76 | .924 | .676 | .593 | .722 |
| 3 | Enhanced inventory turnover | 94 | 3.71 | 1.033 | .758 | .675 | .623 |

Mean = 3.54, Cronbach's Alpha = 0.773,

Source: Research Data (2022)

Quality had only two indicators. The indicator which had the lower improvement was "reduction in the products scrapped" which averaged 3.39 (SD=1.211, N=94). The other indicator "reduction in the number of customer complaints during warranty period" had a mean of 3.50 (SD=1.233, N=94). The subconstruct had an overall average of 3.45 which means that quality was enhanced to an extent of between 21% and 30% in the last 10 years for the manufacturing firms. The factor loadings were both 0.880. Similarly, item-to-total correlations were both 0.759 while Cronbach's Alpha was 0.863. All these point to high reliability and construct validity. It is to be noted that in the column of "Cronbach's Alpha if item deleted" is blank when there are only two variables. This is because the variables left have to be a minimum of two since they are being correlated (Hair et al., 2021). The information is summarised in Table 4.10.

**Table 4.10: Quality**

| | | N | Mean | Std. Deviation | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|---|
| 1 | Reduction in the number of customer complaints during warranty period | 94 | 3.50 | 1.233 | .880 | .759 | - |
| 2 | Reduction in the products scrapped | 94 | 3.39 | 1.211 | .880 | .759 | - |

Mean = 3.45, Cronbach's Alpha = .863

Source: Research Data (2022)

Speed as a measure of competitive advantage had five indicators. The mean measures of improvement ranged from 3.50 to 3.81 with the combined mean being 3.65. This means that speed improved by between 31% and 40% for the manufacturing firms. As represented in Table 4.11, all the factor loadings varied from 0.611 to 0.844 whereas item-to-total correlations range from 0.428 to 0.699. Cronbach's Alpha value is 0.771. All these are an indication of high reliability and construct validity.

**Table 4.11: Speed**

| | N | Mean | Std. Dev. | Factor Loadings | Item- Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|
| 1 Improvement in equipment changeover time | 94 | 3.64 | 1.144 | .611 | .428 | .770 |
| 2 Order lead time reduction | 94 | 3.60 | .943 | .844 | .699 | .682 |
| 3 Decrease in time to solve customer complaints | 94 | 3.81 | 1.110 | .670 | .469 | .755 |
| 4 Reduction in design time | 94 | 3.50 | 1.095 | .773 | .589 | .712 |
| 5 Increase in speed of new product launch | 94 | 3.68 | 1.070 | .734 | .561 | .722 |

Mean = 3.65, Cronbach's Alpha = .771

Source: Research Data (2022)

Dependability was evaluated by use of two indicators. The indicator which had the lower mean improvement of 3.23 was “decrease in machine down-time” (SD = 1.149, N=94). The indicator with the higher mean was “reduced number of times the customer promises not met” which was 3.45 (N=94, SD = 1.197). The grand average for this subconstruct was 3.34 which implied an improvement in dependability for these firms of between 21% and 30%. Factor loadings for both are 0.774 whereas item to total correlation is 0.548 for both indicating that the reliability is established. Cronbach’s Alpha value of 0.708 is higher than the minimum required of 0.7 and hence the two indicators for dependability were retained for further analyses. Table 4.12 exhibits the outcomes.

**Table 4.12: Dependability**

| | N | Mean | Std. Dev. | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|
| 1 Decrease in machine down-town | 94 | 3.23 | 1.149 | .774 | .548 | - |
| 2 Reduced number of times the customer promises not met | 94 | 3.45 | 1.197 | .774 | .548 | - |

Mean = 3.34, Cronbach's Alpha = .708,

Source: Research Data (2022)

Flexibility subconstruct was captured by use of four indicators. All the mean improvements were above 3.6 with the highest being 3.96 for the indicator “capability of the company to vary delivery time to satisfy customers” (SD = 0.915, N=94). The grand average for this subconstruct was 3.84. This implies that flexibility improvement in manufacturing firms was between 31% and 40%. Factor loadings were all high, the lowest being 0.738. Similarly, item to total correlations were all high, the lowest being 0.563. The Cronbach’s Alpha was 0.830. These are all indication that reliability and construct validity were confirmed. This information is summarised in Table 4.13.

**Table 4.13: Flexibility**

| | | N | Mean | Std. Dev | Factor Loadings | Item- Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|---|
| 1 | Ability to change production to fit the change in demand volume | 94 | 3.89 | .898 | .826 | .666 | .782 |
| 2 | Capability of introducing new products in case demand shifts | 94 | 3.84 | .976 | .884 | .765 | .733 |
| 3 | Capacity of introducing a wide assortment of product mix within a short time | 94 | 3.66 | .945 | .738 | .563 | .827 |
| 4 | Capability of the firm to vary time of delivery to satisfy customers | 94 | 3.96 | .915 | .806 | .643 | .792 |

Mean = 3.84, Cronbach's Alpha = .830

Source: Research Data (2022)

### 4.4.3 Environmental Dynamism

Environmental dynamism as a construct was broken down into five subconstructs which were supplier uncertainty, customer uncertainty, competitive intensity, technological uncertainty and government policy. Before further analyses, each of these subconstructs was evaluated for reliability and construct validity. The outcomes of these tests are discussed in the ensuing subsections.

#### 4.4.3.1 Supplier Uncertainty

Six sources of supplier uncertainty were measured. The participants in the research were requested to show the degree to which they experienced uncertainty concerning their suppliers. They were to indicate on a 5-point Likert measure where 1 represented very small degree to 5 representing very large degree. The responses had the lowest average of 2.84 to the highest one of 3.12. The indicator “the level of rejection of

material/components from suppliers is high" had the least average of 2.84 (SD = 1.129, N=94). The indicators "there is a high and unpredictable frequency of change in demand" (SD=1.056, N=94) and "the frequency of change in prices of raw materials or components is very high" (SD= 1.046, N=94) both had the highest means at 3.12. The overall mean rating for this subconstruct was 2.96. This implies that the respondents believed that the degree of supplier uncertainty in their firms was to a moderate extent. The item to total correlations varied from 0.260 to 0.493. However, factor loadings were from 0.492 to 0.679. These are higher than the required minimum value of 0.4 hence reliability was confirmed. Cronbach's Alpha is 0.647 which is below the threshold of 0.7. However, this value is in the acceptable range of between 0.5 and 0.7 according to Nunally (1994). All these indicate reliability and construct validity are met. Table 4.14 exhibits the outcomes.

**Table 4.14: Supplier Uncertainty**

| | N | Mean | Std. Dev. | Factor Loadings | Item-to-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|
| 1 There is high frequency of material delays from suppliers | 94 | 2.95 | .943 | .498 | .260 | .642 |
| 2 Quality of critical materials from suppliers are highly unpredictable | 94 | 2.87 | 1.050 | .629 | .493 | .559 |
| 3 Change of supplier lead time is quite high | 94 | 2.85 | 1.047 | .492 | .461 | .572 |
| 4 There is a high and unpredictable frequency of change in demand | 94 | 3.12 | 1.056 | .528 | .274 | .641 |
| 5 The frequency of change in prices of raw materials or components is very high | 94 | 3.12 | 1.046 | .531 | .471 | .568 |
| 6 The level of rejection of materials/components from suppliers is high | 94 | 2.84 | 1.129 | .679 | .314 | .629 |

Mean = 2.96, Cronbach's Alpha = .647

Source: Research Data (2022)

#### 4.4.3.2 Customer Uncertainty

Customer uncertainty subconstruct was measured using four indicators. Participants were requested to show the degree of uncertainty concerning their customers on a 5-point Likert scale. 1 represented very small degree whereas 5 represented very large degree. The indicators with the lowest mean were "there is high rate of unforeseen change in demand" (M=3.04, SD=1.015, N=94) and "the rate of change in customer preference is quite high" (M=3.04, SD=0.938, N=94). The indicator which had the largest average of 3.27 (SD=1.018, N=94) was "the change in customer delivery schedules is quite often". The overall mean of this subconstruct was 3.13. This implies that on average, these firms experience moderate degree of uncertainty with their customers. The variation of item to total correlations was from 0.285 to 4.46. However, factor loadings were all higher than the lowest acceptable level of 0.4. The value of Cronbach's Alpha is 0.574 which is in the acceptable range of between 0.5 and 0.7. Hence reliability and construct validity are established. Table 4.15 exhibits the outcomes.

**Table 4.15: Customer Uncertainty**

| | | N | Mean | Std. Dev. | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|---|
| 1 | Frequency of order change by customers is high | 94 | 3.18 | 1.067 | .706 | .326 | .529 |
| 2 | There is high rate of unforeseen change in demand | 94 | 3.04 | 1.015 | .705 | .446 | .428 |
| 3 | The rate of change in customer preference is quite high | 94 | 3.04 | .938 | .784 | .285 | .556 |
| 4 | The change in customer delivery schedules is quite often | 94 | 3.27 | 1.018 | .668 | .374 | .488 |

Mean = 3.13, Cronbach's Alpha = .574

Source: Research Data (2022)

#### 4.4.3.3 Competitive Intensity

The competitive intensity subconstruct was conceptualised to be measured by six indicators. Participants were required to show on a 5-point Likert measure the extent of their agreement on questions regarding competitive intensity. 1 represented very small degree while 5 represented very large degree. The lowest ranked indicator with a mean of 2.63 was "entry into the industry was very easy" (SD = 1.182, N=94). The highest ranked indicator with a mean of 3.49 was "there are many competitors in the industry" (SD=1.045, N=94). The grand mean is 3.09. This implies that the manufacturing firms essentially face a moderate degree of competitive intensity.

The factor loadings fall between 0.216 and 0.743 inclusive. The item to total correlations varied from 0.227 to 0.511. Deleting any of the indicators will reduce the Cronbach's Alpha except the first which barely maintains the same level. The Cronbach's Alpha is 0.617 which is in the acceptable range. Hence reliability and construct validity are established. The outcomes are displayed in Table 4.16.

**Table 4.16: Competitive Intensity**

| | N | Mean | Std. Dev | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|
| 1 There is high difficulty in predicting competitor strategies | 94 | 2.95 | 1.009 | .743 | .227 | .617 |
| 2 The frequency at which competitor promotional strategies change is high | 94 | 3.09 | 1.012 | .589 | .509 | .511 |
| 3 There are many competitors in the industry | 94 | 3.49 | 1.045 | .216 | .247 | .611 |
| 4 There are many incidences of counterfeits | 94 | 3.11 | 1.187 | .397 | .329 | .583 |
| 5 Entry into the industry is very easy | 94 | 2.63 | 1.182 | .689 | .306 | .593 |
| 6 The unpredictability of product price change in the industry is quite high | 94 | 3.31 | 1.027 | .559 | .511 | .509 |

Mean=3.09, Cronbach's Alpha = .617

Source: Research Data (2022)

#### 4.4.3.4 Technological Uncertainty

The subconstruct technological uncertainty was captured through four indicators. Participants were requested to rate the extent of their agreement regarding technological uncertainty facing their firms. A 5-point Likert tool was used with 1 representing very small degree while 5 represented very large degree. The mean of the ratings ranged from 3.04 to 3.70. The lowest rated indicator was "imitating technology is easy and rampant" which averaged of 3.04 (SD=1.116, N=94). The highest ranked was "there is high rate of change in ICT" which averaged 3.70 (SD=1.004, N=94).

The overall mean is 3.35. This implies that respondents believe that technological uncertainty which their firms face is to a moderate extent. Factor loadings were all greater than the required minimum of 0.4 except for one indicator which is marginally below the threshold at 0.395. Item to total correlations were all higher than the required minimum of 0.3. The Cronbach's Alpha is 0.610 which is in the acceptable range. Hence, reliability and validity are established. Table 4.17 exhibits the outcomes.

**Table 4.17: Technological Uncertainty**

| | | N | Mean | Std. Dev. | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|---|
| 1 | There is high rate of obsolescence of technology | 94 | 3.24 | 1.002 | .439 | .380 | .548 |
| 2 | Imitating technology is easy and rampant | 94 | 3.04 | 1.116 | .395 | .351 | .576 |
| 3 | The change in production technology is rapid | 94 | 3.41 | 0.885 | .421 | .353 | .567 |
| 4 | There is high rate of change in ICT | 94 | 3.70 | 1.004 | .606 | .490 | .462 |

Mean=3.35, Cronbach's Alpha = .610

Source: Research Data (2022)

#### 4.4.3.5 Government Policy

The subconstruct government policy was captured by use of six indicators. Research participants were asked to show their extent of agreement regarding uncertainty and change in government policy. A 5-point Likert measure was applied with 1 indicating very small degree and 5 indicating very high degree. Table 4.18 presents the outcomes. The lowest mean was recorded for the indicator "road network transportation is unpredictable" (Mean=3.03, SD=1.121, N=94). The highest mean was for the indicator "there is high unpredictability of change in energy cost" (Mean=3.52, SD=0.924, N=94). The grand mean is 3.29. This implies that manufacturing firms perceive unpredictability and change in government policy to be moderate. Factor loading are all higher than the required minimum of 0.4. Also, item to total correlations are all higher than the required minimum of 0.3. Cronbach's Alpha is 0.765. Thus, reliability and construct validity are met. Table 4.18 displays the outcomes.

**Table 4.18: Government Policy**

| | N | Mean | Std. Dev. | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|
| 1 There is high degree of change on taxes and tariffs | 94 | 3.29 | 1.012 | .625 | .442 | .748 |
| 2 There is high uncertainty on government action on counterfeits | 94 | 3.30 | .914 | .774 | .610 | .706 |
| 3 There is high uncertainty on government action on infringement of trademarks and patents | 94 | 3.26 | .972 | .718 | .549 | .720 |
| 4 Road network transportation is unpredictable | 94 | 3.03 | 1.121 | .698 | .530 | .726 |
| 5 There is high unpredictability of change in energy cost (e.g. electric power) | 94 | 3.52 | .924 | .684 | .522 | .727 |
| 6 Availability of adequate energy is highly unpredictable | 94 | 3.33 | .999 | .580 | .412 | .755 |

Mean = 3.29, Cronbach's Alpha = .765
Source: Research Data (2022)

### 4.4.4 Firm Performance

The latent variable, firm performance, was conceptualised as being captured by use of three subconstructs which are financial performance, employee motivation and customer satisfaction. Tests of reliability and construct validity were done for every subconstruct and the outcomes are discussed next.

#### 4.4.4.1 Financial Performance

The financial performance subconstruct was measured by use of the 5-point Likert tool. Respondents were requested to show the percentage increase in operating income and in total assets. A mark of 1 represented an increase of less than 0% (which is actually a decrease), 2 represented 0 to 10 percent, 3 represented 11 to 20 percent, 4 represented 21 to 30 percent while 5 indicated an increase of above 30 percent. Operating income had the lower mean which was 3.75 (SD=0.927, N=94). The overall average of 3.78 implies that manufacturing firms had enhanced firm performance of between 21 to 30% as measured using increase in operating income and total assets over the period. Factor loadings are both 0.761 whereas item to total correlations are both 0.523. Cronbach's Alpha is 0.687. This implies that both reliability and construct validity are established. Table 4.19 displays the outcomes.

**Table 4.19: Financial Performance**

| | N | Average | Std. Dev. | Factor Loadings | Item to Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|
| 1 Operating Income | 94 | 3.75 | .927 | .761 | .523 | - |
| 2 Total Assets | 94 | 3.81 | .919 | .761 | .523 | - |

Mean = 3.78, Cronbach's Alpha =.687,

Source: Research Data (2022)

#### 4.4.4.2 Employee Motivation

The employee motivation subconstruct was measured using four indicators. Participants were requested to specify their extent of agreement with statements on employee motivation on a 5-point Likert measure where 1 represented very small degree and 5 very

large degree. The indicator with the lowest mean of 3.89 was "promotion opportunities are available at my workplace" (SD=0.967, N=94). The indicator "I would recommend the company's products/services to a friend" had the highest average of 4.50 (SD=0.684, N=94). The grand mean was quite high at 4.19. This implies that respondents perceive the degree of employee motivation as being fairly high.

Factor loadings are fairly high, the lowest being 0.506. The lowest item to total correlation is 0.533 whereas Cronbach's Alpha is also high at 0.820. All these indicate that reliability and construct validity are satisfied. Table 4.20 displays the outcomes.

**Table 4.20: Employee Motivation**

| | | N | Mean | Std. Dev. | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|---|
| 1 | I would recommend the company's products/services to a friend | 94 | 4.50 | .684 | .506 | .533 | .821 |
| 2 | Training opportunities are available at my work place | 94 | 4.05 | .966 | .665 | .657 | .770 |
| 3 | Promotion opportunities are available at my work place | 94 | 3.89 | .967 | .750 | .726 | .733 |
| 4 | I would recommend someone to work in this firm | 94 | 4.33 | .768 | .701 | .692 | .755 |

Mean =4.19, Cronbach's Alpha = .820

Source: Research Data (2022)

#### 4.4.4.3 Customer Satisfaction

Customer satisfaction subconstruct was captured by use of four indicators. Research participants were requested to show the extent of their agreement on statements regarding customer satisfaction. A five-point Likert measure was applied with 1 representing very

small degree while 5 represented very large degree. All the means of the statements were above four, with the lowest being 4.27. This was for the indicator "the customer feels that they get good value products/services for the paid price" (SD=0.706, N=94). The indicator with the highest mean was "the firm has helpful sales personnel" (mean=4.57, SD=0.613, N=94). The grand mean was 4.40. This implies that manufacturing firms' customers are satisfied to a large degree. All factor loadings are high (the least is 0.518) whereas the lowest item to total correlation is 0.505. Cronbach's Alpha is 0.756. Thus, both reliability and construct validity are established. Table 4.21 exhibits the results.

**Table 4.21: Customer Satisfaction**

| | | N | Mean | Std. Dev. | Factor Loadings | Item-Total Correlation | Alpha When Item Excluded |
|---|---|---|---|---|---|---|---|
| 1 | The customer gets the products/services when they need | 94 | 4.33 | .662 | .518 | .510 | .722 |
| 2 | The customer feels that they get good value products/services for the paid price | 94 | 4.27 | .706 | .681 | .639 | .647 |
| 3 | The firm has helpful sales personnel | 94 | 4.57 | .613 | .519 | .505 | .724 |
| 4 | Customers recommend this company's products/services to their friends | 94 | 4.43 | .613 | .594 | .563 | .694 |

Mean = 4.40, Cronbach's Alpha = .756

Source: Research Data (2022)

### 4.5 Measurement Model Assessment

In order to evaluate the relationship among the constructs and assess the predictive power of the conceptual models for the 94 manufacturing firms in Kenya, PLS-SEM modelling

was carried out. This analytical technique was found appropriate for the study since the sample size of 94 is assumed to be small for covariance-based SEM analysis. Past researchers have applied PLS-SEM modelling successfully. For instance, Musuva-Musimba (2013) had 50 usable responses, Oredo (2016) had 93 and Odock (2016) had 67.

The statistical analysis was carried out in two stages as proposed by Chin (1998). Stage one involved the estimation of the measurement model. The link connecting the observable variables to the theoretical constructs they represent is evaluated in this stage. Stage two has the specification of the structural model and hypothesis testing. By evaluating the measurement model fit, the researcher will have the confidence that the latent variables, which constitute the foundation for the evaluation of the structural model, are precisely captured consistent with Hair et al. (2014).

### 4.5.1 Outer Model Assessment

Upon execution of the PLS-SEM algorithm, the reliability and validity of the constructs in the structural model were carried out. This requires that the indicators are specified as to whether they are reflective or formative. Reflective measures represent manifestations or the effects of an underlying construct so that cause-and-effect linkage is from the construct to its measure (Hair et al., 2021). In contrast, formative indicators are based on the premise that the causal indicators form the construct through their linear combinations.

A property of reflective indicators is that they should be substitutable, which is the case for all latent variables in this study. Therefore, all indicators are treated as reflective in the study. This study had four latent variables which are measured using 16 observed variables or indicators. The connection linking the latent variables to their indicators were formulated in a measurement model. This outer model was applied to explain how individual set of indicators relate to their corresponding latent construct. The latent constructs were captured by use of multiple indicators. Several questionnaire items were used to measure each indicator. Table 4.22 summarizes the details.

**Table 4.22: Latent Constructs and Indicators**

| Latent Construct | Kind of Construct | No of Indicators | No of Questionnaire Items |
|---|---|---|---|
| Supply Chain Integration | Reflective | 3 | 30 |
| Competitive Advantage | Reflective | 5 | 16 |
| Environmental Dynamism | Reflective | 5 | 26 |
| Firm Performance | Reflective | 3 | 10 |

Source: Research Data (2022)

The latent variables were conceptualised in accordance with previous studies as indicated in chapter 3, Table 3.2. Supply chain integration as a construct was captured by use of three subconstructs. These were supplier integration, internal integration and customer integration. Competitive advantage construct had five indicators which are cost, quality, speed, dependability and flexibility. Environmental dynamism construct had 5 subconstructs also which are supplier uncertainty, customer uncertainty, competitive intensity, technological uncertainty and government policy. The construct of firm performance had three subconstructs which were financial performance, employee motivation and customer satisfaction. All the subconstructs were evaluated for internal consistency reliability, unidimensionality, indicator reliability, convergent validity and discriminant validity considering they were conceptualised as reflective as contented by Hair et al. (2014) and Petter, Straub, and Rai (2007). These tests were carried out by conducting confirmatory factor analysis (CFA) by use of Smart PLS package.

Table 4.23 displays descriptive statistical values for every latent construct. All skewness and kurtosis coefficients fall in the range -1 to +1 for all variables. This indicates that all the variables are normally distributed.

**Table 4.23: Descriptive Statistical Values of Measurement Scales**

| Latent Construct | Indicator item | Code | Items | Average | Sd | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|
| Supply Chain | Supplier Integration | SCI1 | 10 | 3.698 | 0.606 | -0.627 | 0.068 |
| Integration (SCI) | Internal Integration | SCI2 | 9 | 3.991 | 0.575 | -0.401 | 0.696 |
| | Customer Integration | SCI3 | 11 | 4.017 | 0.531 | -0.192 | -0.948 |
| Competitive | Cost | CA1 | 3 | 3.535 | 0.897 | -0.194 | -0.636 |
| Advantage (CA) | Quality | CA2 | 2 | 3.447 | 1.140 | -0.605 | -0.283 |
| | Speed | CA3 | 5 | 3.645 | 0.772 | -0.307 | -0.106 |
| | Dependability | CA4 | 2 | 3.340 | 1.027 | -0.122 | -0.840 |
| | Flexibility | CA5 | 4 | 3.838 | 0.756 | -0.103 | -0.675 |
| Environmental | Supplier Uncertainty | ED1 | 6 | 2.957 | 0.626 | 0.870 | 0.255 |
| Dynamism (ED) | Customer Uncertainty | ED2 | 4 | 3.133 | 0.666 | 0.523 | -0.505 |
| | Competitive Intensity | ED3 | 6 | 3.094 | 0.629 | 0.358 | -0.295 |
| | Technological Uncertainty | ED4 | 4 | 3.351 | 0.679 | 0.196 | -0.959 |
| | Government Policy | ED5 | 6 | 3.287 | 0.669 | 0.548 | 0.257 |
| Firm | Financial Performance | FP1 | 2 | 3.777 | 0.801 | -0.216 | -0.869 |
| Performance (FP) | Employee Motivation | FP2 | 4 | 4.194 | 0.685 | -0.660 | -0.353 |
| | Customer Satisfaction | FP3 | 4 | 4.399 | 0.491 | -0.668 | -0.034 |

Source: Research Data (2022)

### 4.5.2 Construct Unidimensionality

Construct unidimensionality refers to the existence of a single underlying measurement construct that accounts for variation in the responses (Yu, Osborn-Popp, DiGangi, & Jannasch-Pennell, 2007). It assures that the indicators of a latent variable actually measure that construct. Construct unidimensionality was done in two stages. The first stage involved obtaining the factor loadings and item to total correlations. This was done in previous sections. After this was done, the remaining indicators were then subjected to PLS-SEM analysis.

In stage two, item to total correlations of the indicators for every latent variable were determined. Except for one that is marginally within the level (government policy = 0.256 ≈ 0.3), the corrected item-to-total correlations were all greater than the required minimum of 0.3, as shown in Table 4.24.

**Table 4.24: Results of Item to Total Correlation**

| Latent Construct | Indicators | Corrected Item-to-Total Correlation |
|---|---|---|
| Supply Chain Integration (SCI) | Supplier Integration | .356 |
| | Internal Integration | .479 |
| | Customer Integration | .634 |
| Competitive Advantage (CA) | Cost | .685 |
| | Quality | .475 |
| | Speed | .641 |
| | Dependability | .595 |
| | Flexibility | .621 |
| Environmental Dynamism (ED) | Supplier Uncertainty | .401 |
| | Customer Uncertainty | .373 |
| | Competitive Intensity | .303 |
| | Technological Uncertainty | .412 |
| | Government Policy | .256 |
| Firm Performance (FP) | Financial Performance | .444 |
| | Employee Motivation | .439 |
| | Customer Satisfaction | .368 |

Source: Research Data (2022)

Additionally, CFA was done. The results are presented in Table 4.25. It can be observed that the respective indicators of a particular latent variable loaded more heavily on their

constructs than on any other construct. This therefore, implies that unidimensionality of the constructs is established.

**Table 4.25: CFA Results for All Indicators and Constructs**

| Indicator | Supply Chain Integration | Competitive Advantage | Environmental Dynamism | Firm Performance |
|---|---|---|---|---|
| Supplier Integration | **0.742** | 0.298 | 0.170 | 0.264 |
| Internal Integration | **0.900** | 0.410 | 0.184 | 0.486 |
| Customer Integration | **0.906** | 0.508 | 0.329 | 0.557 |
| Cost | 0.477 | **0.833** | 0.340 | 0.399 |
| Quality | 0.156 | **0.664** | 0.223 | 0.167 |
| Speed | 0.346 | **0.825** | 0.261 | 0.316 |
| Dependability | 0.263 | **0.779** | 0.243 | 0.330 |
| Flexibility | 0.505 | **0.812** | 0.255 | 0.495 |
| Supplier Uncertainty | 0.209 | 0.290 | **0.806** | 0.239 |
| Customer Uncertainty | 0.214 | 0.268 | **0.674** | 0.191 |
| Competitive Intensity | 0.069 | 0.212 | **0.593** | 0.078 |
| Technological Uncertainty | 0.263 | 0.275 | **0.625** | 0.141 |
| Government Policy | 0.144 | 0.091 | **0.647** | 0.159 |
| Financial Performance | 0.284 | 0.428 | 0.245 | **0.620** |
| Employee Motivation | 0.463 | 0.351 | 0.207 | **0.877** |
| Customer Satisfaction | 0.475 | 0.305 | 0.143 | **0.777** |

Source: Research Data (2022)

### 4.6 Supply Chain Integration and Firm Performance

Objective one of the research was to find out the effect of supply chain integration on performance of large scale manufacturing companies in Kenya. To achieve this objective, PLS-SEM analysis using Smart PLS was done. Given that the two constructs, supply chain integration and organizational performance are reflective measures, it required that they be subjected to reliability and validity tests before the results are interpreted. These are assessed in the subsections which follow.

### 4.6.1 Outer Model Loading

To attain objective one, the indicators of the two latent variables were evaluated for indicator reliability. The outcomes are displayed in Table 4.26. Each of the indicators of the two latent constructs has individual outer loadings which are above 0.7 except for financial performance with 0.512. However, Hulland (1999) contends that outer loading values should be carefully examined for the effect of subconstruct removal on the content validity. In particular values between 0.4 and 0.7 should be retained for purposes of content validity. In any case, the T statistics and P values show that this construct is statistically significant at 5% level (T = 2.906 > 1.96, P = 0.004 < 0.05).

**Table 4.26: Reflective Outer Model**

| Indicators | Loadings | Indicator Reliability | T-statistics | P-Value |
|---|---|---|---|---|
| Financial Performance | 0.512 | 0.262 | 2.906 | 0.004 |
| Employee Motivation | 0.897 | 0.805 | 24.332 | 0.000 |
| Customer Satisfaction | 0.840 | 0.706 | 14.352 | 0.000 |
| Supplier Integration | 0.724 | 0.524 | 10.620 | 0.000 |
| Internal Integration | 0.907 | 0.823 | 41.106 | 0.000 |
| Customer Integration | 0.909 | 0.826 | 51.054 | 0.000 |

Source: Research Data (2022)

### 4.6.2 Internal Consistency Reliability

Composite reliability and Cronbach's Alpha values were used to evaluate internal consistency reliability and outcomes are presented in Table 4.27. It can be observed that the composite reliability values of the two variables are both larger than the minimum required of 0.7 (Hair et al., 2011). It can also be noted from the table that the Cronbach's Alpha for firm performance is higher than the required minimum value of 0.7 and for supply chain integration is within the acceptable level of between 0.5 and 0.7 (Nunally, 1994). Hence internal consistency reliability is established.

**Table 4.27: Cronbach's Alpha, Composite Reliability, and AVE of Latent Variables**

| Latent Construct | Cronbach's Alpha | Composite Reliability | Average Variance Extracted |
|---|---|---|---|
| Supply Chain Integration | 0.631 | 0.804 | 0.590 |
| Firm Performance | 0.817 | 0.886 | 0.724 |

Source: Research Data (2022)

### 4.6.3 Convergent Validity

Convergent validity was evaluated using AVE and CFA. Table 4.28 displays the outcomes of CFA on the evaluation of convergent validity. The cross-loadings of indicator items to their corresponding latent variables are higher than for other constructs except for financial performance (FP1) which will be retained for purpose of content validity. Table 4.27 shows that the AVEs values for the two latent variables are greater than the threshold value of 0.5 and hence convergent validity is established (Hair et al., 2021).

**Table 4.28: Confirmatory Factor Analysis Outcomes**

| Indicators | Firm Performance | Supply Chain Integration |
|---|---|---|
| Financial Performance | **0.512** | 0.283 |
| Employee Motivation | **0.897** | 0.467 |
| Customer Satisfaction | **0.840** | 0.482 |
| Supplier Integration | 0.254 | **0.724** |
| Internal Integration | 0.498 | **0.907** |
| Customer Integration | 0.562 | **0.909** |

Source: Research Data (2022)

### 4.6.4 Discriminant Validity

Discriminant validity was assessed by use of three criteria which are cross loadings, Fornell-Larcker criterion and HTMT ratio (Henseler et al., 2014). It can be observed from Table 4.28 that the two constructs load more heavily on their indicators than on any other

except one value of financial performance. Table 4.29 displays the Fornell-Larcker test results.

**Table 4.29: Fornell-Larcker Test Analysis Results**

| Latent Construct | Firm Performance | Supply Chain Integration |
|---|---|---|
| Firm Performance | **0.768** | |
| Supply Chain Integration | 0.548 | **0.851** |

Source: Research Data (2022)

The square root of average variance extracted (AVE) for the latent variable firm performance of 0.590 (from Table 4.27) is 0.768 (Table 4.29). This value exceeds the correlation value in the firm performance column (0.548). Likewise, the square root of AVE (0.851) for the latent construct supply chain integration is higher than the correlation level in the supply chain integration row (0.548). These results show that discriminant validity is established. Additionally, the HTMT value for the link connecting supply chain integration to firm performance construct is 0.709. This value is less than the maximum required of 0.85 as averred by Hair et al. (2021). These two results imply that discriminant validity is established.

### 4.6.5 Overall Model Fit

Overall model fit was tested by use of the standardized root mean residual (SRMR). SRMR is the root mean square difference among observed correlations and the model implied correlations (Henseler et al., 2014). Since it is an absolute measure of fit, a value of zero is an indication of a perfect fit. Therefore, as a rule of thumb, a model having a value lower than 0.1 is taken to have a good fit. The SRMR value obtained from Smart PLS for this model was 0.105 which is marginally higher than 0.1. Bootstrapping with 500 resamples was carried out to verify the significance of this value and was established to be significant (T = 7.752, P = 0.000). This implies that the model has a good fit. Table 4.30 exhibits the outcomes of significance of SRMR.

**Table 4.30 Composite Model SRMR Results**

| Original Sample | Sample Mean | Standard Error | T-statistic | P-value |
|---|---|---|---|---|
| 0.548 | 0.565 | 0.071 | 7.752 | 0.000 |

Source: Research Data (2022)

### 4.6.6 Predictive Relevance for the Endogenous Variable

Blindfolding procedure was used to evaluate predictive relevance of the model. The acceptable level of $Q^2$ value is required to be greater than zero for an endogenous variable (Chin, 1998). For this model, $Q^2$ equals 0.162 (Figure 4.1). This figure is higher than zero and hence predictive relevance for the model is affirmed.

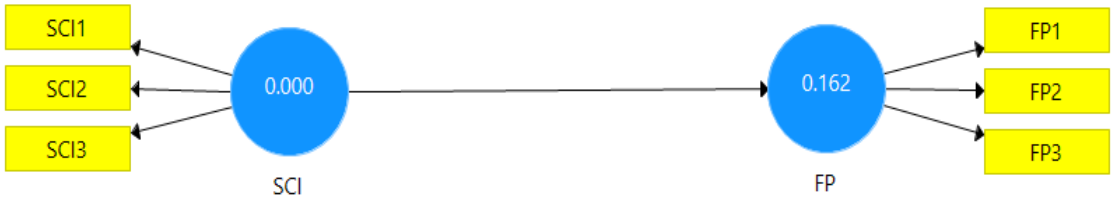



**Figure 4. 1: Structural Equation Model having $Q^2$ Value**

### 4.6.7 Endogenous Variable Variance and Path Coefficient Significance

After assessing validity and reliability of the measurement and structural models, coefficient of determination ($R^2$) is interpreted next. Also, the path coefficient is interpreted. From Figure 4.2, it is observed that $R^2$ is 0.300 for the firm performance construct. This implies that variation in supply chain integration accounts for 30.0% of the variation in firm performance. Peng and Lai (2012) contend that $R^2$ values of 67 percent, 33 percent and 19 percent represent substantial, moderate and weak variances in that order. Hence it can be concluded that the percentage variation in firm performance that is explained by supply chain integration falls in the moderate range.

Hair et al. (2021) argues that the effect size of an exogenous variable which is the drop in $R^2$ if the variable is not included in the model are as follows; $f^2$ levels of 0.02, 0.15 and 0.35 show that an exogenous variable has a low, moderate or large predictive relevance in that order for a given endogenous variable. For this model the $f^2$ value is 0.429 which means that supply chain integration has a large predictive effect on organizational

performance. Hypothesized connection linking supply chain integration to organizational performance results in a path coefficient of 0.548. This path coefficient is significant (t=7.752, p=0.000) as indicated in Figures 4.3 and 4.4.

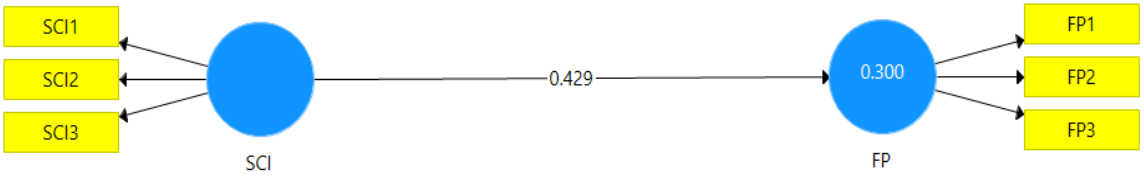



**Figure 4. 2: Structural Equation Model having $R^2$ and $f^2$ Values**

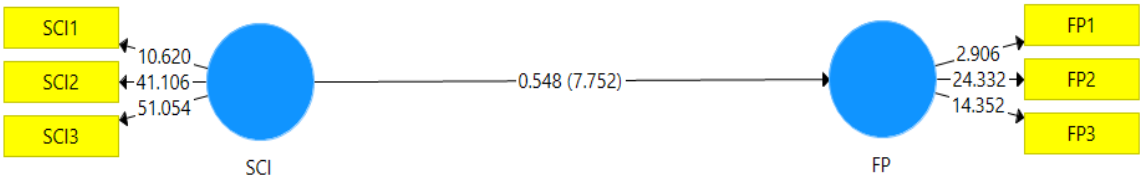



**Figure 4. 3: Structural Equation Model having Path Coefficient and T values**

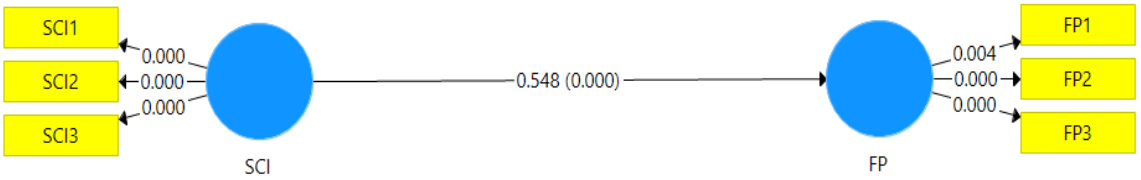



**Figure 4. 4: Structural Equation Model having Path Coefficient and P-values**

## 4.7 Supply Chain Integration, Competitive Advantage and Firm Performance

The second aim of this research was to find out the mediating effect of competitive advantage on the connection linking supply chain integration to firm performance. This objective was attained by use of PLS SEM analysis with Smart PLS 3 software. The three constructs of the model are first assessed for reliability and validity which are done in the next subsections.

### 4.7.1 Outer Loadings for the Model

Table 4.31 exhibits the indicator outer loadings, reliability, T statistics, and P values. Except for quality and financial performance, which have values of 0.663 and 0.603 respectively, all outer loadings are higher than the required minimum of 0.7.

Nevertheless, both of them will be retained for purposes of content validity since they are within the range of between 0.4 and 0.7.

**Table 4.31: Outer Loading Model Results**

| Latent Construct | Indicators | Loadings | Indicator Reliability | T-value | P-value |
|---|---|---|---|---|---|
| Supply Chain Integration (SCI) | Supplier Integration | 0.742 | 0.551 | 12.118 | 0.000 |
| | Internal Integration | 0.900 | 0.810 | 33.219 | 0.000 |
| | Customer Integration | 0.907 | 0.823 | 44.545 | 0.000 |
| Competitive Advantage (CA) | Cost | 0.833 | 0.694 | 25.976 | 0.000 |
| | Quality | 0.663 | 0.440 | 5.807 | 0.000 |
| | Speed | 0.824 | 0.679 | 14.739 | 0.000 |
| | Dependability | 0.778 | 0.605 | 8.665 | 0.000 |
| | Flexibility | 0.813 | 0.661 | 24.012 | 0.000 |
| Firm Performance (FP) | Financial Performance | 0.603 | 0.364 | 3.913 | 0.000 |
| | Employee Motivation | 0.881 | 0.776 | 17.202 | 0.000 |
| | Customer Satisfaction | 0.789 | 0.623 | 10.208 | 0.000 |

Source: Research Data (2022)

In addition, bootstrapping results of 500 resamples show that each factor loading is statistically significant (T values > 1.96, P values <0.05).

### 4.7.2 Internal Consistency Reliability

Cronbach's Alpha and composite reliability were used to evaluate the internal consistency reliability and the values are displayed in Table 4.32. It can be observed that all Cronbach's Alpha levels are more than the required minimum of 0.7 except for firm performance which is in the acceptable range of between 0.5 and 0.7. It can also be observed that every composite reliability value is higher than the minimum value of 0.7. Therefore, internal consistency reliability is established.

**Table 4.32: Cronbach's Alpha, Composite Reliability and AVE Results**

| Latent Construct | Cronbach's Alpha | Composite Reliability | Average Variance Extracted |
|---|---|---|---|
| Supply Chain Integration | 0.817 | 0.888 | 0.727 |
| Competitive Advantage | 0.852 | 0.888 | 0.616 |
| Firm Performance | 0.631 | 0.807 | 0.588 |

Source: Research Data (2022)

### 4.7.3 Convergent Validity

AVE and CFA tests were carried out to verify convergent validity. Table 4.32 shows that the AVE values for all the variables are greater than the minimum required level of 0.5 and thus convergent validity is confirmed. Table 4.33 displays the output of CFA for the evaluation of convergent validity. It is to be noted that the cross-loadings of indicator items to their corresponding latent variables are larger than for other latent variables. This is a further confirmation of convergent validity.

**Table 4.33: Confirmatory Factor Analysis**

| Indicators | Competitive Advantage | Firm Performance | Supply Chain Integration |
|---|---|---|---|
| Cost | **0.833** | 0.396 | 0.477 |
| Quality | **0.663** | 0.164 | 0.156 |
| Speed | **0.824** | 0.309 | 0.346 |
| Dependability | **0.778** | 0.326 | 0.263 |
| Flexibility | **0.813** | 0.496 | 0.505 |
| Financial Performance | 0.427 | **0.603** | 0.284 |
| Employee Motivation | 0.351 | **0.881** | 0.463 |
| Customer Satisfaction | 0.306 | **0.789** | 0.475 |
| Supplier Integration | 0.298 | 0.263 | **0.742** |
| Internal Integration | 0.411 | 0.489 | **0.900** |
| Customer Integration | 0.508 | 0.558 | **0.907** |

Source: Research Data (2022)

### 4.7.4 Discriminant Validity

In order to establish discriminant validity, three tests were used; Fornell-Larcker Criterion, cross-loadings of latent variable scores and HTMT ratio. Table 4.34 exhibits the Fornell-Larcker test analysis results.

**Table 4.34: Fornell-Larcker Test Analysis Results**

| Latent Construct | Competitive Advantage | Firm Performance | Supply Chain Integration |
|---|---|---|---|
| Competitive Advantage | **0.785** | | |
| Firm Performance | 0.469 | **0.766** | |
| Supply Chain Integration | 0.492 | 0.540 | **0.853** |

Source: Research Data (2022)

The AVE for competitive advantage is 0.616 (Table 4.32) and its square root is 0.785 (Table 4.34). This value is larger than the other correlation values in the column (0.469 and 0.492). The square root for AVE for firm performance (0.766) is bigger than the correlation level in the column (0.540) and that in the row (0.469). Similarly, the square root of AVE for supply chain integration (0.853) is larger than all the correlation values in its row (0.492 and 0.540). Thus, according to Fornell-Larcker criterion these results show that discriminant validity is confirmed. On the basis of cross loadings, it can be observed from Table 4.33 that every item loads highest on its corresponding latent variable compared to any other latent variable. Finally, the HTMT values among paired latent variables in the model are all lower than the maximum required level of 0.85 (Table 4.35). This further establishes convergent validity.

**Table 4.35: Heterotrait-Monotrait Ratios**

| | HTMT Ratio |
|---|---|
| Supply Chain Integration > Competitive Advantage | 0.505 |
| Competitive Advantage > Firm Performance | 0.594 |
| Supply Chain Integration > Firm Performance | 0.709 |

Source: Research Data (2022)

### 4.7.5 Evaluating Collinearity

Collinearity was assessed for both the outer and the inner model using Smart PLS 3 software. The results are presented next.

#### 4.7.5.1 Collinearity for the Outer Model

Collinearity was evaluated through the use of variance inflation factor (VIF) and tolerance values. The outcomes are displayed in Table 4.36.

**Table 4.36: Outer Variance Inflation Factor Values**

| | Tolerance | VIF |
|---|---|---|
| Supplier Integration | 0.644 | 1.553 |
| Internal Integration | 0.443 | 2.255 |
| Customer Integration | 0.488 | 2.048 |
| Cost | 0.529 | 1.890 |
| Quality | 0.505 | 1.980 |
| Speed | 0.471 | 2.122 |
| Dependability | 0.457 | 2.188 |
| Flexibility | 0.576 | 1.737 |
| Financial Performance | 0.874 | 1.144 |
| Employee Motivation | 0.526 | 1.900 |
| Customer Satisfaction | 0.584 | 1.712 |

Source: Research Data (2022)

It can be observed that all the VIF values of the indicators are below 5 while their tolerance levels are larger than the required minimum of 0.2. This establishes that there is no multicollinearity in the outer model (Hair et al., 2021).

#### 4.7.5.2 Collinearity for the Inner Model

The collinearity statistics for the inner model are exhibited in Table 4.37.

**Table 4.37: Collinearity Statistics for Exogenous Variables**

| | Collinearity Statistics | |
|---|---|---|
| Exogenous Variables | Tolerance | VIF |
| Supply Chain Integration | .758 | 1.319 |
| Competitive Advantage | .758 | 1.319 |

Source: Research Data (2022)

It can be observed that both the tolerance values are higher than 0.2 and the VIFs are both lower than 5. This confirms that there is no collinearity in the inner model.

### 4.7.6 Predictive Relevance for Endogenous Variables

In this model, predictive relevance was carried out by use of blindfolding procedure. The acceptable level of $Q^2$ values for PLS-SEM models should be larger than zero for every endogenous variable (Chin, 1998). Results for $Q^2$ are displayed in Table 4.38 and Figure 4.5.

**Table 4.38: $Q^2$ Values for the Endogenous Variables**

| Endogenous Variables | $Q^2$ Value | $q^2$ Value | Inference |
|---|---|---|---|
| Competitive Advantage | 0.122 | 0.028 | Small effect |
| Firm Performance | 0.185 | 0.091 | Medium effect |

Source: Research Data (2022)

Both the $Q^2$ values in Table 4.38 are greater than zero and hence predictive relevance is established.

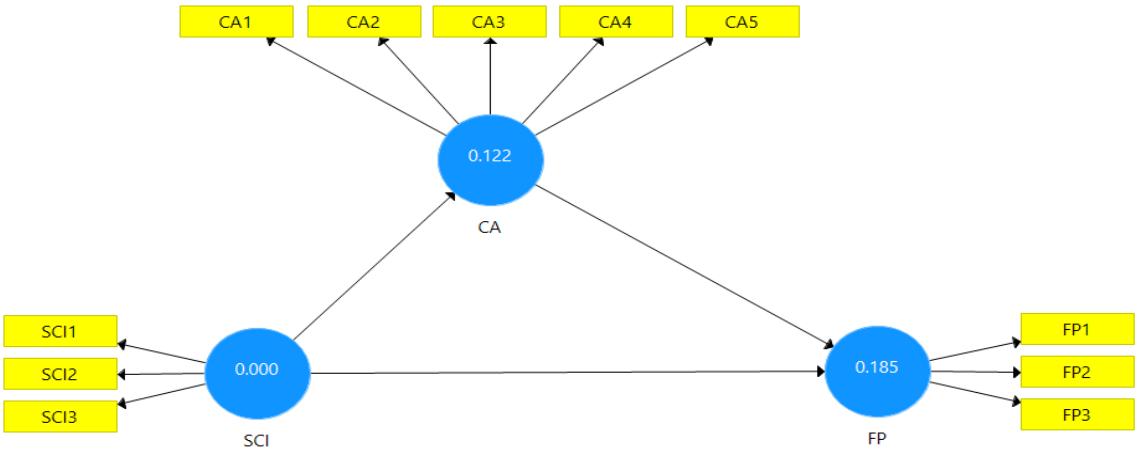



**Figure 4. 5: $Q^2$ Values for the Endogenous Variables**

The effect size, $q^2$, allows for the evaluation of an exogenous variable's contribution to the level of $Q^2$ of an endogenous latent variable. It is obtained as the drop in the value of $Q^2$ if that exogenous variable is not included in the model (Hair et al., 2021). Comparable to $f^2$, $q^2$ levels of 0.02, 0.15 and 0.35 show that an exogenous variable has a low, moderate or large predictive effect in that order for a given endogenous variable (Peng & Lai, 2012). The results are summarized in Table 4.38. It can be noted that competitive advantage has small effect while firm performance has medium effect.

### 4.7.7 Target Endogenous Variable Variance

Coefficients of determination, $R^2$ for the endogenous variables in the model are shown in Figure 4.6. According to Peng and Lai (2012), $R^2$ values of 67 percent, 33 percent and 19 percent represents large, moderate and low explained variance in that order. $R^2$ value for competitive advantage is 24.2%. This means that 24.2% of the variance in competitive advantage variable is attributed to the variation in supply chain integration. This value falls in the weak range. Similarly, $R^2$ value for firm performance is 34.6%. This implies that 34.6% of the variation in firm performance is explained by the variation in both competitive advantage and supply chain integration. This value falls in the moderate range. Hair et al. (2021) argues that the effect size of an exogenous variable which is the drop in $R^2$ if the variable is omitted from the model are as follows; $f^2$ levels of 0.02, 0.15 and 0.35 is an indication that an exogenous variable has a low, moderate or large predictive effects in that order for a given endogenous variable.

For this model, the $f^2$ values are provided in Table 4.39 and Figure 4.6. It is to be noted that the greatest effect size is that of integration of supply chain as a predictor of competitive advantage followed by supply chain integration as a predictor of organisational performance and the weakest is that of competitive advantage as a predictor of firm performance.

**Table 4.39: Effect Size Values**

| | $f^2$ Value | Inference |
|---|---|---|
| Supply Chain Integration > Firm Performance | 0.193 | Medium |
| Supply Chain Integration > Competitive Advantage | 0.319 | Large |
| Competitive Advantage > Firm Performance | 0.083 | Small |

Source: Research Data (2022)

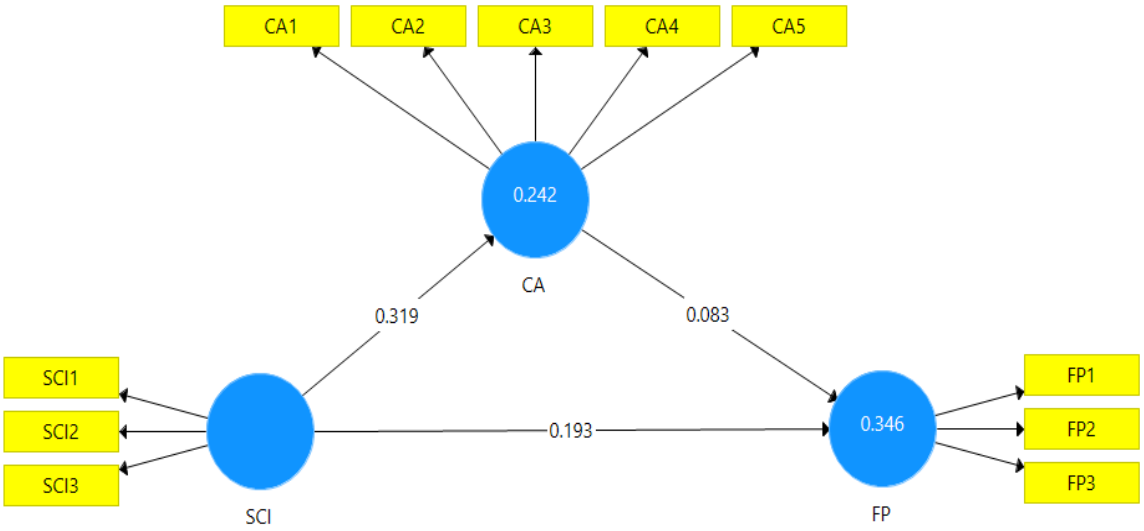



**Figure 4. 6: $R^2$ and $f^2$ Values**

### 4.7.8 Overall Model Fit

The overall goodness of fit for the model was assessed by use of the SRMR statistic which was determined to be 0.117. This is marginally more than the maximum required value of less than 0.1. Further, significance tests were done and the findings are displayed in Table 4.40.

**Table 4.40: Composite Model SRMR Results**

| Original Sample | Sample Mean | Standard Error | T-statistic | P-value |
|---|---|---|---|---|
| 0.132 | 0.142 | 0.062 | 2.115 | 0.035 |

Source: Research Data (2022)

As it can be noted from the table, SRMR is significant for the model since the magnitude of T statistic is higher than 1.96 while the p-value is below 0.05 (T=2.115, P=0.035). Hence it can be inferred from significance tests that the model has a good fit.

### 4.7.9 Mediation Analysis

Mediation analysis was carried out by bootstrapping the sampling distribution of the indirect effect as suggested by Klarner, Sarstedt, Hoeck, and Ringle (2013) and Nitzl, Roldan, and Cepeda (2018). Essentially, the significance of direct and indirect effects are compared to assess whether there is mediation, and if it is there, the type of mediation is inferred (see flow chart in Appendix VII).

**Table 4.41: Mediation Analysis Results**

| | Path Coefficient | 95% CI | T-Value | P-Value |
|---|---|---|---|---|
| Supply Chain Integration > Firm Performance (direct effect) | 0.408 | 0.191, 0.591 | 4.017 | 0.000 |
| Supply Chain Integration > Competitive Advantage | 0.492 | 0.329, 0.603 | 6.847 | 0.000 |
| Competitive Advantage > Firm Performance | 0.268 | 0.040, 0.470 | 2.417 | 0.016 |
| Supply Chain Integration > Competitive Advantage > Firm Performance (indirect effect) | 0.132 | 0.023, 0.263 | 2.115 | 0.035 |

Source: Research Data (2022)

As can be observed in Table 4.41 and Figures 4.7 and 4.8, the indirect effect is significant (T=2.115, P=0.035). Also, the confidence interval (CI) does not include zero. The direct role of supply chain integration on organizational performance is also significant

(T=4.017, P=0.000, CI excludes 0). In a situation where both the direct and indirect effects are significant; also, the product of path coefficients of supply chain integration > firm performance, supply chain integration > competitive advantage and competitive advantage > company performance is positive (0.408*0.492*0.268=0.054) this is a complementary partial mediation (Hair et al., 2021, Appendix VII). As a result, competitive advantage can be argued to be a key mediator variable in the link connecting supply chain integration to organizational performance. It is to be noted that the link connecting supply chain integration to competitive advantage is statistically significant (T=6.847, P=0.000, CI excludes 0). It can also be observed that the connection linking competitive advantage to firm performance is statistically significant (T=2.417, P=0.016, CI excludes 0).

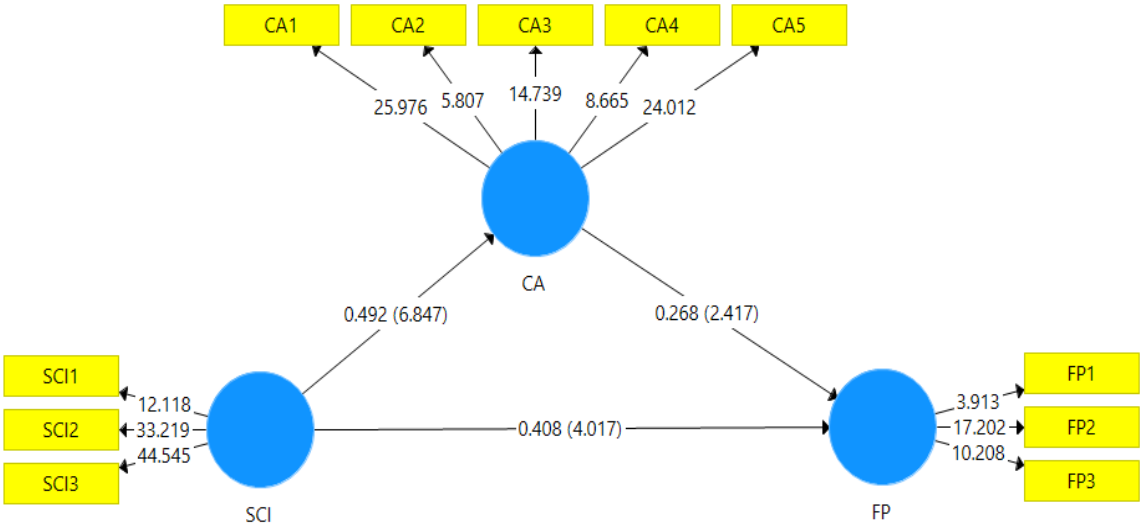



**Figure 4. 7: Path Coefficients and T-values for Mediation**

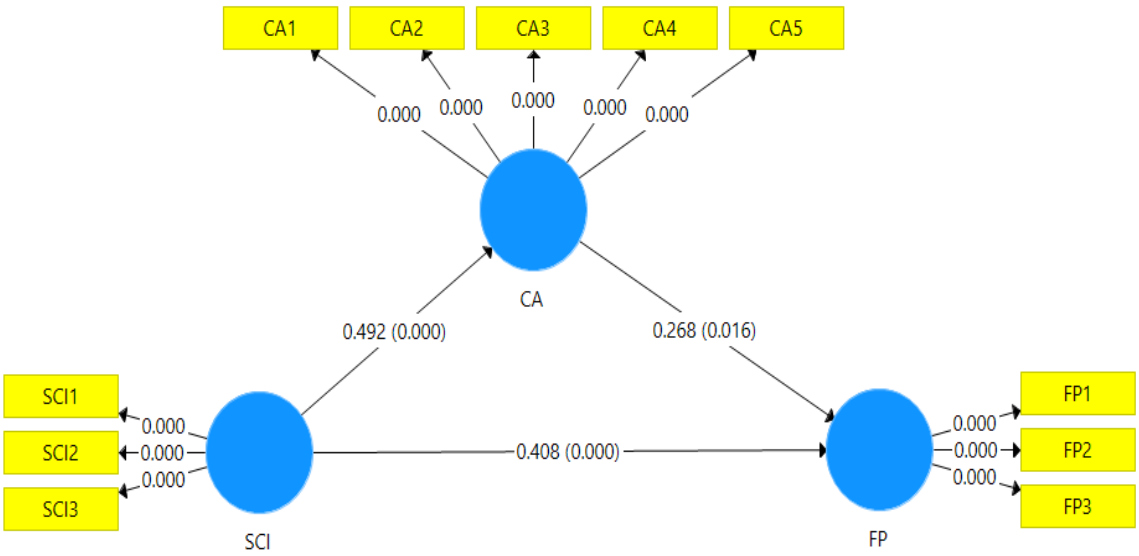



**Figure 4. 8: Path Coefficients and P-values for Mediation**

## 4.8 Supply Chain Integration, Environmental Dynamism and Firm Performance

PLS SEM procedures were applied in determining the moderating influence of environmental dynamism on the link connecting integration of supply chain to firm performance. However, reliability and validity assessments were carried out first. These are presented next.

### 4.8.1 Outer Model Indicator Reliability

Indicator reliability statistics for the outer model are displayed in Table 4.42. All outer loadings for supply chain integration and supplier uncertainty, employee motivation and customer satisfaction are greater than the threshold of 0.7; outer loadings for customer uncertainty, competitive intensity, technological uncertainty, government policy and financial performance are more than the required lowest level of 0.4 (Hair et al., 2021). Also, all these indicators are statistically significant given that their T-values are larger than 1.96 while P-values are lower than 0.05. Hence, every indicator was retained for further analyses.

**Table 4.42: Reflective Outer Model Results**

| Latent Variable | Indicator | Outer Loading | Indicator Reliability | T statistic | P value |
|---|---|---|---|---|---|
| Supply Chain Integration | Supplier Integration | 0.726 | 0.527 | 10.715 | 0.000 |
| | Internal Integration | 0.906 | 0.821 | 35.873 | 0.000 |
| | Customer Integration | 0.909 | 0.826 | 46.366 | 0.000 |
| Environmental Dynamism | Supplier Uncertainty | 0.811 | 0.658 | 5.971 | 0.000 |
| | Customer Uncertainty | 0.679 | 0.461 | 4.363 | 0.000 |
| | Competitive Intensity | 0.587 | 0.345 | 2.955 | 0.003 |
| | Technological Uncertainty | 0.611 | 0.373 | 3.235 | 0.001 |
| | Government Policy | 0.648 | 0.420 | 3.739 | 0.000 |
| Firm Performance | Financial Performance | 0.554 | 0.307 | 3.579 | 0.000 |
| | Employee Motivation | 0.893 | 0.797 | 18.369 | 0.000 |
| | Customer Satisfaction | 0.816 | 0.666 | 11.872 | 0.000 |

Source: Research Data (2022)

### 4.8.2 Internal Consistency Reliability

Composite reliability and Cronbach's Alpha tests were carried out to assess reliability of internal consistency. Table 4.43 displays the outcomes.

**Table 4.43: Cronbach's Alpha, Composite Reliability and AVE Results**

| Latent Construct | Cronbach's Alpha | Composite Reliability | AVE |
|---|---|---|---|
| Supply Chain Integration | 0.817 | 0.887 | 0.725 |
| Environmental Dynamism | 0.708 | 0.802 | 0.451 |
| Firm Performance | 0.631 | 0.806 | 0.590 |

Source: Research Data (2022)

As it can be noted, two constructs (supply chain integration and environmental dynamism) have Cronbach's Alpha of greater 0.7. Although that of firm performance is less than 0.7, it is within the acceptable level of 0.5 to 0.7. In any case, composite

reliability levels are all larger than the required minimum of 0.7. Therefore, internal consistency reliability is established.

### 4.8.3 Convergent Validity

AVE and CFA were used to evaluate Convergent validity. AVE values are presented on Table 4.43. As can be observed, two constructs (supply chain integration and company performance) have AVE values above 0.5. The AVE of environmental dynamism is 0.451 which is slightly less than the threshold of 0.5. Fornell and Larcker (1981) have opined that the AVE could be a more conservative estimate of the validity of a model, and "on the basis of composite reliability alone, the researcher may conclude that the convergent validity of the construct is adequate even though 50% of the variance is due to error." Table 4.44 presents the results of CFA. It is noted that all the indicators load more heavily on their corresponding latent variables than on any other variables. Therefore, convergent validity is confirmed.

**Table 4.44: Confirmatory Factor Analyses Statistics**

| Indicator | Supply Chain Integration | Environmental Dynamism | Firm Performance |
|---|---|---|---|
| Supplier Integration | **0.726** | 0.168 | 0.258 |
| Internal Integration | **0.906** | 0.184 | 0.494 |
| Customer Integration | **0.909** | 0.329 | 0.551 |
| Supplier Uncertainty | 0.210 | **0.811** | 0.234 |
| Customer Uncertainty | 0.212 | **0.679** | 0.187 |
| Competitive Intensity | 0.069 | **0.587** | 0.071 |
| Technological Uncertainty | 0.261 | **0.611** | 0.126 |
| Government Policy | 0.145 | **0.648** | 0.155 |
| Financial Performance | 0.284 | 0.244 | **0.554** |
| Employee Motivation | 0.467 | 0.208 | **0.893** |
| Customer Satisfaction | 0.481 | 0.146 | **0.816** |

Source: Research Data (2022)

### 4.8.4 Discriminant Validity

Discriminant validity was evaluated using three criteria; evaluation of indicator factor loadings on their respective constructs, Fornell-Larcker criterion and HTMT ratios. Table 4.44 indicates that all indicators load more heavily on their associated constructs than on any other constructs. This is a confirmation that discriminant validity holds. Grounded on Fornell-Larcker test (Table 4.45), the square root of AVE for supply chain integration (0.851) is larger than the correlation values in the row (0.278, 0.546). The square root of AVE for environmental dynamism (0.672) is greater than the correlation values in the column (0.251, 0.278). Further the square root of AVE for firm performance (0.768) is larger than the other correlation in the row (0.251) and the column (0.546). This is further assertion of discriminant validity.

**Table 4.45: Fornell-Larcker Test Ratios**

| Latent Variable | Environmental Dynamism | Firm Performance | Supply Chain Integration |
|---|---|---|---|
| Environmental Dynamism | **0.672** | | |
| Firm Performance | 0.251 | **0.768** | |
| Supply Chain Integration | 0.278 | 0.546 | **0.851** |

Source: Research Data (2022)

Table 4.46 provides the HTMT ratios and as can be observed they are all below the threshold of 0.85. This further confirms the establishment of discriminant validity.

**Table 4.46: HTMT ratios**

| | HTMT Ratios |
|---|---|
| Supply Chain Integration > Environmental Dynamism | 0.332 |
| Supply Chain Integration > Firm Performance | 0.709 |
| Environmental Dynamism > Firm Performance | 0.366 |

Source: Research Data (2022)

### 4.8.5 Collinearity Assessment

Assessment of collinearity was carried out for both the outer and inner models. The following subsections discuss the results.

#### 4.8.5.1 Collinearity for the Measurement Models

VIF and tolerance values were used to assess collinearity for the measurement model. The outcomes are displayed in Table 4.47.

**Table 4.47: Variance Inflation Factor Outcomes**

| Indicator | Tolerance | VIF |
|---|---|---|
| Supplier Integration | 0.644 | 1.553 |
| Internal Integration | 0.443 | 2.255 |
| Customer Integration | 0.488 | 2.048 |
| Supplier Uncertainty | 0.701 | 1.426 |
| Customer Uncertainty | 0.824 | 1.214 |
| Competitive Intensity | 0.749 | 1.335 |
| Technological Uncertainty | 0.792 | 1.262 |
| Government Policy | 0.784 | 1.257 |
| Financial Performance | 0.874 | 1.144 |
| Employee Motivation | 0.526 | 1.900 |
| Customer Satisfaction | 0.584 | 1.712 |

Source: Research Data (2022)

It can be noted from Table 4.47, all the VIF values are lower than the maximum required level of 5 while tolerance values are all above the threshold of 0.2. This implies that there is no multicollinearity in the measurement model.

#### 4.8.5.2 Collinearity for the Structural Model

The collinearity statistics for the inner model are exhibited in Table 4.48.

**Table 4.48: Collinearity and Tolerance Results**

| | Collinearity Statistics | |
|---|---|---|
| Latent Construct | Tolerance | VIF |
| Supply Chain Integration | 0.791 | 1.265 |
| Environmental Dynamism | 0.711 | 1.407 |

Source: Research Data (2022)

As can be observed, both tolerance levels are larger than the required minimum of 0.2 while the VIF levels are lower than 5. This confirms that there is no collinearity in the inner model.

### 4.8.5.3 Predictive Relevance for Endogenous Variables and Overall Model Fit

Predictive relevance for the endogenous variable firm performance in the inner model was found to be 0.174 as shown in Figure 4.9. This value of $Q^2$ is substantially larger than the threshold of zero. Hence, predictive relevance is established.

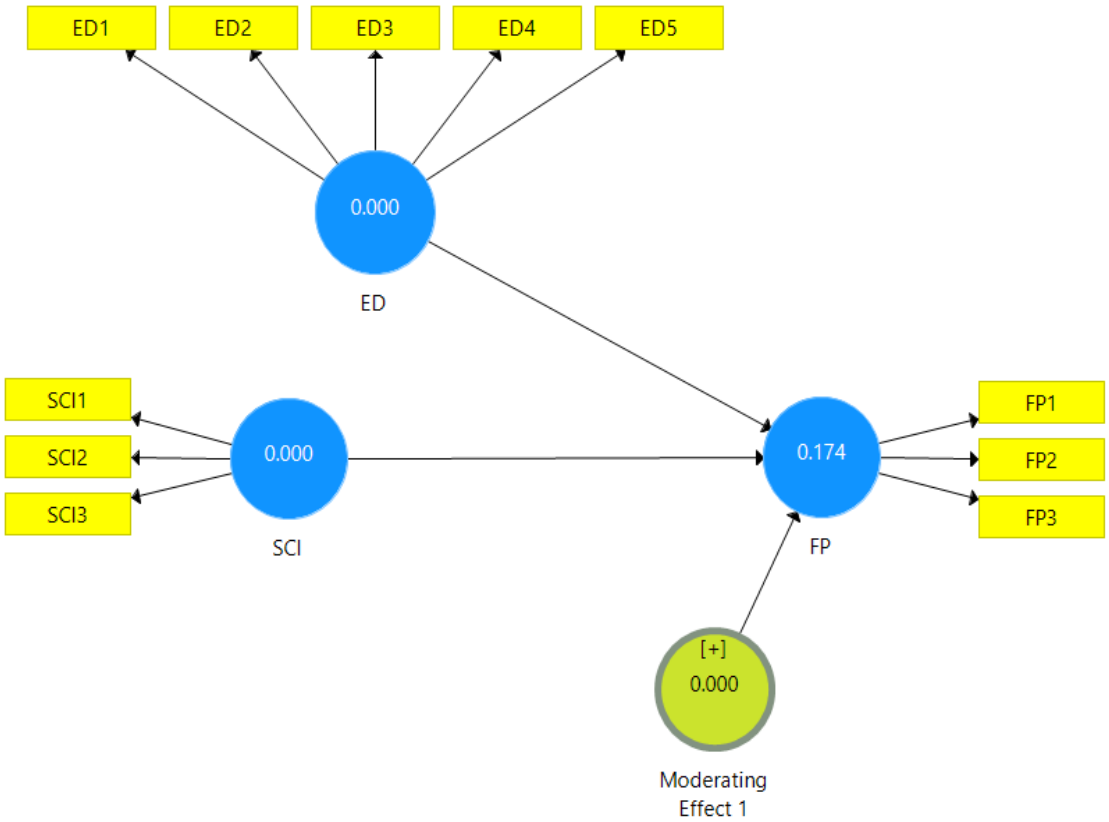



**Figure 4. 9: $Q^2$ Value for the Endogenous Variable**

The $q^2$ value for environmental dynamism is 0.015 indicating a small effect on the predictive relevance for the endogenous variable firm performance while that for supply chain integration is 0.177 indicating a medium predictive relevance effect. Table 4.49 exhibits these values.

**Table 4.49 $q^2$ Results**

| Construct | $q^2$ Value | Inference |
|---|---|---|
| Environmental Dynamism | 0.015 | Small effect |
| Supply Chain Integration | 0177 | Medium effect |

Source: Research Data (2022)

The overall goodness of fit for the moderation model was evaluated by use of SRMR statistic and found to be 0.094. This value is lower than the maximum required value of 0.1. Hence it can be inferred that the model is of good fit. The value was also subjected to significance test and the outcomes were statistically significant as exhibited in Table 4.50.

**Table 4.50 Composite Model SRMR Results**

| Original Sample | Sample Mean | Standard Error | T-statistic | P-value |
|---|---|---|---|---|
| -0.283 | -0.244 | 0.125 | 2.268 | 0.024 |

Source: Research Data (2022)

#### 4.8.5.4 Target Endogenous Variable Variance

Coefficient of determination, $R^2$ for the endogenous variable firm performance is provided in Figure 4.10. The value is 35.0%. Hence, 35.0% of the variance in firm performance is attributed to the variance in supply chain integration and environmental dynamism. According to Peng and Lai (2012), $R^2$ values of 67 percent, 33 percent and 19 percent represent large, medium and low explained variance in that order. On the basis of these criteria, 35.0% is moderate. Aguinis, Beaty, Boik, and Pierce (2005) have argued that the average effect size, $f^2$ in assessment of a moderator is a low level of only 0.009. On the basis of this, Hair et al. (2021) proposes that effect size of 0.005, 0.01 and 0.025 represent more reasonable standards for low, moderate and substantial effect sizes in that

order. $f^2$ for supply chain integration is 0.225 which falls in the range of large effect. The effect size for environmental dynamism is 0.054 which is also large effect.

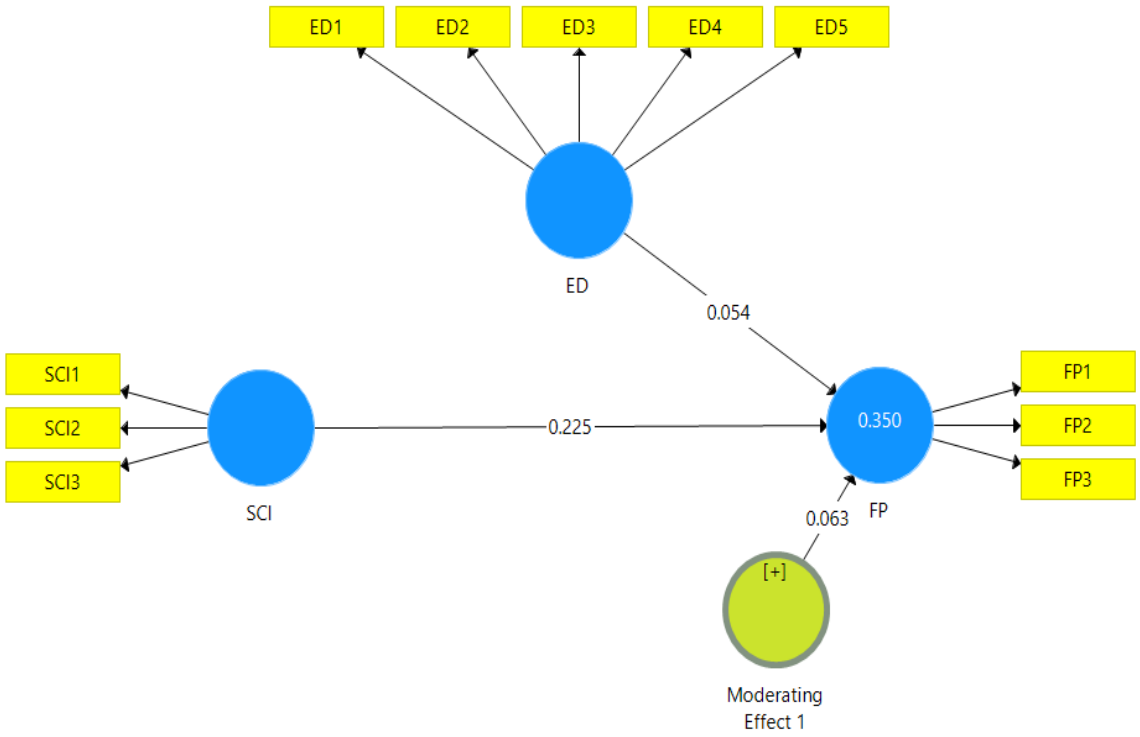



**Figure 4. 10: $R^2$ and $f^2$ Statistics**

### 4.8.6 Moderation Analysis

The moderating influence of environmental dynamism on the link connecting integration of supply chain to firm performance was carried out through the use of the two-stage approach. Henseler and Chin (2010) contend that where the primary objective is to gauge the significance of the moderation effect, the two-stage technique is the best since it also results in a higher level of statistical power relative to the other methods (orthogonalizing and product indicator approaches).

The PLS SEM moderating results are provided in Figure 4.11. The moderating effect has a value of -0.283 while the simple effect of integration of supply chain on organizational performance is 0.430. These outcomes suggest that the connection linking supply chain integration to company performance is 0.430 for an average level of environmental dynamism. However, if environmental dynamism is increased by one standard deviation

the connection linking supply chain integration to firm performance will decrease by interaction effect (that is 0.430 + (– 0.283 = 0.147). On the other hand, if environmental dynamism is reduced by one standard deviation the connection linking supply chain integration to firm performance will increase by interaction effect (i.e., 0.430 – (- 0.283) = 0.713). The graphical presentation is displayed in Figure 4.12.

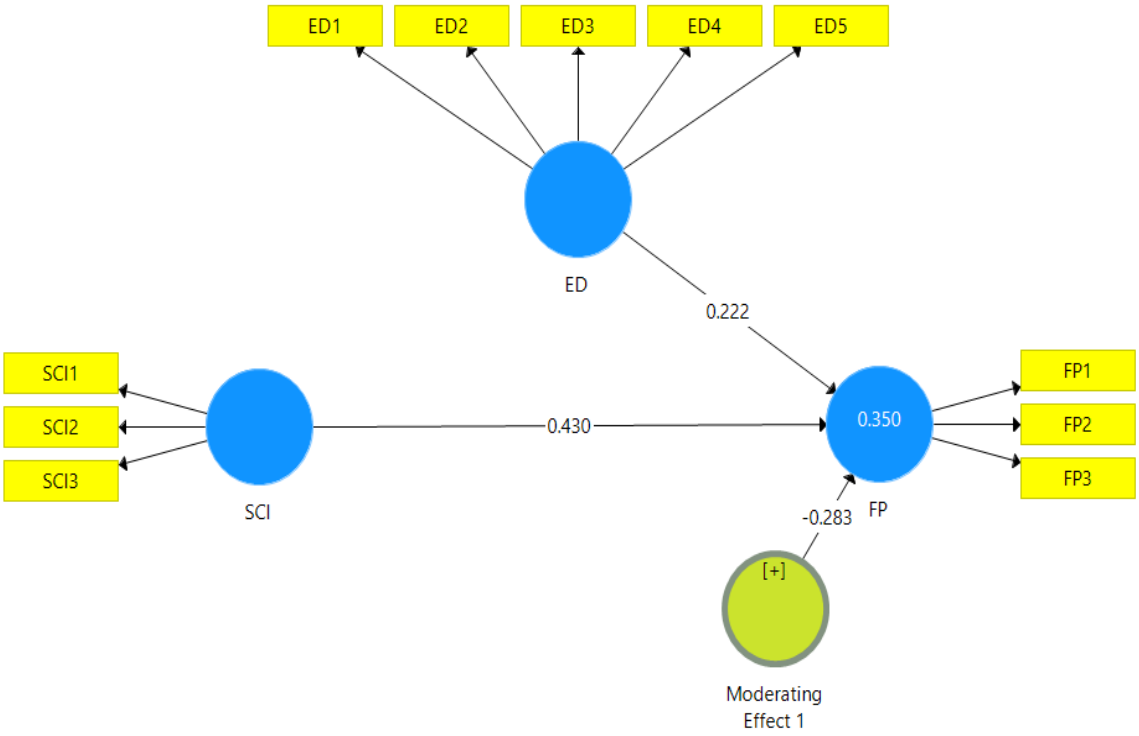



**Figure 4.11: Structural Equation Model having $R^2$ and Path Coefficients**

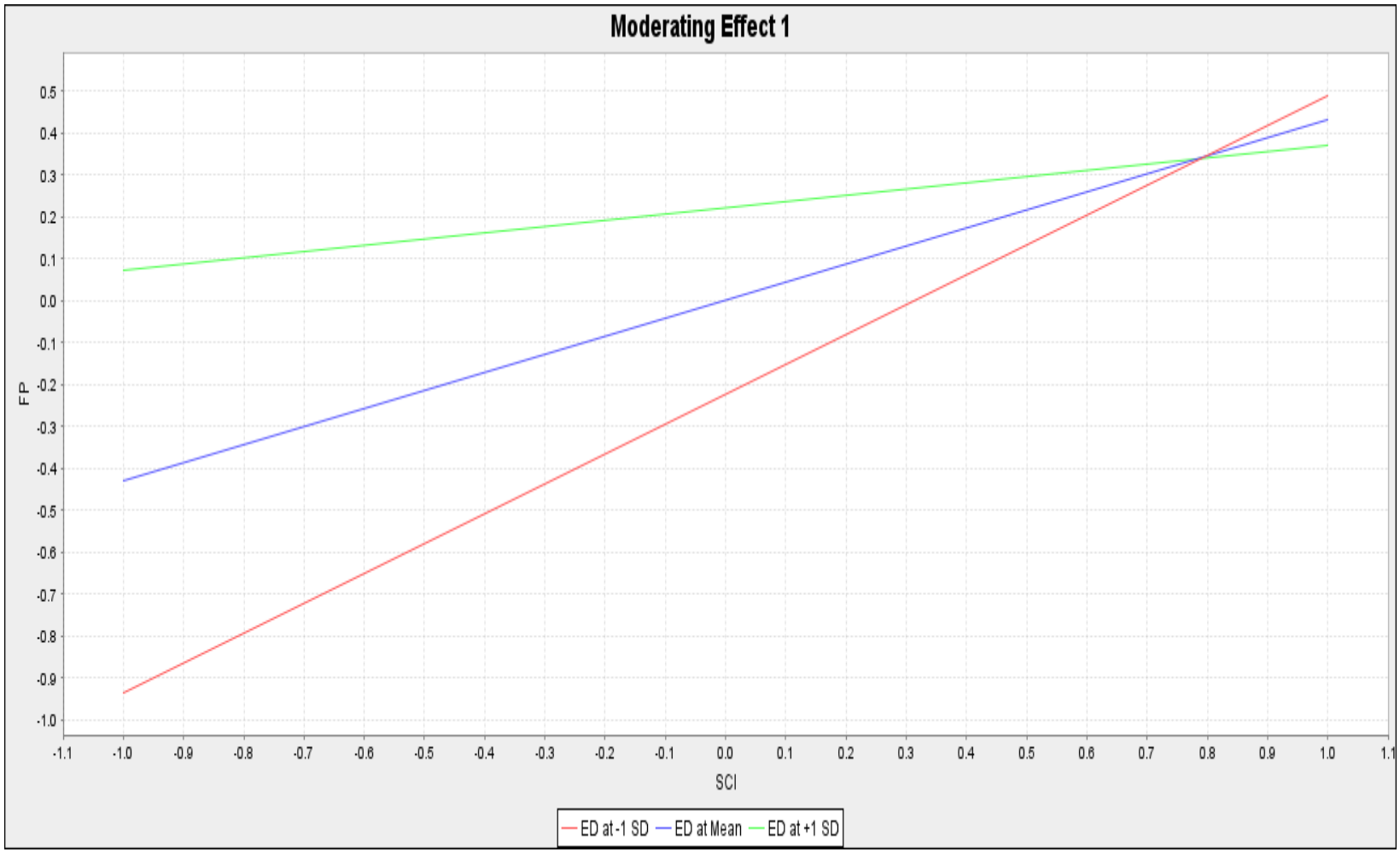



**Figure 4. 12: Simple Slope Plot for Moderating Effect**

The significance of the moderation effect was analysed next. The findings are displayed in Table 4.51.

**Table 4.51: Moderating Effect Statistics**

| | Path Coeff. | T Statistic | P Statistic | 95% CI | $f^2$ |
|---|---|---|---|---|---|
| Moderating Effect | -0.283 | 2.268 | 0.024 | -0.554, -0.084 | 0.063 |

Source: Research Data (2022)

It is observed that the moderating effect is statistically significant since T statistic is 2.268 which is larger than 1.96. The P-value of 0.024 is less than 0.05 while the 95% confidence interval ranging from -0.554 to -0.084 does not include zero. The outcomes are displayed in Figures 4.13 and 4.14. This further confirms the significance of the moderating effect. The implication is that environmental dynamism had a significant moderating role on the connection linking supply chain integration to organisational performance. Finally, the effect size, $f^2$ is 0.063 which is large (Hair et al., 2021).

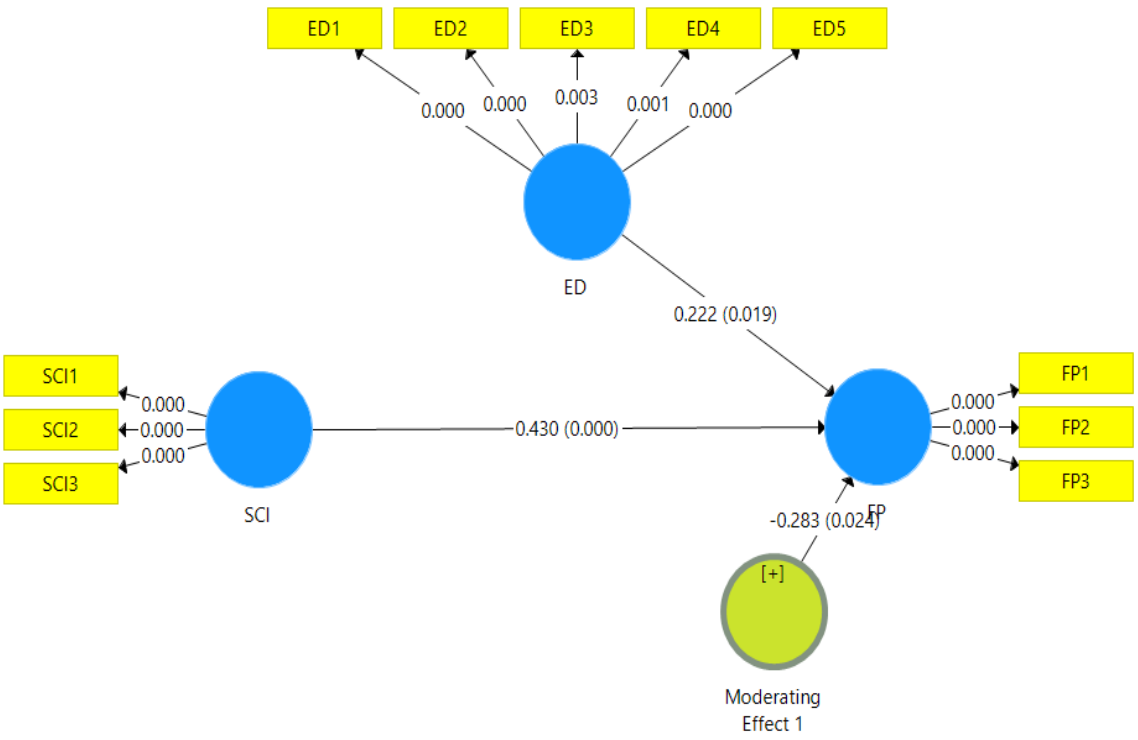



**Figure 4. 13 Path Coefficients and P-values for Overall Moderation**

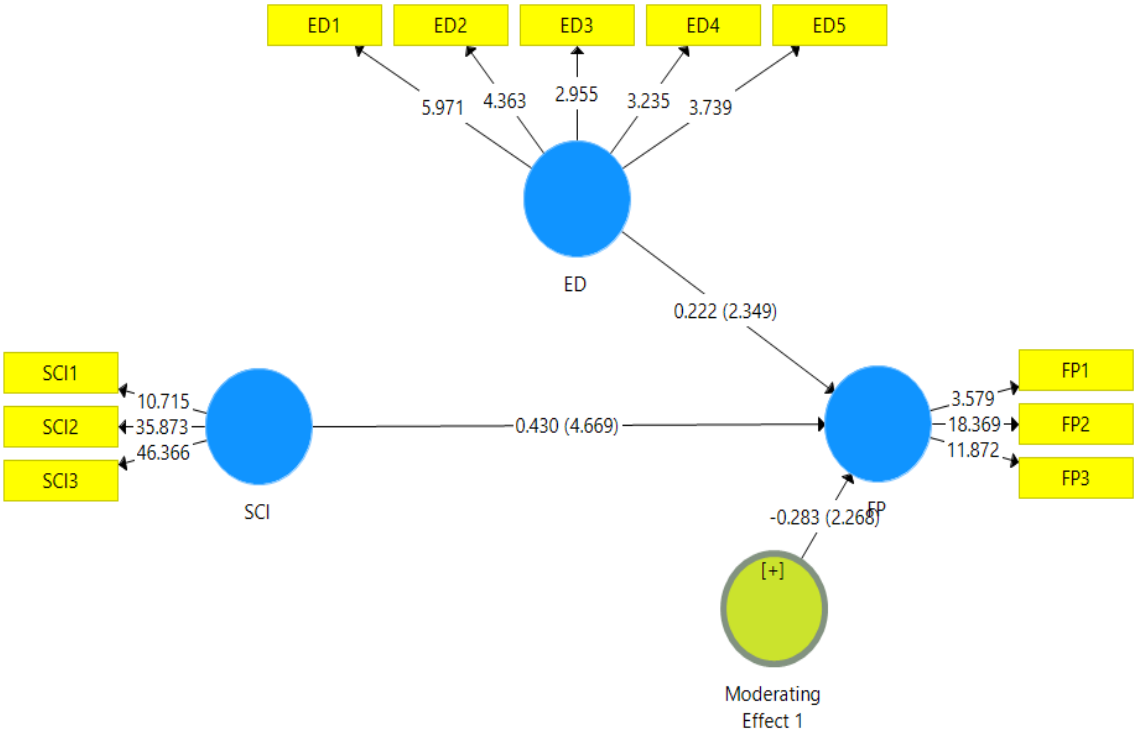



**Figure 4. 14 Path Coefficients and T-values for Overall Moderation**

### 4.8.7 Indicator Moderating Effect

In this section, significance tests for individual indicator moderating effect on the link connecting supply chain integration to firm performance are presented.

#### 4.8.7.1 Supplier Uncertainty as a Moderator

The moderating influence statistics of supplier integration on the link connecting supply chain integration to firm performance are displayed in Table 4.52 and Figures 4.15 and 4.16. It can be observed that this moderating effect is insignificant since the T-value is lower than 1.96 and P-value is larger than 0.05 (T = 1.032, P = 0.303). Also, the confidence interval includes zero.

**Table 4. 52: Moderating Effect Statistics**

| | Path Coeff | T Statistic | P Statistic | 95% CI | $f^2$ |
|---|---|---|---|---|---|
| Moderating Effect | -0.145 | 1.032 | 0.303 | -0.447, 0.121 | 0.015 |

Source: Research Data (2022)

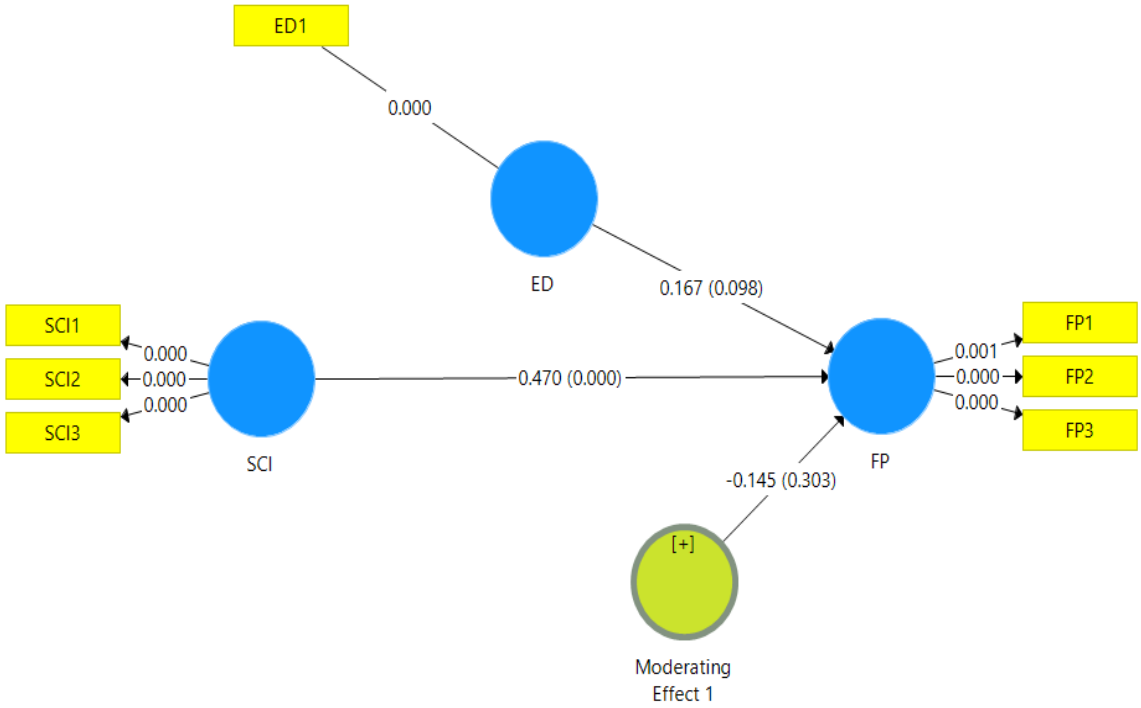



**Figure 4. 15: Path Coefficients and P-values for Supplier Uncertainty**

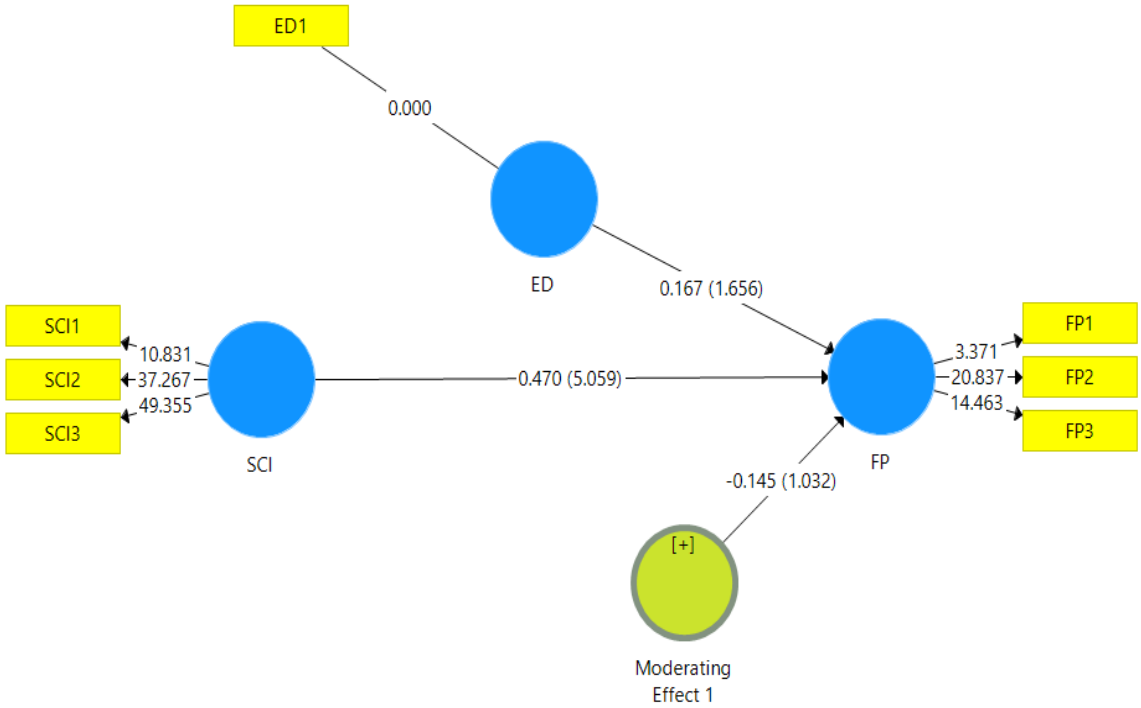



**Figure 4. 16: Path Coefficients and T-values for Supplier Uncertainty**

### 4.8.7.2 Customer Uncertainty as a Moderator

The moderating influence statistics of customer uncertainty on the connection linking supply chain integration to organizational performance are provided in Table 4.53 and Figures 4.17 and 4.18. It can be noted that this moderating effect is statistically significant since the T-value is higher than 1.96 while the P-value is lower than 0.05 (T = 2.448, P = 0.015). Also, the confidence interval excludes zero. Hence, it can be inferred that customer uncertainty has a significant moderating effect on the connection linking supply chain integration to company performance.

**Table 4. 53: Moderating Effect Statistics**

| | Path Coeff | T Statistic | P Statistic | 95% CI | $f^2$ |
|---|---|---|---|---|---|
| Moderating Effect | -0.196 | 2.448 | 0.015 | -0.328, -0.006 | 0.073 |

Source: Research Data (2022)

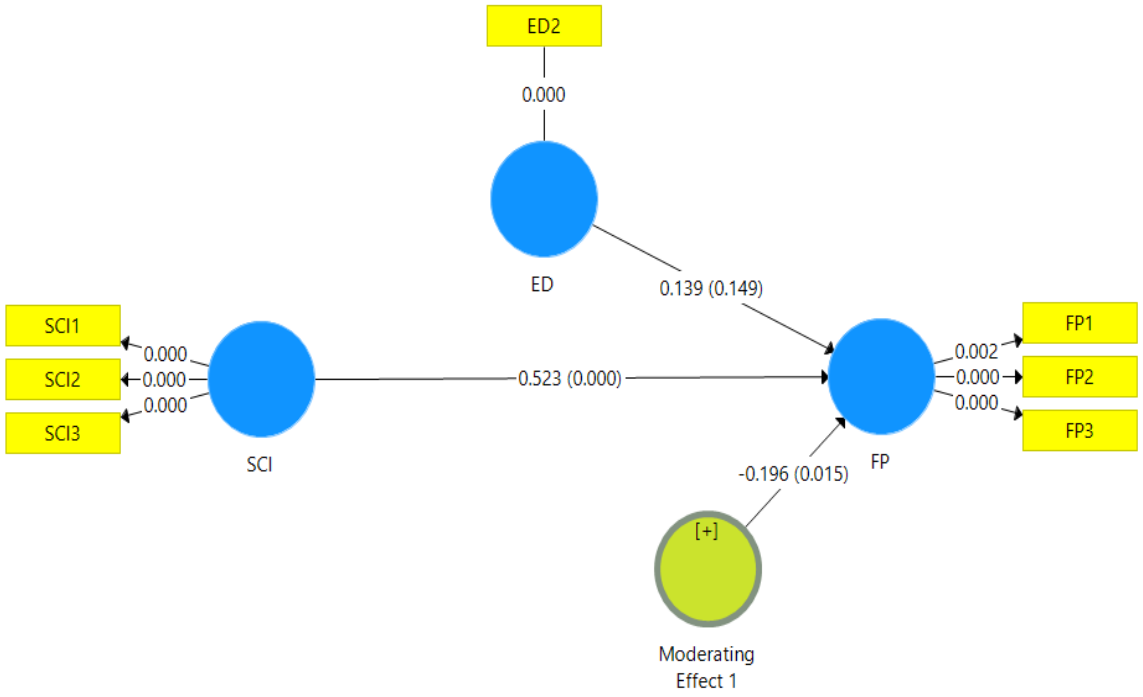



**Figure 4. 17: Path Coefficients and P-values for Customer Uncertainty**

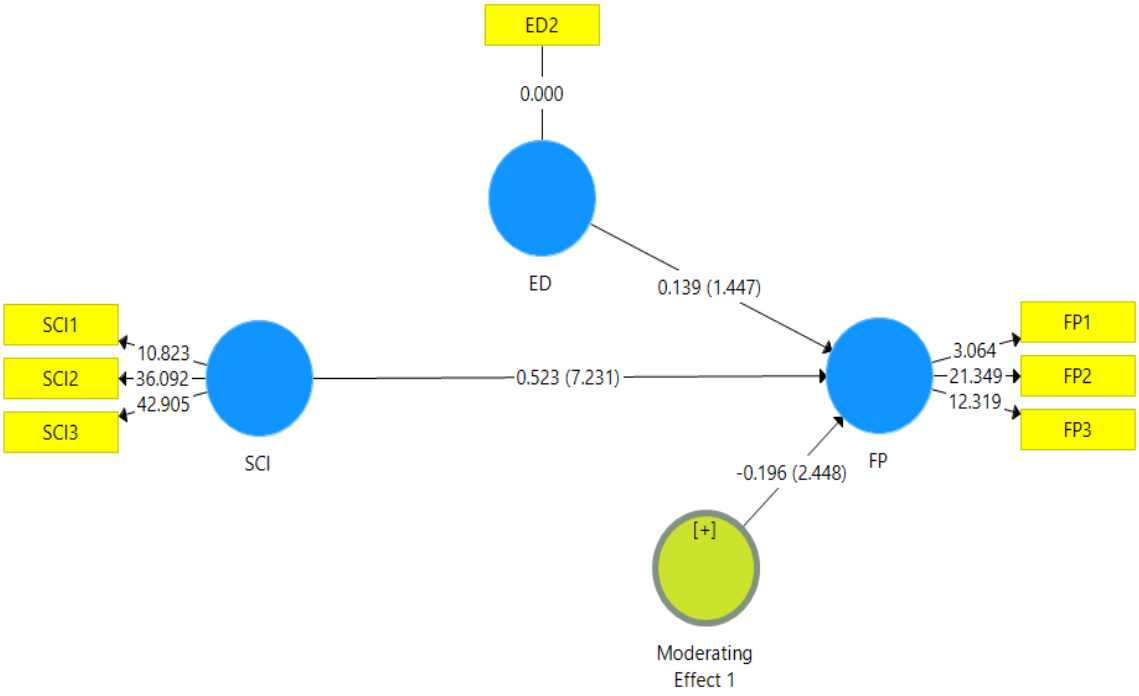



**Figure 4. 18: Path Coefficients and T-values for Customer Uncertainty**

### 4.8.7.3 Competitive Intensity as a Moderator

The moderating influence statistics of competitive intensity on the connection liking supply chain integration to firm performance are displayed in Table 4.54 and Figures 4.19 and 4.20. It can be noted that this moderating effect is insignificant since the T-value is lower than 1.96 while P-value is larger than 0.05 (T = 0.236, P = 0.811). Furthermore, the confidence interval includes zero. Thus, it can be inferred that competitive intensity has no significant moderating effect on the connection linking supply chain integration to firm performance.

**Table 4. 54: Moderating Effect Statistics**

| | Path Coeff | T Statistic | P Statistic | 95% CI | $f^2$ |
|---|---|---|---|---|---|
| Moderating Effect | 0.026 | 0.236 | 0.811 | -0.167, 0.240 | 0.001 |

Source: Research Data (2022)

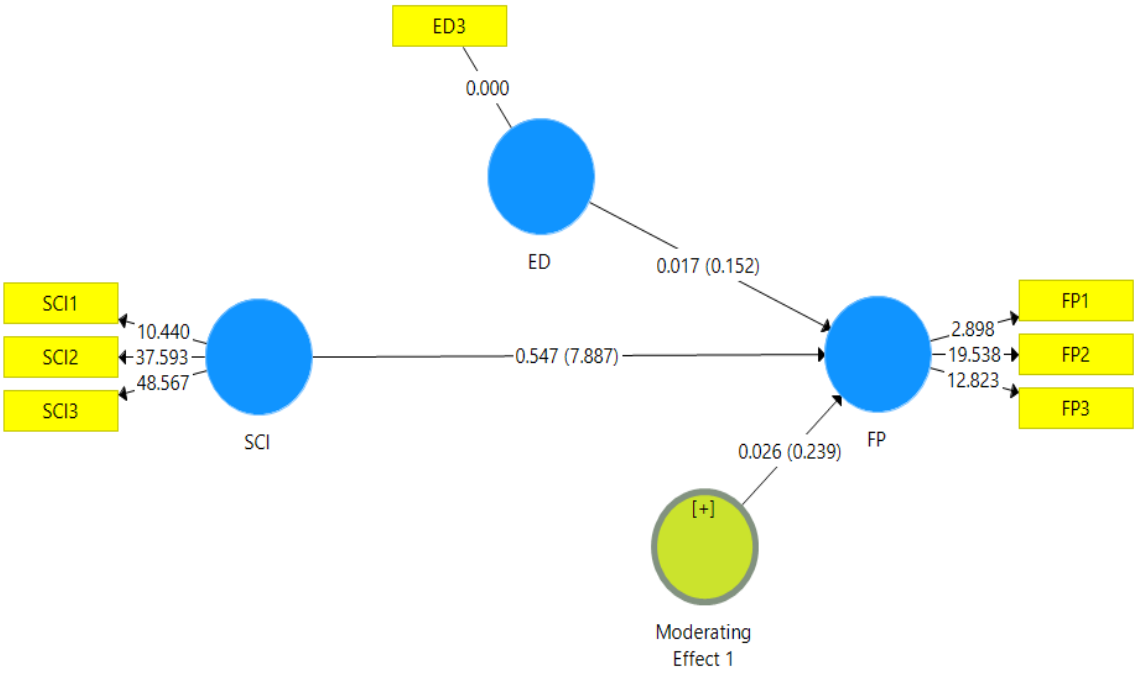



**Figure 4. 19: Path Coefficients and T-values for Competitive Intensity**

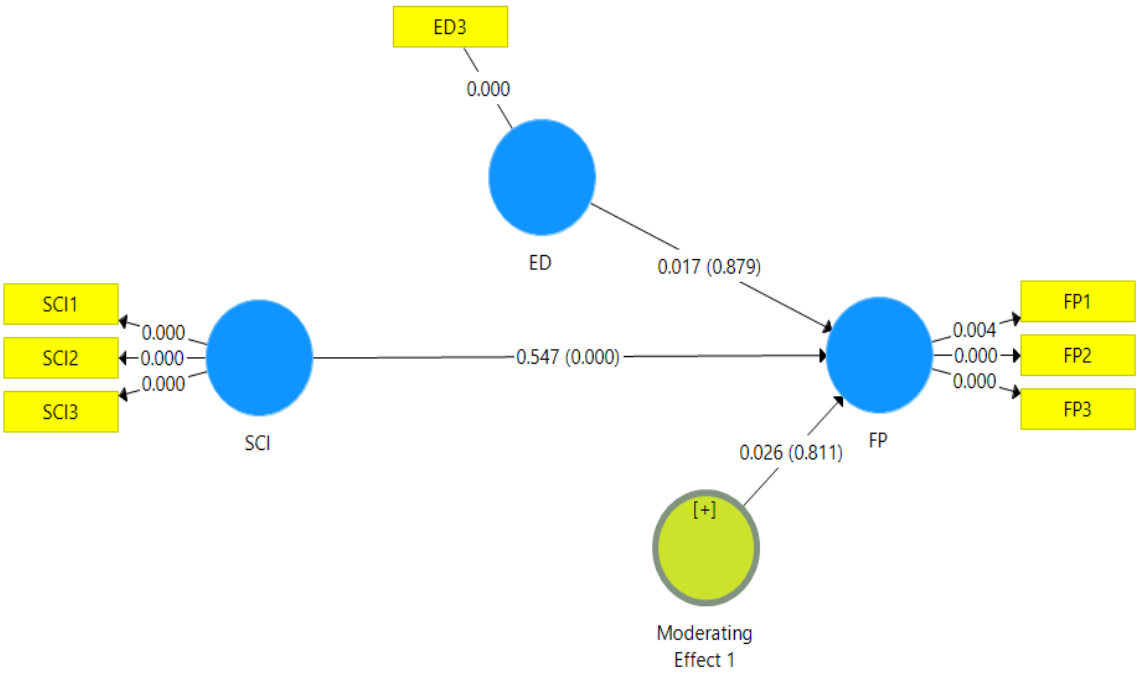



**Figure 4. 20: Path Coefficients and P-values for Competitive Intensity**

### 4.8.7.4 Technological Uncertainty as a Moderator

The moderating influence statistics of technological uncertainty on the link connecting supply chain integration to organization performance are shown in Table 4.55 and Figures 4.21 and 4.22. It can be observed that this moderating effect is not significant (T = 0.442, P = 0.659). It can also be noted that the confidence interval includes zero (-0.169, 0.246). Thus, it can be inferred that technological uncertainty has no significant moderating effect on the link connecting supply chain integration to firm performance.

**Table 4. 55: Moderating Effect Statistics**

| | Path Coeff | T Statistic | P- Statistic | 95% CI | $f^2$ |
|---|---|---|---|---|---|
| Moderating Effect | 0.046 | 0.442 | 0.659 | -0.169, 0.246 | 0.003 |

Source: Research Data (2022)

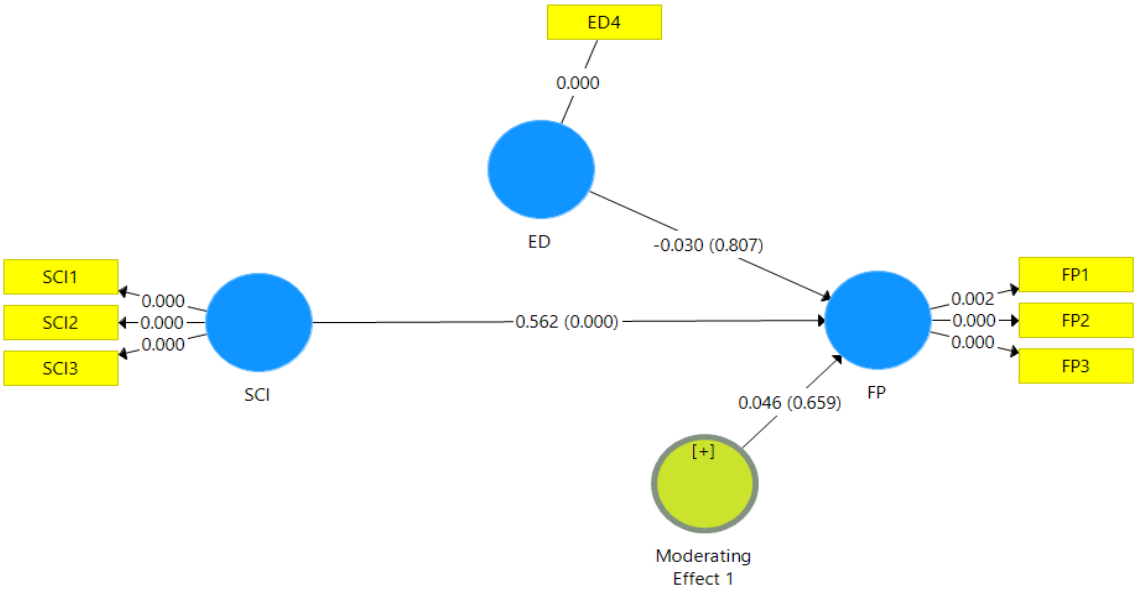



**Figure 4. 21: Path Coefficients and P-values for Technological Uncertainty**

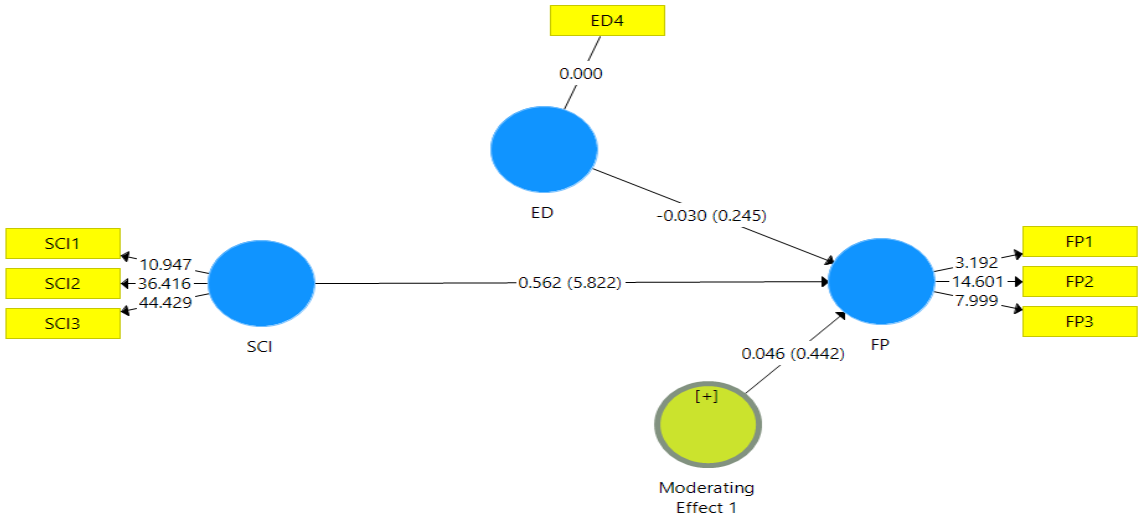



**Figure 4. 22: Path Coefficients and T-values for Technological Uncertainty**

#### 4.8.7.5 Government Policy as a Moderator

The moderating influence statistics of government policy on the connection linking supply chain integration to firm performance are exhibited in Table 4.56 and Figures 4.23 and 4.24. It can be noted that this moderating effect is significant (T = 2.018, P = 0.044). It can also be noted that the confidence interval does not include zero (-0.169, 0.246). Hence, it can be inferred that government policy has a significant moderating effect on the relationship between supply chain integration and firm performance.

**Table 4. 56: Moderating Effect Statistics**

| | Path Coeff | T Statistic | P-Statistic | 95% CI | $f^2$ |
|---|---|---|---|---|---|
| Moderating Effect | -0.197 | 2.018 | 0.044 | -0.408, -0.023 | 0.040 |

Source: Research Data (2022)

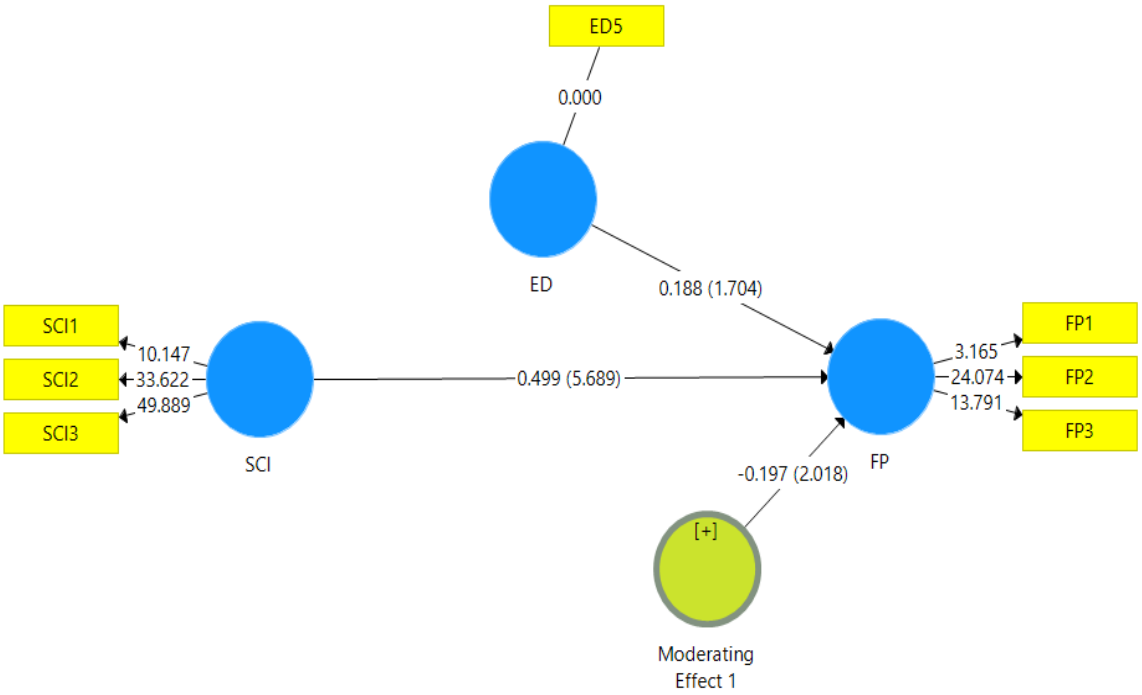



**Figure 4. 23: Path Coefficients and T-values for Government Policy**

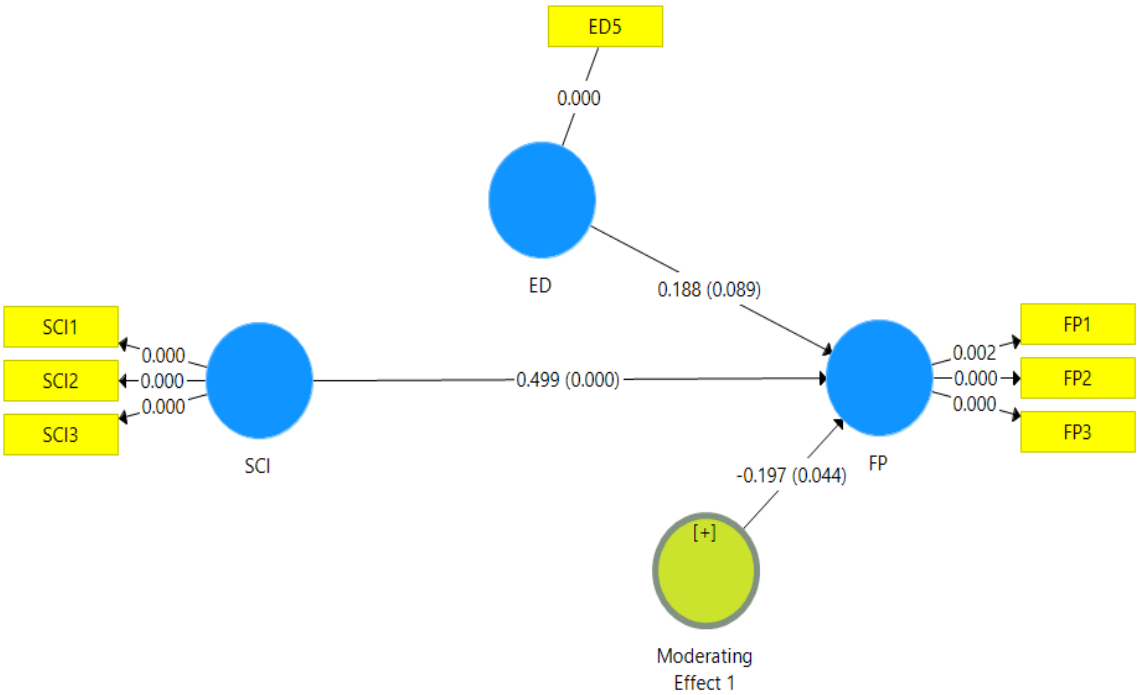



**Figure 4. 24: Path Coefficients and P-values for Government Policy**

## 4.9 Supply Chain Integration, Competitive Advantage, Environmental Dynamism and Firm Performance

The research's fourth and last purpose was to consider the combined effect of supply chain integration, competitive advantage, and environmental dynamism on company performance. This objective was attained by applying PLS SEM analysis using Smart PLS software. The four constructs of the model were then assessed for reliability and validity. These are discussed in the next subsections.

### 4.9.1 Outer Model Loadings

Table 4.57 exhibits the results for the outer model loadings. The indicator reliability levels are all above the threshold of 0.4 except for competitive intensity, technological uncertainty and financial performance which are marginally below (0.352, 0.391 and 0.384 respectively). However, their outer loadings are above the acceptable level of between 0.4 and 0.7 (Hair et al., 2021). The T values are also all significant since they are above the critical value of 1.96 and P-values are all lower than the maximum required of 0.05. Thus, all these constructs were retained for further analyses.

**Table 4.57: Outer Mode Loadings Results**

| Latent Variable | Outer Loading | Indicator Reliability | T -Value | P-Value |
|---|---|---|---|---|
| Supplier Integration | 0.742 | 0.551 | 11.793 | 0.000 |
| Internal Integration | 0.900 | 0.810 | 34.004 | 0.000 |
| Customer Integration | 0.906 | 0.821 | 41.380 | 0.000 |
| Cost | 0.833 | 0.694 | 27.045 | 0.000 |
| Quality | 0.664 | 0.441 | 6.462 | 0.000 |
| Speed | 0.825 | 0.681 | 14.915 | 0.000 |
| Dependability | 0.779 | 0.607 | 9.983 | 0.000 |
| Flexibility | 0.812 | 0.659 | 24.611 | 0.000 |
| Supplier Uncertainty | 0.806 | 0.650 | 6.482 | 0.000 |
| Customer Uncertainty | 0.674 | 0.454 | 4.573 | 0.000 |
| Competitive Intensity | 0.593 | 0.352 | 3.721 | 0.000 |
| Technological Uncertainty | 0.625 | 0.391 | 4.341 | 0.000 |
| Government Policy | 0.647 | 0.419 | 4.135 | 0.000 |
| Moderating Effect | 0.845 | 0.714 | 13.472 | 0.000 |
| Financial Performance | 0.620 | 0.384 | 4.337 | 0.000 |
| Employee Motivation | 0.877 | 0.769 | 18.687 | 0.000 |
| Customer Satisfaction | 0.777 | 0.604 | 10.955 | 0.000 |

Source: Research Data (2022)

### 4.9.2 Internal Consistency Reliability

Cronbach's Alpha and Composite reliability tests were carried out to assess internal consistency reliability. The Cronbach's Alpha values are all above the acceptable level of 0.5 while the composite reliability levels are all larger than the required minimum value of 0.7; hence all the latent variables were retained for further analysis. Table 4.58 exhibits the outcomes.

**Table 4.58: Cronbach's Alpha, Composite Reliability and AVE results**

| Latent Variable | Cronbach's Alpha | Composite Reliability | AVE |
|---|---|---|---|
| Supply Chain Integration | 0.817 | 0.888 | 0.727 |
| Competitive Advantage | 0.852 | 0.889 | 0.616 |
| Environmental Dynamism | 0.708 | 0.804 | 0.453 |
| Moderating Effect | 1.000 | 1.000 | 1.000 |
| Firm Performance | 0.631 | 0.806 | 0.586 |

Source: Research Data (2022)

### 4.9.3 Convergent Validity

AVE and CFA were used to test convergent validity. Table 4.58 reveals that the AVE values are all larger than the minimum required level of 0.5 except for environmental dynamism which is marginally below at 0.453. However, all will be retained on the basis of composite reliability which are all greater than the required minimum level of 0.7 (Hulland, 1999). It can also be noted from Table 4.59 that the cross-loadings of indicator latent variables to their respective constructs are larger than for any other construct (shown in bold). This further confirms convergent validity.

**Table 4.59: Confirmatory Factor Analysis**

| Indicator | Competitive Advantage | Environmental Dynamism | Firm Performance | Moderating Effect | Supply Chain Integration |
|---|---|---|---|---|---|
| Cost | **0.833** | 0.340 | 0.399 | -0.145 | 0.477 |
| Quality | **0.664** | 0.223 | 0.167 | -0.027 | 0.156 |
| Speed | **0.825** | 0.261 | 0.316 | 0.002 | 0.346 |
| Dependability | **0.779** | 0.243 | 0.330 | -0.121 | 0.263 |
| Flexibility | **0.812** | 0.255 | 0.495 | 0.003 | 0.505 |
| Supplier Uncertainty | 0.290 | **0.806** | 0.239 | 0.255 | 0.209 |
| Customer Uncertainty | 0.268 | **0.674** | 0.191 | 0.186 | 0.214 |
| Competitive Intensity | 0.212 | **0.593** | 0.078 | 0.490 | 0.069 |
| Technological Uncertainty | 0.275 | **0.625** | 0.141 | 0.208 | 0.263 |
| Government Policy | 0.091 | **0.647** | 0.159 | 0.336 | 0.144 |
| Financial Performance | 0.428 | 0.245 | **0.620** | -0.111 | 0.284 |
| Employee Motivation | 0.351 | 0.207 | **0.877** | -0.276 | 0.463 |
| Customer Satisfaction | 0.305 | 0.143 | **0.777** | -0.146 | 0.475 |
| Moderating Effect | -0.073 | 0.389 | -0.238 | **1.000** | -0.218 |
| Supplier Integration | 0.298 | 0.170 | 0.264 | -0.071 | **0.742** |
| Internal Integration | 0.410 | 0.184 | 0.486 | -0.266 | **0.900** |
| Customer Integration | 0.508 | 0.329 | 0.557 | -0.187 | **0.906** |

Source: Research Data (2022)

### 4.9.4 Discriminant Validity

Discriminant validity was assessed using three criteria; Fornell-Larcker criterion, cross-loadings of latent variable scores and HTMT ratio. Table 4.55 exhibits the Fornell-Larcker test results.

**Table 4.60: Fornell-Larcker Criterion Analysis Results**

| Latent Construct | Competitive Advantage | Environmental Dynamism | Firm Performance | Moderating Effect | Supply Chain Integration |
|---|---|---|---|---|---|
| Competitive Advantage | **0.785** | | | | |
| Environmental Dynamism | 0.341 | **0.673** | | | |
| Firm Performance | 0.472 | 0.259 | **0.766** | | |
| Moderating Effect | -0.073 | 0.389 | -0.238 | **1.000** | |
| Supply Chain Integration | 0.491 | 0.279 | 0.538 | -0.218 | **0.853** |

Source: Research Data (2022)

The AVE for competitive advantage is 0.616 (Table 4.58) and its square root is 0.785 (Table 4.60). This figure is bigger than the other correlation values in its column (0.341, 0.472, -0.073 and 0.491). Similarly, the AVE for environmental dynamism is 0.453 (Table 4.58) and its square root is 0.673 (Table 4.60). This value is bigger than the correlation value in the row (0.341) and in the column (0.259, 0.389 and 0.279). Also, the AVE for firm performance is 0.586 (Table 4.58) and its square root is 0.766 (Table 4.60). This figure is bigger than the correlation values in the row (0.472 and 0.259) and in the column (-0.238 and 0.538). The AVE for moderating effect is 1.000 (Table 4.58) and its square root is 1.000 (Table 4.60). This figure is bigger than the correlation values in the row (-0.073, 0.389 and -0.238) and in the column (-0.218). The AVE for supply chain integration is 0.727 (Table 4.58) and its square root is 0.853 (Table 4.60). This figure is higher than the correlation values in the row (0.491, 0.279, 0.538, and -0.218). Hence on the basis of Fornell-Larcker test, discriminant validity is affirmed. Further, the HTMT ratios were all lower than the maximum required of 0.85. This further confirms discriminant validity. Table 4.61 displays the outcomes.

**Table 4. 61: HTMT Outcomes**

| | HTMT Ratios |
|---|---|
| Supply Chain Integration > Competitive Advantage | 0.505 |
| Competitive Advantage > Firm Performance | 0.594 |
| Moderating Effect > Firm Performance | 0.295 |
| Supply Chain Integration > Firm Performance | 0.709 |
| Environmental Dynamism > Firm Performance | 0.366 |

Source: Research Data (2022)

### 4.9.5 Evaluating Collinearity for the Outer Model

Collinearity was evaluated for the outer model using VIF and tolerance values. The results are presented in Table 4.62. As can be observed, the tolerance levels are higher than 0.2 and the VIF levels are lower than the threshold of 5. This confirms that there is no multicollinearity in the outer model.

**Table 4.62: Tolerance and Variance Inflation Factor Statistics for the Outer Model**

| | Tolerance | VIF |
|---|---|---|
| Cost | 0.529 | 1.890 |
| Quality | 0.505 | 1.980 |
| Speed | 0.471 | 2.122 |
| Dependability | 0.457 | 2.188 |
| Flexibility | 0.576 | 1.737 |
| Supplier Uncertainty | 0.701 | 1.426 |
| Customer Uncertainty | 0.824 | 1.214 |
| Competitive Intensity | 0.749 | 1.335 |
| Technological Uncertainty | 0.792 | 1.262 |
| Government Policy | 0.796 | 1.257 |
| Financial Performance | 0.874 | 1.144 |
| Employee Motivation | 0.526 | 1.900 |
| Customer Satisfaction | 0.584 | 1.712 |
| Moderating Effect | 1.000 | 1.000 |
| Supplier Integration | 0.644 | 1.553 |
| Internal Integration | 0.443 | 2.255 |
| Customer Integration | 0.488 | 2.048 |

Source: Research Data (2022)

### 4.9.6 Collinearity for the Inner Model

The collinearity statistics for the inner model are displayed in Table 4.63. As can be observed, all the tolerance levels are greater than the minimum required of 0.2 and the VIF values are below 5. This confirms that there is no collinearity in the inner model.

**Table 4. 63: Tolerance and Variance Inflation Factors for the Inner Model**

| | Tolerance | VIF |
|---|---|---|
| Competitive Advantage - Firm Performance | 0.708 | 1.413 |
| Environmental Dynamism – Firm Performance | 0.663 | 1.508 |
| Moderating Effect – Firm Performance | 0.727 | 1.376 |
| Supply Chain Integration – Competitive Advantage | 1.000 | 1.000 |
| Supply Chain integration – Firm Performance | 0.676 | 1.480 |

Source: Research Data (2022)

### 4.9.7 Predictive Relevance for Firm Performance

The predictive relevance for the applicable endogenous variable in the model (firm performance) was $Q^2$ = 0.188. This is bigger than zero; hence model's predictive relevance is acceptable. The outcomes are exhibited in Figure 4.25.

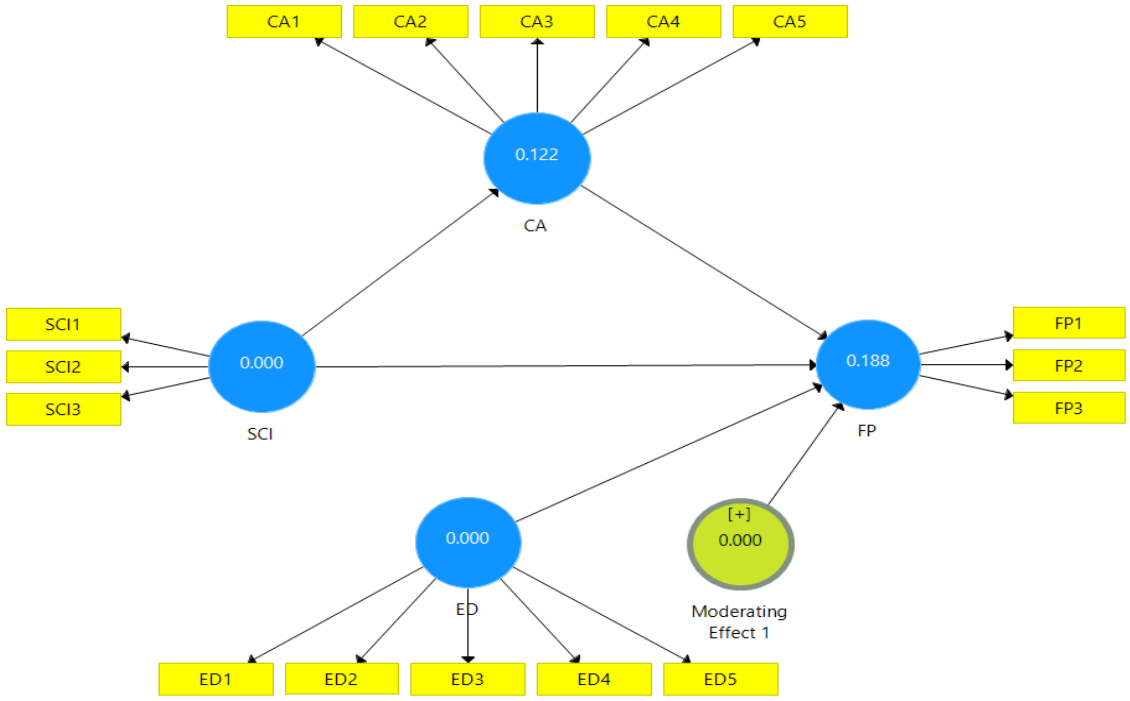



**Figure 4. 25: $Q^2$ Value**

The $q^2$ values for supply chain integration, competitive advantage, environmental dynamism and moderating effect are 0.091, 0.017, 0.004 and 0.005 respectively. All these values have small predictive relevance effect. Table 4.64 displays the outcomes.

**Table 4. 64: Summary of $q^2$ Values**

| Latent Variable | $q^2$ Value |
|---|---|
| Supply Chain Integration | 0.091 |
| Competitive Advantage | 0.017 |
| Environmental Dynamism | 0.004 |
| Moderating Effect | 0.005 |

Source: Research Data (2022)

### 4.9.8 Overall Model Fit

The overall model was assessed for goodness of fit using SRMR statistic and its statistical significance. The SRMR value was found to be 0.102 which is marginally above the threshold of less than 0.1. Hence, model fit is established. Statistical significance outcomes are displayed in Table 4.65.

**Table 4.65: Composite Model SRMR Results**

| | Original Sample | Sample Mean | Standard Error | T Statistic | P Value |
|---|---|---|---|---|---|
| CA>FP | 0.237 | 0.232 | 0.113 | 2.092 | 0.037 |
| ED>FP | 0.171 | 0.207 | 0.109 | 1.573 | 0.116 |
| Moderating | -0.255 | -0.228 | 0.119 | 2.144 | 0.032 |
| SCI>CA | 0.491 | 0.508 | 0.071 | 6.954 | 0.000 |
| SCI>FP | 0.326 | 0.337 | 0.100 | 3.255 | 0.001 |

Source: Research Data (2022)

### 4.9.9 Target Endogenous Variable Variance and Path Coefficient Significance

The coefficient of determination, $R^2$, for the relevant endogenous variable (firm performance) in the model and the effect size, $f^2$ are shown in Figure 4.26. The value for $R^2$ is 38.3%. This implies that the variance in the combined exogenous latent variables explain 38.3 percent of the variation in the endogenous variable (firm performance).

According to Peng and Lai (2012) this is a moderate explained variance. The $R^2$ value for the direct link connecting supply chain integration to organizational performance is 30.0%. The mediating effect model was found to be 34.6% while that for the moderating effect model was found to be 35.0%. It can therefore be observed that the combined effect model $R^2$ is the largest among all models. The outcomes are displayed in Table 4.66.

**Table 4. 66: Summary of $R^2$ Values of the Objectives**

| Objective | $R^2$ Value |
|---|---|
| Direct Effect | 30.0% |
| Mediating Effect | 34.6% |
| Moderating Effect | 35.0% |
| Combined Effect | 38.3% |

Source: Research Data (2022)

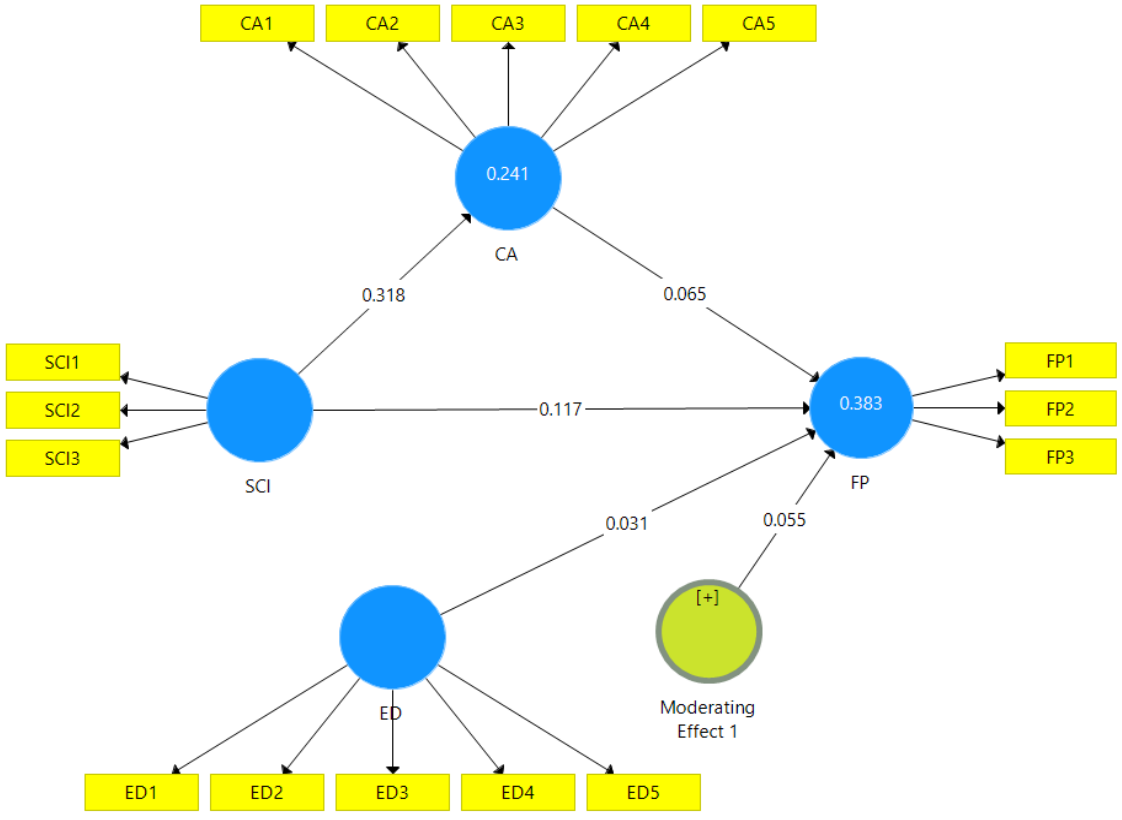



**Figure 4. 26: $R^2$ and $f^2$ Values**

The $f^2$ value for supply chain integration is 0.117 which falls in the range of medium effect. The values for competitive advantage, environmental dynamism and moderating effect are 0.065, 0.031 and 0.055 respectively. These all fall in the range of small effect. Table 4.67 exhibits the findings.

**Table 4. 67: $f^2$ Values**

| Latent Variable | $f^2$ | Inference |
|---|---|---|
| Supply Chain Integration | 0.117 | Medium |
| Competitive Advantage | 0.065 | Small |
| Environmental Dynamism | 0.031 | Small |
| Moderating Effect | 0.055 | Small |

Source: Research Data (2022)

The hypothesized results of the combined effect of supply chain integration, competitive advantage and environmental dynamism on organizational performance are displayed in Figures 4.27 and 4.28 and on Table 4.68.

**Table 4. 68: Path Coefficients, T Values and P Values**

| | Path Coefficient | T Statistic | P Value | Significance |
|---|---|---|---|---|
| Competitive Advantage > Firm Performance | 0.237 | 2.092 | 0.037 | Significant |
| Environmental Dynamism > Firm Performance | 0.171 | 1.573 | 0.116 | Insignificant |
| Moderating Effect | -0.255 | 2.144 | 0.032 | Significant |
| Supply Chain Integration > Competitive Advantage | 0.491 | 6.954 | 0.000 | Significant |
| Supply Chain Integration >Firm Performance | 0.326 | 3.255 | 0.001 | Significant |

Source: Research Data (2022)

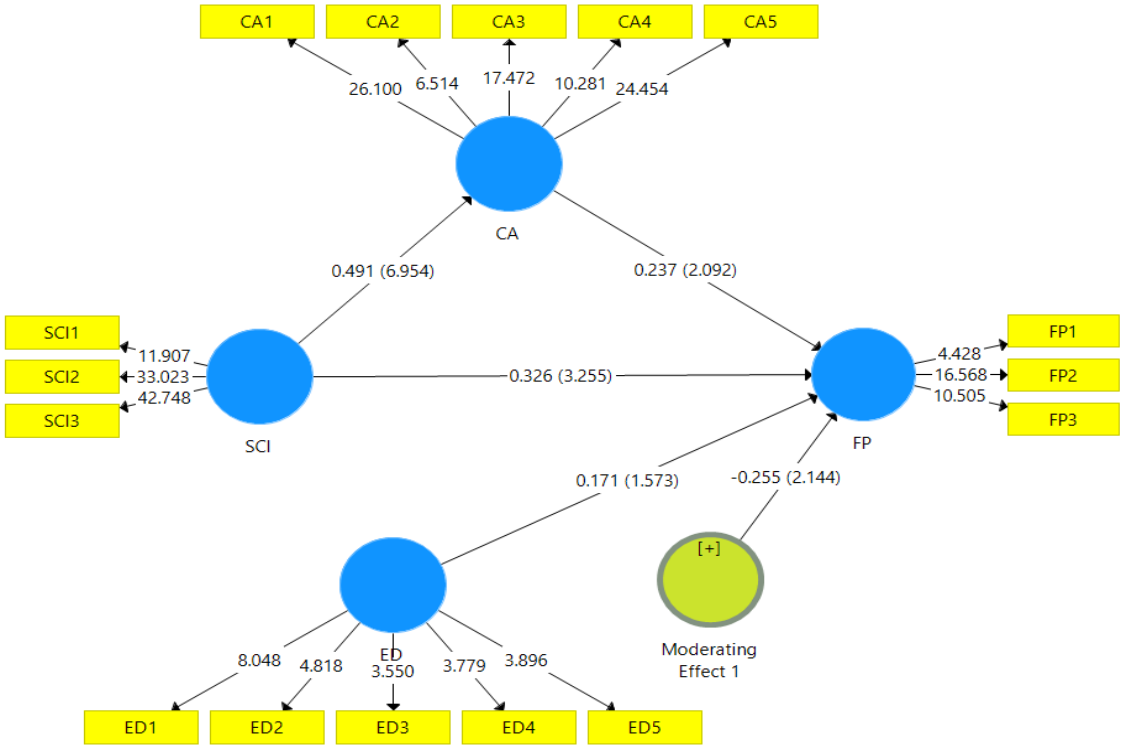



**Figure 4.27: Combined Effect Model having Path Coefficient and T-Values**

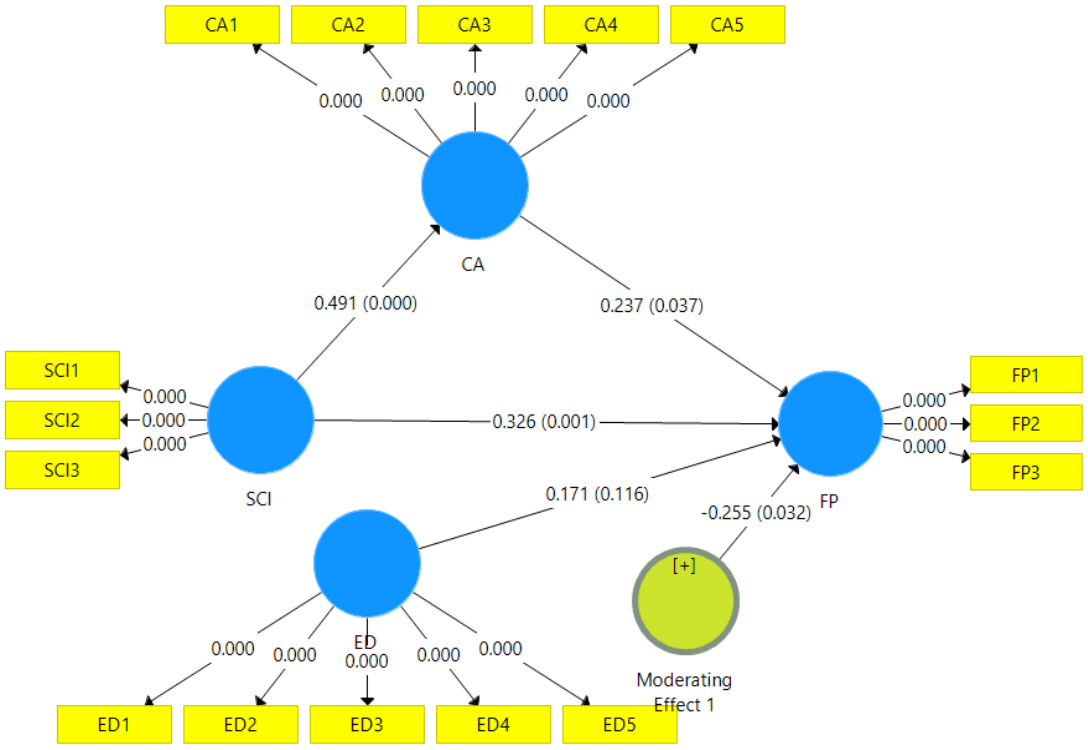



**Figure 4.28: Combined Effect Diagram having Path Coefficient and P-Values**

It can be observed that the path coefficients of the combined effect model are all significant except for the path of environmental dynamism to firm performance. However, environmental dynamism is represented by the moderating effect latent variable in the model. Hence, it is to be inferred that supply chain integration, competitive advantage and environmental dynamism have a significant combined effect on firm performance.

### 4.10 Summary of Data Presentation and Analysis

This chapter begun by examining the general characteristics of the research firms. Next, KMO measure of sampling adequacy and Bartlett's Test of sphericity were carried out to assess the suitability of applying factor analysis. This was followed by reliability and validity tests. Then an assessment of the measurement (outer) model was carried out. Finally, PLS SEM analyses were carried out by use of smart PLS 3 to examine the hypotheses in the study. First, the direct connection of supply chain integration to organizational performance was tested. This was followed by testing the mediating influence of competitive advantage on the connection linking supply chain integration to firm performance. Next to be tested was the moderating influence of environmental dynamism on the connection linking integration of supply chain to organizational performance. The combined effect of integration of supply chain, competitive advantage and environmental dynamism on firm performance concluded the chapter.

# CHAPTER FIVE: HYPOTHESIS TESTING, INTERPRETATIONS AND DISCUSSIONS

## 5.1 Introduction

The research's principal aim was to establish the relationships among supply chain integration, competitive advantage, environmental dynamism and business performance of large-scale manufacturing firms in Kenya. To address the research questions, a conceptual model and a number of hypotheses were set up.

The reliability and validity of the latent variables were first established. This was achieved through exploratory factor analyses to determine the unidimensionality of the constructs. The descriptive statistics were then obtained. PLS-SEM data analysis approach was employed to realize the objectives of the research.

This chapter therefore picks up from the preceding chapter. It provides the results of the tests of hypotheses, then analyses and interprets the relationships among the four latent variables in four major sections; supply chain integration and organizational performance; supply chain integration, competitive advantage and firm performance; supply chain integration, environmental dynamism and firm performance and finally supply chain integration, competitive advantage, environmental dynamism and firm performance. Lastly, a discussion of the results is provided.

## 5.2 Supply Chain Integration and Firm Performance

The first aim of the research was to investigate whether there is a direct link connecting supply chain integration to firm performance. To attain this goal, a structural model was formulated and a hypothesis was tested. The exogenous variable in the model was supply chain integration while organizational performance was the endogenous variable. This structural model is represented in Figures 4.1, 4.2, 4.3 and 4.4 in chapter four. For this objective, the study hypothesised as follows:

$H_1$: Supply chain integration has no significant effect on firm performance.

The alternative hypothesis predicts a positive significant connection linking supply chain integration to organizational performance. PLS-SEM analysis technique with Smart PLS

3.0 was used to test the hypothesis. Initially, validity and reliability of the inner model was confirmed. All the outer model loadings were established to be statistically significant with all indicator reliability levels being greater than the lowest acceptable level of 0.4 (Wong, 2013). Overall model fit was assessed through the use of standardized root mean square residual (SRMR) statistic. The SRMR statistic was found to be 0.105 which is marginally larger than the maximum required level of 0.1 (Henseler et al., 2014). In any case this value was significant at 5% level of significance.

Bootstrapping method with 500 resamples was applied to gauge the significance of the path coefficient of the inner model (Chin, 1998). The connection linking supply chain integration to firm performance was found to be positive and statistically significant at $\alpha$=5% ($\beta$=0.548, t=7.752, p=0.000, $f^2$=0.429). Hence, the null hypothesis is not supported and it is inferred that implementation of supply chain integration leads to enhanced organizational performance. The explained variance, $R^2$ was found to be 30% meaning that 30% of the variance in organizational performance is accounted for by the variance in supply chain integration. According to Peng and Lai (2012), $R^2$ values of 67 percent, 33 percent and 19 percent represent large, medium and small variances in that order. Thus, it can be concluded that the percentage variance in firm performance that is accounted for by supply chain integration is within the moderate range. This model had a predictive relevance value of 0.162 which is larger than zero. Hence predictive relevance for this model was affirmed.

Hair et al. (2021) contends that the effect size of an exogenous variable which is the drop in $R^2$ if the variable is not included from the model is as follows: $f^2$ levels of 0.35, 0.15 and 0.2 imply that an exogenous variable has large, moderate and low effect size in that order. The $f^2$ value of 0.429 in this model indicates that if supply chain integration is not included in the model the increase or decrease in explained variance of firm performance would be large.

### 5.3 Supply Chain Integration, Competitive Advantage and Firm Performance

The second purpose of the research was to assess whether the link connecting supply chain integration to firm performance is mediated by competitive advantage. In pursuit of

this objective, a structural model with three latent variables was formulated. These variables were integration of supply chain, competitive advantage and organizational performance whereby supply chain integration was an exogenous variable and firm performance was an endogenous variable. Competitive advantage was an endogenous variable with respect to supply chain integration but an exogenous variable with respect to performance. The measurement items for all the three latent constructs had individual indicator reliability scores greater than the threshold of 0.4 except for financial performance which was marginally lower at 0.364. Also, all the indicators loaded more heavily on their corresponding latent variables relative to any other variables, hence establishing convergent and discriminant validity of the measurement model. The inner model had values of Cronbach's Alpha larger than the required lowest level of 0.7 except for firm performance which was in the acceptable range of between 0.5 and 0.7 (Nunally, 1994). Also, composite reliability values were all bigger than the required lowest level of 0.7. Both of these tests affirmed the structural model's three latent variables' internal consistency and reliability. The average variance extracted (AVE) statistic was used to assess convergent validity, and it was revealed that all of the values were more than the required minimum of 0.5. Thus, convergent validity was established.

Fornell-Lacker test and Heterotrait-Monotrait (HTMT) criteria were employed check discriminant validity. Fornell-Lacker conditions were fulfilled. The HTMT values between paired latent variables in the model were all lower than the maximum level of 0.85. On the basis of these criteria, discriminant validity was established. Collinearity for both the outer and the inner models were also assessed. It was established that all the tolerance levels were all bigger than the lowest level of 0.2. Further, the variance inflation factors (VIFs) were all lower than the maximum required level of 5. Hence, neither the measurement nor the structural models had collinearity.

Predictive relevance for the two endogenous constructs were both greater than zero, meaning this was an acceptable SEM model. SRMR statistic was applied to assess model's goodness of fit and it was found to be 0.117. This value is marginally bigger than the required maximum of 0.1 and its statistical significance was established at $\alpha$=5%

(T=2.115, p=0.035). This affirmed that the model was of good fit. The final model results are laid out in Figures 4.5, 4.6, 4.7 and 4.8.

These findings showed that supply chain integration and competitive advantage represent 34.6% of the variance in organizational performance. This is an improvement of 4.6% in explained variance (from 30% to 34.6%) relative to the explained variance when competitive advantage was not included in the model. Further it was noted that 24.2% of the variance in competitive advantage was attributed to the variance in supply chain integration. The significance of the path coefficients were evaluated by bootstrapping approach with 500 resamples (Chin, 1998; Musuva-Musimba, 2013; Odock, 2016).

**Table 5. 1: Mediation Analysis Results**

| | Path Coefficient | P-Value | $f^2$-Value |
|---|---|---|---|
| Supply Chain Integration > Firm Performance (direct effect) | 0.408 | 0.000 | 0.193 |
| Supply Chain Integration > Competitive Advantage | 0.492 | 0.000 | 0.319 |
| Competitive Advantage > Firm Performance | 0.268 | 0.016 | 0.083 |
| Supply Chain Integration > Competitive Advantage > Firm Performance (indirect effect) | 0.132 | 0.035 | |

Source: Research Data (2022)

The hypothesis for objective two was:

$H_2$: Competitive advantage has no substantial mediating role on the connection linking supply chain integration to firm performance.

The hypothesis was evaluated using the two-step approach as contended by Klaner et al. (2013) and Nitzl et al. (2018). This approach is displayed in flowchart in Appendix VII. The first step is to check the significance of the indirect and direct effects. The direct

effect of supply chain integration on organizational performance has a path coefficient of 0.408 and p-value of 0.000. The indirect influence of supply chain integration on firm performance via competitive advantage has a path coefficient of 0.132 and its p-value is 0.035. It can be noted that both p-values are lower than 0.05 and thus both paths were statistically significant. The next step is to check the sign of the product of the path coefficient of the direct and indirect effects. This product is (0.408*0.132=0.054) which can also be obtained as (0.408*0.492*0.268=0.054). This product is a positive value.

Given that both the direct and indirect paths were statistically significant, the null hypothesis was not supported. Therefore, it was inferred that mediating role of competitive advantage on the link connecting supply chain integration to firm performance was statistically significant. Further, given that the path coefficients' products of the direct and indirect effects is positive, this is a complementary, partial mediation (Hair et al., 2021; Appendix VII).

### 5.4 Supply Chain Integration, Environmental Dynamism and Firm Performance

Objective three of this research was to establish if environmental dynamism had a significant moderating influence on the connection linking supply chain integration to firm performance. In order to achieve this objective, a structural model with three latent constructs was developed. These constructs were supply chain integration, environmental dynamism and organizational performance. Supply chain integration and environmental dynamism were exogenous variables while firm performance was an endogenous variable.

All the measurement indicators for the three latent constructs had individual indicator reliability levels larger than the minimum required level of 0.4 except for competitive intensity (0.345), technological uncertainty (0.373) and financial performance (0.307). Nonetheless, all these indicators were statistically significant. All the indicators of these constructs loaded highly on their associated latent variables than on any other variables. This affirmed the existence of both convergent and discriminant validity of the outer model. The structural model had Cronbach's Alpha levels larger than the required minimum of 0.7 except for firm performance which was however in the acceptable range

of 0.5 to 0.7. Furthermore, composite reliability values were all bigger than the required lowest level of 0.7. Internal consistency reliability of the three latent constructs in the structural model was established based on these two tests.

The assessment of discriminant validity was done by use of Fornell-Lacker test and HTMT ratios. Fornell-Lacker conditions were met whereas the HTMT ratios were all lower than the maximum value of 0.85. Therefore, discriminant validity was established. Assessment of collinearity for both the outer and inner models was carried out. It was found that all the VIF statistics were lower the maximum required level of 5 and all the tolerance levels were higher than the minimum level of 0.2. This affirms that neither the outer nor the inner models had collinearity.

The predictive relevance for the endogenous variable was found to be greater than zero in the model, implying that this is an acceptable SEM model. The model's goodness of fit was examined through the use of the SRMR statistic and this was found to be 0.094. This value, being lower than 0.1 affirmed that the model was of good fit. Further, this value was statistically significant (T=2.268, p=0.024).

The final model results are presented in Figures 4.9, 4.10, 4.11, 4.12, 4.13 and 4.14. The results indicate that supply chain integration and environmental dynamism explain 35% of the variance in organizational performance. This is higher than when supply chain integration was the predictor for firm performance ($R^2$=30%) and also marginally higher than when competitive advantage and supply chain integration were both predictors of firm performance ($R^2$=34.6%). This implies that competitive advantage and environmental dynamism have more or less the same explained variance on firm performance. The hypothesis tested for objective three was:

$H_3$: Environmental dynamism has no substantial moderating effect on the connection linking supply chain integration to firm performance.

The hypothesis was evaluated by use of the two-stage approach as proposed by Henseler and Chin (2010). They contend that when the primary objective is to gauge the significance of the moderation effect, this approach is the best since it also yields a

greater value of statistical power relative to the orthogonalizing and product indicator approaches. Partial least squares SEM analysis found a path coefficient of -0.283 for the moderating effect with a P statistic of 0.024 (T=2.268, 95% CI=-0.554, -0.084). Since p-statistic is lower than 5%, the null hypothesis is not supported. This implies that the moderating effect of environmental dynamism on the connection linking supply chain integration to firm performance was negative and statistically significant.

Finally, the effect size, $f^2$ is 0.063 which is large according to Hair et al. (2016). This indicates that if environmental dynamism was to be excluded from the model, then the drop or increase in explained variation, $R^2$, for firm performance would be large. This result therefore affirms that the moderating role of environmental dynamism on the link connecting supply chain integration implementation to firm performance is strong.

## 5.5 Supply Chain Integration, Individual Environmental Dynamism Indicator Moderating Variables and Firm Performance

This part outlines the outcomes of hypothesis tests which were carried out on the moderating effect of every individual indicator variable of environmental dynamism on the link connecting implementation of supply chain integration to firm performance. This is within the third objective. The subconstructs of environmental dynamism were supplier uncertainty, customer uncertainty, competitive intensity, technological uncertainty and government policy. This was found necessary since though the overall outcome of the moderating influence of environmental dynamism on the link connecting implementation of supply chain integration to firm performance was found to be negative, the subconstructs taken individually yielded different results. The validity and reliability tests are already outlined in section 5.4 above.

### 5.5.1 Supply Chain Integration, Supplier Uncertainty and Firm Performance

The moderating influence of the uncertainty of supplier on the connection linking implementation of supply chain integration to company performance is outlined in this section. In order to achieve this objective, a structural model with three latent variables was developed. These constructs were supply chain integration, supplier uncertainty and

organizational performance. Supply chain integration and supplier uncertainty were exogenous variables with firm performance being an endogenous variable.

The null hypothesis for this test was;

$H_{3a}$: Supplier uncertainty has no substantial moderating role on the connection linking supply chain integration to firm performance

The outcomes of this test are outlined in Figures 4.15 and 4.16. The path coefficient was found to be 0.470 (T=1.032, p=0.303, 95% CI=-0.447, 0.121). Since the p-value is larger than 5% while T-value is less than 1.96 and confidence interval contains zero, the null hypothesis is not rejected. Thus, it can be concluded that the moderating influence of supplier uncertainty on the link connecting integration of supply chain to firm performance is not significant. The effect size for supplier uncertainty is 0.015 which falls in the medium range (Hair et al., 2021). This implies that if supplier uncertainty is excluded from the model, the drop in explained variance for firm performance would only be medium implying that supplier uncertainty is not a strong moderating indicator in the connection linking implementation of supply chain integration to firm performance.

### 5.5.2 Supply Chain Integration, Customer Uncertainty and Firm Performance

The moderating influence of uncertainty of customer on the link connecting supply chain integration to firm performance is outlined in this sub-section. This objective was achieved using a structural model with three constructs which were supply chain integration, customer uncertainty and organizational performance. Supply chain integration and customer uncertainty were exogenous variables while firm performance was an endogenous variable.

The null hypothesis for this test was

$H_{3b}$: Customer uncertainty has no substantial moderating role on the connection linking supply chain integration to firm performance.

The outcomes of these analyses are displayed in Figures 4.17 and 4.18. The path coefficient was found to be -0.196 (T=2.448, p=0.015, 95% CI=-0.328, -0.006). The T

statistic is larger than 1.96, p-value lower than 0.05 while the 95% confidence interval excludes zero. Each of these statistics indicated that the null hypothesis is not supported. Thus, it was inferred that customer uncertainty had a significant and negative moderating role on the link connecting supply chain integration to organizational performance. Further, the effect size, $f^2$ is 0.073, which falls in the large range. This implies that if customer uncertainty is excluded from the model, then the drop or increase in explained variation, $R^2$, of firm performance would be large (Hair et al., 2021). These outcomes provide strong support for customer uncertainty as a significant moderating indicator variable.

### 5.5.3 Supply Chain Integration, Competitive Intensity and Firm Performance

The moderating influence of competitive intensity on the connection linking integration of supply chain to organizational performance is outlined in this section. In order to achieve this objective, a structural model with three latent constructs was formulated. These constructs were integration of supply chain, competitive intensity and company performance. Both supply chain integration and competitive intensity were exogenous variables whereas firm performance was an endogenous variable.

The null hypothesis for this test was;

$H_{3c}$: Competitive intensity has no substantial moderating role on the connection linking supply chain integration to firm performance

Partial least squares SEM results are presented in Figures 4.19 and 4.20. The path coefficient was found to be 0.026 (T=0.236, p=0.811, 95% CI=-0.167, 0.240). The T statistic is less than 1.96, p-value is greater than 0.05 and the 95% confidence interval includes zero. All these statistics resulted in the conclusion that the null hypothesis was supported. Thus, the implication is that there is no significant moderating influence of competitive intensity on the connection linking supply chain integration implementation to firm performance. The effect size, $f^2$ is 0.001 which falls in the range of small effect. This further lends credence that competitive intensity is not a strong moderating factor in the link connecting supply chain integration to company performance.

### 5.5.4 Supply Chain Integration, Technological Uncertainty and Firm Performance

The moderating influence of technological uncertainty on the link connecting implementation of supply chain integration to organizational performance was carried out. This objective was attained by formulating a structural model with three latent variables namely supply chain integration, technological uncertainty and company performance. Whereas supply chain integration and technological uncertainty were exogenous variables, firm performance was an endogenous variable.

The null hypothesis for this test was;

$H_{3d}$: Technological uncertainty has no substantial moderating role on the connection linking supply chain integration to firm performance

The outcomes for this test are displayed in Figures 4.21 and 4.22. The path coefficient was found to be 0.046 (T=0.442, p=0.659, CI=-0.169, 0.246). Since T statistic is less than 1.96, p-value greater than 0.05 and the 95% confidence interval includes zero, the null hypothesis was not rejected. This led to the conclusion that technological uncertainty does not have a significant moderating role on the link connecting implementation of supply chain integration to company performance. The effect size, $f^2$ was found to be 0.003 which falls in the small range, further supporting the position that technological uncertainty is not a significant moderating factor in the link connecting supply chain integration implementation to firm performance.

### 5.5.5 Supply Chain Integration, Government Policy and Firm Performance

The moderating influence of government policy on the connection linking implementation of supply chain integration to organizational performance was done. This objective was achieved through the formulation of a structural model with three latent variables. These were supply chain integration, government policy and company performance. Whereas supply chain integration and government policy were both exogenous variables, company performance on the other hand was an endogenous variable.

The null hypothesis for this test was;

$H_{3e}$: Government policy has no discernible moderating role on the connection linking supply chain integration to company performance

The outcomes for the analyses are displayed in Figures 4.23 and 4.24. The path coefficient was found to be -0.197 (T=2.018, p=0.044, CI=-0.408, -0.023). The T-value is greater than 1.96, p statistic is lower than 0.05 while the 95% confidence interval excludes zero. All these statistics resulted in the rejection of the null hypothesis in favour of the alternative hypothesis. Thus, it was concluded that government policy had a negative and significant effect on the link connecting supply chain integration to company performance. Further, the effect size, $f^2$ is 0.04 which falls in the large range. This implies that if government policy was to be excluded from the model, then the decrease/increase in the explained variation of firm performance would be large. These outcomes provide strong support that government policy is a significant moderating indicator variable on the connection linking supply chain integration implementation to company performance.

## 5.6 Supply Chain Integration, Competitive Advantage, Environmental Dynamism and Firm Performance

Objective four of this research was to investigate the combined influence of supply chain integration, competitive advantage and environmental dynamism on organizational performance. To pursue this objective, a structural model with four latent variables was formulated. These variables were integration of supply chain, competitive advantage, environmental dynamism and company performance whereby supply chain integration and environmental dynamism were exogenous variables while firm performance was an endogenous variable. Competitive advantage was an exogenous variable with respect to firm performance but endogenous variable with respect to supply chain integration.

All the measurement indicators for the four constructs had individual reliability scores greater than 0.4 except for competitive intensity (0.352), technological uncertainty (0.391) and financial performance (0.384). These values are marginally below the threshold of 0.4 and in any case, all of them were statistically significant. All the indicators of these constructs also loaded more heavily on their associated latent variables

than on any other construct. This affirms the establishment of convergent and discriminant validity of the measurement model. The inner model had Cronbach's alpha figures greater than 0.7 apart from firm performance which had a value of 0.631. This value is in the acceptable range of between 0.5 and 0.7. Also, composite reliability values were all above 0.7, indicating that the four latent variables in the structural model had internal consistency reliability.

Convergent validity was evaluated using AVE whose values were all above the minimum level of 0.5 except for environmental dynamism whose AVE was 0.453. However, convergent validity was nevertheless affirmed based on composite reliability values which are all above 0.7 (Hulland, 1999). Discriminant validity was examined by use of Fornell-Lacker test and HTMT ratios. Fornell-Lacker conditions were met and all the HTMT ratios were lower than the maximum level of 0.85. Thus, discriminant validity was met.

Collinearity for both the outer and the inner models were also evaluated. All the tolerance values were larger than 0.2 and the VIF statistics were all lower than the required minimum of 5. This confirmed that there was no multicollinearity in either the outer or the inner models. The predictive relevance of the applicable endogenous variable in the model (firm performance) was greater than zero, meaning that this is an acceptable SEM model. The overall goodness of fit for the model was assessed by use of the SRMR statistic which was found to be 0.102. This value is marginally above the threshold of less than 0.1 but it was found to be statistically significant. Thus, it can be inferred that the model had a good fit.

The final model outcomes are displayed in Figures 4.25, 4.26, 4.27 and 4.28. The outcomes show that variance in supply chain integration, competitive advantage and environmental dynamism explain 38.3 percent of the variance in organizational performance. This is the highest explained variance among the four models in the study given that for supply chain integration and organizational performance, $R^2$ was 30.0%; for supply chain integration, competitive advantage and company performance, $R^2$ was 34.6% whereas that connecting supply chain integration, environmental dynamism and

company performance was 35.0%. All these $R^2$ values fall in the moderate range (Peng & Lai, 2012). It is to be observed that the explained variance in the combined model was the highest. This was to be expected since the direct, mediating and moderating effects are all in one model. The null hypothesis to be tested for objective four was:

$H_4$: Supply chain integration, competitive advantage, and environmental dynamism have no significant combined effect on firm performance.

The PLS-SEM outcomes of this hypothesis test are presented in Table 4.68. The path coefficient between path competitive advantage and firm performance is 0.237 (T=2.092, p=0.037). This path is statistically significant since T statistic is higher than 1.96 and p-value less than 0.05. The path coefficient for environmental dynamism and firm performance was found to be 0.171 (T = 1.573, p = 0.116). The path coefficient for moderating effect was -0.255 (T=2.144, p=0.032). It can be observed that although the path for environmental dynamism and company performance is not statistically significant, that of the moderating role is significant. The path coefficient connecting supply chain integration to competitive advantage was established as 0.491 (T=6.954, p=0.000). This path coefficient was significant. The path coefficient linking supply chain integration to company performance was 0.326 (T=3.55, p=0.001). This path coefficient was also significant. Hence, for the combined model, the only path that was insignificant was that of environmental dynamism and performance of the company. Nevertheless, it can be noted that the moderating effect takes up the role between environmental dynamism and firm performance and this effect was found to be significant. Hence the null hypothesis for this objective was rejected. Thus, it was concluded that supply chain integration, competitive advantage and environmental dynamism had a significant combined effect on company performance.

The respective effect size, $f^2$ for supply chain integration, competitive advantage, environmental dynamism and moderating effect are 0.117, 0.065, 0.031 and 0.055. All these fall in the small effect range except for supply chain integration which falls in the medium effect range (Hair et al., 2021). The implication is that the latent variable with the largest contribution to explained variance for company performance among the four

of them is supply chain integration since if it was dropped, it would have the greatest effect on explained variance, $R^2$.

**Table 5. 2: Tests of Hypotheses Findings Summary**

| Objective | Hypotheses | Results | Interpretations/Remarks |
|---|---|---|---|
| **Objective 1:** Find out the effect of supply chain integration on firm performance | **Hypothesis 1:** Supply chain integration has no significant effect on firm performance | Path coefficient=0.548, SRMR = 0.105, p=0.000, T=7.752, $R^2$=30%. It is statistically significant | Hypothesis 1 is rejected. This implies that there is significant influence of supply chain integration on firm performance |
| **Objective 2:** Find out the effect of competitive advantage on the link connecting supply chain integration to firm performance. | **Hypothesis 2:** Competitive advantage has no substantial mediating effect on the connection linking supply chain integration to firm performance | Path coefficient=0.132, SRMR = 0.117, p=0.035, T=2.115, $R^2$=34.6%. It is statistically significant | Hypothesis 2 is rejected. This implies that there is positive significant mediating influence of competitive advantage on the connection linking supply chain integration to firm performance |
| **Objective 3:** Determine the effect of environmental dynamism on the link connecting supply chain integration to | **Hypothesis 3:** Environmental dynamism has no substantial moderating effect on the connection linking supply chain integration to firm performance | Path coefficient=-0.283, SRMR = 0.094, p=0.024, T=2.268, $R^2$=35%. It is statistically significant | Hypothesis 3 is rejected. This implies that there is significant and negative moderating influence of environmental dynamism on the connection linking supply chain integration to firm performance |

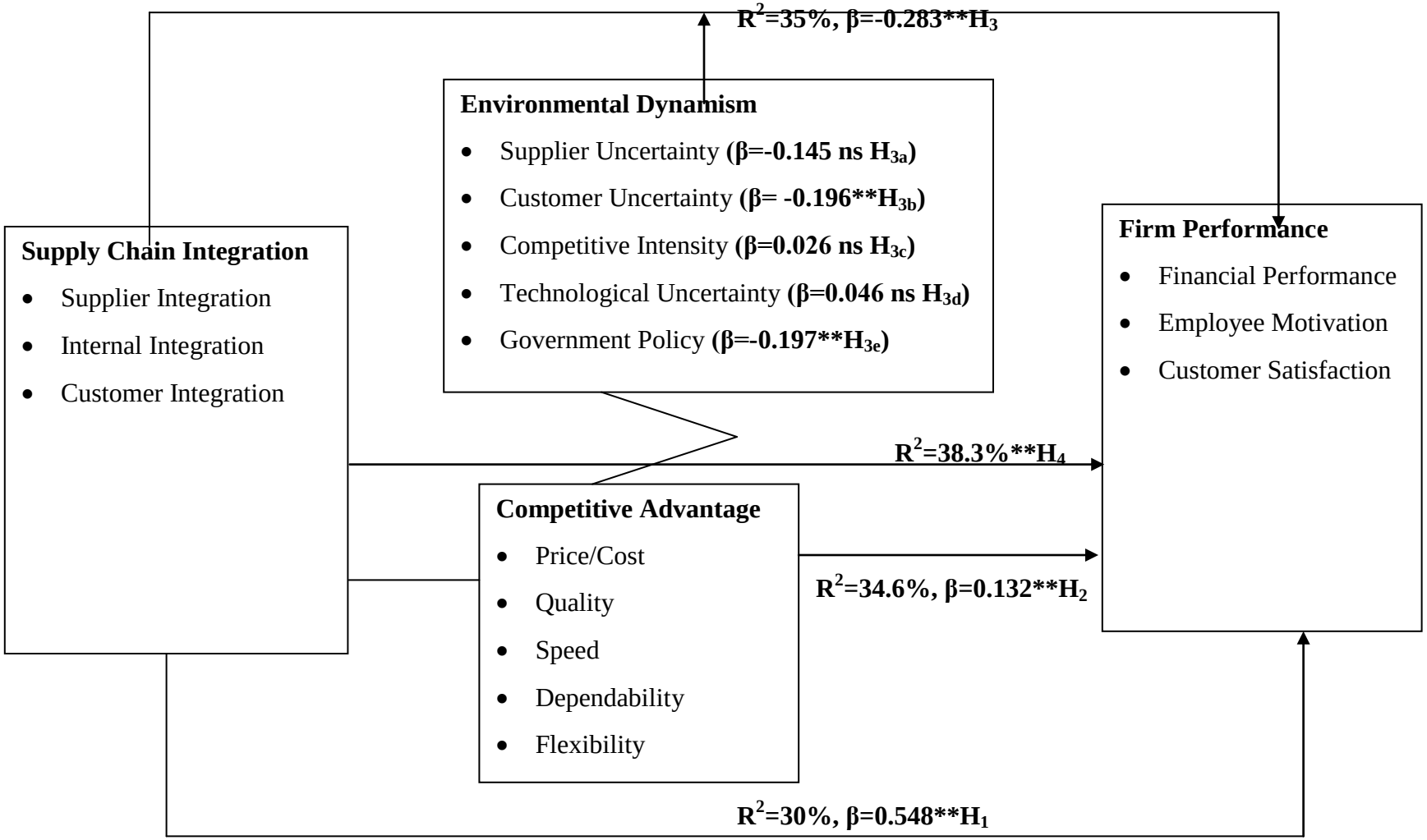
| Objective | Hypotheses | Results | Interpretations/Remarks |
|---|---|---|---|
| firm performance | | | |
| | **$H_{3a}$:** Supplier uncertainty has no substantial moderating effect on the connection linking supply chain integration to firm performance | Path coefficient=-0.145, t=1.032, p=0.303, $f^2$=0.015. Path coefficient statistically insignificant. | Hypothesis $H_{3a}$ is not rejected. This implies that there is negative insignificant moderating influence of supplier uncertainty on the connection linking supply chain integration to firm performance |
| | **$H_{3b}$:** Customer uncertainty has no substantial moderating effect on the connection linking supply chain integration to firm performance | Path coefficient=-0.196, t=2.448, p=0.015, $f^2$=0.073. Path coefficient statistically significant. | Hypothesis $H_{3b}$ is rejected. This implies that there is negative significant moderating influence of customer uncertainty on the connection linking supply chain integration to firm performance |
| | **$H_{3c}$:** Competitive intensity has no substantial moderating effect on the connection linking supply chain integration to firm | Path coefficient=0.026, t=0.236, p=0.811, $f^2$=0.001. Path coefficient statistically insignificant. | Hypothesis $H_{3c}$ is not rejected. This implies that there is positive insignificant moderating influence of competitive intensity on the connection linking supply chain |

| Objective | Hypotheses | Results | Interpretations/Remarks |
|---|---|---|---|
| | performance | | integration to firm performance |
| | **$H_{3d}$:** Technological uncertainty has no substantial moderating effect on the connection linking supply chain integration to firm performance | Path coefficient=0.046, t=0.446, p=0.659, $f^2$=0.003. Path coefficient statistically insignificant. | Hypothesis $H_{3d}$ is not rejected. This implies that there is positive insignificant moderating influence of technological uncertainty on the connection linking supply chain integration to firm performance |
| | **$H_{3e}$:** Government policy has no discernible moderating effect on the connection linking supply chain integration to firm performance | Path coefficient=-0.197, t=2.018, p=0.044, $f^2$=0.040. Path coefficient statistically significant. | Hypothesis $H_{3e}$ is rejected. This implies that there is negative significant moderating influence of government policy on the connection linking supply chain integration to firm performance |
| **Objective 4:** Establish the combined influence of supply chain integration, | **Hypothesis 4:** Supply chain integration, competitive advantage, and environmental dynamism have no significant combined effect on firm | SRMR = 0.102, $R^2$=38.3%. Competitive advantage and firm performance (T=2.092, p=0.037). Environmental dynamism (T=1.573, p=0.116). Moderating | Hypothesis 4 is rejected. This implies that there is a positive significant combined influence of supply chain integration, competitive advantage and |

| Objective | Hypotheses | Results | Interpretations/Remarks |
|---|---|---|---|
| competitive advantage and environmental dynamism on firm performance | performance | effect (T=2.144, p=0.032). Supply chain integration and competitive advantage (T=6.954, p=0.000). Supply chain integration and firm performance (T=3.55, p=0.001). All paths are statistically significant except for path between environmental dynamism and firm performance which was represented by moderating effect path | environmental dynamism on firm performance |

Source: Researcher (2022)

**Figure 5. 1 Conceptual Framework with Findings**




** p<0.05, ns = not significant

## 5.7 Discussion of the Findings

This section discusses the outcomes based on the study's four objectives and the resultant hypotheses.

### 5.7.1 Supply Chain Integration and Firm Performance

From the findings of the first hypothesis, supply chain integration implementation had a significant positive influence on firm performance. These outcomes are in line with conclusions of other researches (Aduku & Ayertey, 2015; Yuen & Thai, 2017; Uwamahoro, 2018; Pakurar et al., 2019; Sabburaj et al., 2020). The study adds to the body of knowledge in this area of the positive connection linking supply chain integration to firm performance. This therefore is a step in decreasing the uncertainty linked to previous researches that have resulted in contradictory outcomes on whether implementing supply chain integration is beneficial or not to a firm (Huo, Qi, Wang, & Zhao, 2014; Danese & Romano, 2010; Tarifa-Fernandez & De Burgos-Jimenez, 2017).

Another insight of the present research is that supply chain integration was broken down into its three elements. Past studies either took supply chain integration to be a unidimensional variable (Beheshti et al., 2014a; Hanif et al., 2018); others broke it down into two constructs of internal and external integrations (Zhao et al, 2015; Yuen & Thai, 2017); yet others had only a subset of integration of supply chain (Huang et al., 2014; Huo, 2012; Danese & Romano, 2011). The three aspects of supply chain integration were supplier integration, internal integration and customer integration.

Supplier integration enables purchasing and supplying entities to share strategic, operational and financial knowledge so as to add value to the participants (Kim, 2013). The key aim of supplier integration is to surpass any one organisation boundaries in order to easily synchronise processes (Pakurar et al., 2019). Integration of internal processes tears down functional departmental barriers, thus facilitating sharing of information so as to meet customer expectations (Zhao et al., 2011; Wong et al., 2011). Finally, implementation of customer integration enables the participation of customers in product creation so as to maximise their expectations and satisfaction (Kim, 2013). As Lau et al.

(2010) argue, the customer is the only person who has the ability to decide and evaluate a product.

The study also used a more encompassing measure of firm performance through the balanced scorecard as advocated by Kaplan and Norton (1992). The balanced scorecard seeks to address both financial together with non-financial indicators of performance. The financial indicators used in this study were percentage change in operating income and percentage change in assets while the non-financial measures were employee motivation and customer satisfaction. Also used were measures of competitive advantage as mediating variable. This is consistent with Bhagwat and Sharma (2017) who argued that the balanced scorecard approach is superior to traditional-based financial measures since it seeks to complement financial indicators of historical performance with those of desired future performance.

The link connecting supply chain integration implementation to firm performance was premised on resource dependence theory which posits that virtually all organisations are dependent on one another for access to crucial resources (Drees & Heugens, 2013). These interdependencies are essentially adopted so as to diminish uncertainty in the environment and a way of doing so is to implement such strategies as supply chain integration. This then should lead to enhanced firm performance as found out in this study.

### 5.7.2 Supply Chain Integration, Competitive Advantage and Firm Performance

In this research, a model was empirically developed and tested on the premise that if a firm implements supply chain integration, its competitive advantage will be boosted and this in turn will result in improved organizational performance. This model was validated by examining the following relationships: supply chain integration and competitive advantage, competitive advantage and firm performance, supply chain integration and firm performance, and also supply chain integration, competitive advantage and performance of the company.

It was hypothesised that implementation of supply chain integration would result in improved competitiveness of the firm. The result of this research is in line with this

claim. This finding adds support of positive links of previous studies on the connection linking supply chain integration and competitive advantage (Lucas, 2015; Wijetunge, 2017; Baah & Jin, 2019; Ploenhad et al., 2019). This study also resolves the findings of previous researchers which either found the link connecting supply chain integration to competitive advantage as negative or those which found mixed results (Rattawiboonsom, 2016; Hosseini et al., 2012; Quynh & Huy, 2018). All dimensions of supply chain integration were also considered in the model. Also, all the five measures of competitive advantage: price/cost, quality, speed, dependability and flexibility were used to bring out the full spectrum of the construct (Ploenhad et al., 2019; Shakkya, 2013).

The link connecting competitive advantage to company performance was also established to be statistically significant and positive as had been predicted. This outcome is in congruence with the outcomes of past researches (Lucas, 2015; Quynh & Huy, 2018; Baah & Jin, 2019). The model also tested the possible mediating role of competitive advantage on the influence of supply chain integration on company performance. This was done by testing the significance of the direct link connecting supply chain integration implementation to company performance and the indirect link of integration of supply chain, competitive advantage and organizational performance and both were found to be significant. The overall result was that competitive advantage positively and partially mediates the link connecting supply chain integration implementation to company performance. This outcome is in congruence with findings from past studies (Wijetunge, 2017; Ju et al., 2016).

The theoretical basis for the mediation role of competitive advantage on the connection linking supply chain integration to firm performance is anchored on resource-based perspective (Barney, 1991). Supply chain integration can be viewed as a resource that is rare, non-substitutable, valuable and imperfectly imitable. To the extent that a firm has integrated its activities relative to the competitors, then such a firm will gain competitive advantage. When a firm gains competitive advantage through lower pricing, high quality, reduced lead time and a product is delivered the way a customer expected, including the capacity of the organization to counter fluctuations in the volume of production and

product mix, this inevitably results in enhanced organizational performance (Vencataya et al., 2016).

### 5.7.3 Supply Chain Integration, Environmental Dynamism and Firm Performance

The present research formulated and empirically examined a model which hypothesized that environmental dynamism had a significant moderating influence on the connection linking implementation of supply chain integration to organizational performance. Whether the moderating role was positive or negative depended on the nature of the environment. Duran and Akci (2015) argue that as the degree of environmental dynamism increases, there is greater necessity for organisations to form strategic alliances to reduce the uncertainty. Thus, the moderating role of environmental dynamism is expected to be positive in highly dynamic or unstable environments while in more stable environments, it is expected to be non-existent or negative (Ahmed et al., 2020; Fynes et al., 2004; Zhang & Tse, 2017; Wamba et al., 2020). It is to be noted that for this study the index of environmental dynamism was 3.16 which was calculated as the average of the individual indices of the five subconstructs. The averages for supplier uncertainty, customer uncertainty, competitive integration, technological uncertainty and government policy were 2.96, 3.13, 3.09, 3.35 and 3.29 respectively (refer to section 4.4.4). Hence, this level of environmental dynamism was moderate whereby no moderation effect was expected (Kamasak et al., 2016).

Fynes et al. (2004) contend that in uncertain times, stronger relationships enable the company to obtain the essential resources from partners so as to sustain performance. This view is also consistent with resource dependence theory, systems theory and network theory. This study found an overall significant and negative moderating influence of environmental dynamism on the link connecting supply chain integration implementation to company performance which is contrary to expectation. This is in congruence with the findings of Huang et al. (2014) but contradicts those of Zhang et al. (2017), Fynes et al. (2018), Muddaha et al. (2018), Pham and Doan (2020) and Wamba et al. (2020). It is to be noted that out of the five dimensions of environmental dynamism, three of them (supplier uncertainty, competitive intensity and technological uncertainty) had results predicted by theory. Only customer uncertainty and government policy

moderating results differed. Huang et al. (2014) argued that when market demand is turbulent, the performance of all of the members of a supply chain may suffer due to explorative and exploitative behaviour of partners. Further, Thongratana and Perera (2014) argued that uncertainty in government policy may negatively affect firm performance.

A contribution of the moderating role of environmental dynamism in this study is that it used all the five variables of environmental dynamism to bring out the full spectrum of its effect on the connection linking supply chain integration to firm performance. Past researchers have omitted some. For instance, Fynes et al. (2018) and Peng and Lin (2019) used three variables in different combinations. Huang et al. (2014) used a single one, customer uncertainty.

### 5.7.4 Supply Chain Integration, Individual Environmental Dynamism Indicator Moderator Variables and Firm Performance

This section discusses the outcomes of the individual moderating role of the subconstructs of environmental dynamism on the link connecting integration of supply chain to firm performance. As has been argued before, it is expected that in highly dynamic environments, it is expected that the moderating effect of these variables is expected to be positive. In contrast, this moderating role is expected to be non-existent if environmental dynamism was moderate and negative in more stable environments. The moderating influence of each subconstruct of environmental dynamism on the connection linking integration of supply chain to firm performance is discussed next. The individual indicator moderating variables had mixed results as displayed on Table 5.3.

**Table 5. 3: Moderator Indicator Variable Outcomes**

| Moderator Indicator Variable | Mean of Environmental Dynamism | Path Coefficient | T-Value | P – Value | Significance |
|---|---|---|---|---|---|
| Supplier Uncertainty | 2.96 | -0.145 | 1.032 | 0.303 | Insignificant |
| Customer Uncertainty | 3.13 | -0.196 | 2.448 | 0.015 | Significant |
| Competitive Intensity | 3.09 | 0.026 | 0.236 | 0.811 | Insignificant |
| Technological Uncertainty | 3.35 | 0.046 | 0.442 | 0.659 | Insignificant |
| Government Policy | 3.29 | -0.197 | 2.018 | 0.044 | Significant |

Source: Research Data (2022)

It is to be noted that out of the five indicator moderator variables, only two were statistically significant and had negative path coefficients. This means that their combined significance was sufficiently strong to counter the insignificance of the other three to result in the overall significance of the environmental dynamism construct.

#### 5.7.4.1 Supply Chain Integration, Supplier Uncertainty and Firm Performance

For this research, a model was formulated and tested which hypothesised that supplier uncertainty had a significant and positive moderating influence on the connection linking supply chain integration implementation and company performance if supplier uncertainty was high, non-existent effect if supplier uncertainty was moderate and negative if supplier uncertainty was low. Supplier uncertainty has a non-significant moderating role on the link connecting supply chain integration to company performance, according to this study. This outcome is consistent with theory since the level of environmental dynamism was moderate given that supplier uncertainty had a mean rating of 2.96 (see Table 5.3).

These outcomes are consistent with those of Kamasak et al. (2016) and Ambrosini and Bowman (2009) who averred that if the degree of environmental dynamism is high, then a positive moderating effect was expected, but if it is moderate or low, then a non-existent and negative moderating effect were expected respectively. The results contradict those of Chiao et al. (2018), Ince et al. (2020) and Yousuf et al. (2021) who

established a positive and significant moderating effect. They also contradict those of Golgeci and Ponomarov (2015) who found a negative moderating effect. None of these studies with contradicting findings indicated the level of environmental dynamism in which the study was carried out. This would have shed more light on whether their findings were consistent with theory or otherwise.

#### 5.7.4.2 Supply Chain Integration, Customer Uncertainty and Firm Performance

In the research, a model was formulated and tested which postulated that the moderating influence of customer uncertainty on the link connecting supply chain integration implementation to firm performance depended on the level of customer uncertainty as an indicator of environmental dynamism. With a low level of customer uncertainty, the moderating effect was expected to be negative for a medium level of customer uncertainty, a non-significant moderating effect was expected while a positive moderating effect was expected with a high level of customer uncertainty.

The finding on the level of customer uncertainty was medium given that it had an average of 3.13 (see Table 5.3). On the moderating effect of customer uncertainty, the results yielded a significant positive effect. This therefore was not consistent with theory. The outcomes are however in line with that of Fynes et al. (2004), Chiao et al. (2021), Hendijani and Saei (2020) and Yousuf et al. (2021). The results contradict those which found a significant negative moderating effect (Srivastava et al., 2015; Liu, 2018; Nenavani & Jain, 2021). More studies are therefore needed to settle the moderating role of customer uncertainty on the link connecting supply chain integration implementation to firm performance.

#### 5.7.4.3 Supply Chain Integration, Competitive Intensity and Firm Performance

The study formulated and tested a model which postulated that the nature of the moderating influence of competitive intensity on the connection linking supply chain integration implementation to firm performance was contingent on the level of competitive intensity as an indicator of environmental dynamism. For a medium level of competitive intensity, a non-significant moderating effect was expected whereas

significant negative and positive moderating effects were expected for low and high levels of competitive intensity respectively.

The results on level of competitive intensity indicated an average score of 3.09 which was a medium level (see Table 5.3). The finding for the moderating influence of competitive intensity on the link connecting supply chain integration implementation to company performance was non-significant. This finding was expected from theory. It is also in congruence with the finding by Abdallah et al. (2014). The finding however contradicts those of Chan et al. (2012), Tzempelikos and Kooli (2020), Liu (2018) and Mazroui Nasrabadi and Eslami (2019) who found significant positive moderating effects. They also contradict those of Ahamed (2015) who found a significant negative moderating effect. The outcomes of this research contribute to settle the debate on the expected nature of moderating effect of competitive intensity on the connection linking supply chain integration implementation to performance of the firm.

#### 5.7.4.4 Supply Chain Integration, Technological Uncertainty and Firm Performance

This research formulated and tested a model which hypothesised that if the level of technological uncertainty was high, then the moderating influence of technological uncertainty on the link connecting supply chain integration implementation to firm performance would be positive. If the level of technological uncertainty was medium, then the moderating effect would not be significant but it would be negative if the level of technological uncertainty was low. The findings indicate that the average level of technological uncertainty was 3.35 which is medium (see Table 5.3).

The test for the moderating effect was found to be nonsignificant. This finding is therefore consistent with what was predicted. The findings also corroborate those of Fynes et al. (2004) and Tzempelikos and Kooli (2018). They however contradict those of Srivastava et al. (2015) and Pham and Doan (2020) who found significant positive moderating effects. The findings are also inconsistent with those of Chavez et al. (2015) who established a negative moderating influence. This study therefore serves as one of those to settle the debate on the moderating role of technological uncertainty on the link connecting supply chain integration implementation to performance of the firm.

#### 5.7.4.5 Supply Chain Integration, Government Policy and Firm Performance

This research formulated and tested a model which hypothesised that the kind of moderating influence of government policy on the connection linking supply chain integration implementation to organizational performance depended on the uncertainty level of government policy as a measure of environmental dynamism. In particular, it was postulated that if the level of uncertainty of government policy was high, then a positive moderating effect was expected. For low and medium levels of uncertainty, negative and no moderating effects were expected respectively.

The average level of uncertainty of government policy in this study was found to be 3.29 which was medium (see Table 5.3). A non-significant moderating effect was therefore expected. However, the study found a significant moderating effect, contrary to prediction from theory. There are very few studies which have had government policy as a moderator on the link connecting supply chain integration implementation to company performance. A single study was found in the literature and the moderating role was significant and positive (Thongrattana & Perera, 2010). Thus, a contribution of this study is that it had government policy as a moderator as advocated by Li and Atuahene – Gima (2001) and Jacoby and Hodge (2004). In conclusion, this study has contributed in terms of exploring the moderating influence of environmental dynamism and its subconstructs on the link connecting supply chain integration to firm performance which takes into account the level of uncertainty in the environment.

### 5.7.5 Supply Chain Integration, Competitive Advantage, Environmental Dynamism and Firm Performance

Objective four of this research was to determine the combined effect of supply chain integration, competitive advantage and environmental dynamism on performance of the firm. A structural model integrating these four latent variables was developed and tested. All the path coefficients of the model were found to be statistically significant. This was not unexpected since the direct connection linking supply chain integration implementation to organizational performance, the mediating influence of competitive advantage on the connection linking supply chain integration to company performance and the moderating influence of environmental dynamism on the connection linking

supply chain integration implementation to organizational performance were all found to be significant.

This is in congruence with the finding by Zhang et al. (2017) although this study did not have competitive advantage as a variable. It also concurs with that of Arifin and Baihaqi (2012). The finding also resolves the results of some researchers such as Koufteros et al. (2005) who found a non-significant combined effect of supply chain integration, competitive advantage and environmental dynamism on organisational performance. It is to be noted that studies on the combined influence of integration of supply chain, competitive advantage and environmental dynamism on organizational performance are quite scarce. This study therefore provides a significant contribution in this regard.

## 5.8 Chapter Summary

This chapter evaluated the results of the tests of the hypotheses and interpretations on the basis of the research analyses and findings. The chapter finished by discussing the implications of the findings grounded on the theoretical and empirical literature, the objectives and the hypotheses of the study.

# CHAPTER SIX: SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

## 6.1 Introduction

This chapter provides a summary of the findings of the research together with the conclusions and its contributions. Firstly, a summary of the findings is outlined. This is followed by a discussion of the contribution of the research to knowledge, theory, policy and practice. Recommendations from the study are presented next, followed by a discussion on the shortcomings of the research. Probable areas for further research as a result of this study conclude the chapter.

## 6.2 Summary of Findings

This study aimed at establishing the role of supply chain integration implementation on firm performance. It also purposed to find out the effect of competitive advantage and environmental dynamism on the connection linking supply chain integration implementation to company performance. The influence of environmental dynamism on the link connecting supply chain integration implementation to company performance was carried out in two levels; first, all the dimensions of environmental dynamism were considered together and next, each dimension of environmental dynamism was considered separately.

The first goal of the research was to determine the connection linking supply chain integration implementation to firm performance. This objective was pursued by performing PLS-SEM analysis. The model had two latent constructs; supply chain integration and firm performance. The study found that there is a significant positive link between the implementation of supply chain integration and firm performance. Variation in supply chain integration was found to explain 30 percent of variation in firm performance, which falls in the moderate range according to Peng and Lai (2012). The effect size of integration of supply chain on company performance was found to be large (Hair et al., 2021). This means that if supply chain integration was to be excluded from the model, the increase or decrease in explained variation for firm performance would be substantive implying that supply chain integration is a strong predictor of firm

performance. Nevertheless, the unexplained variance in firm performance of 70% is still large. This implies that there are other variables which are not in the model which explain performance of the firm.

Objective two of the research purposed to establish the mediating role of competitive advantage on the link connecting supply chain integration to firm performance. A SEM model comprising of three latent variables with one having the intervening effect was formulated and tested. Results of hypotheses tests through PLS-SEM analysis showed that supply chain integration had a significant positive association with both competitive advantage and firm performance. It was also found out that competitive advantage had a significant positive association with company performance. Further, the indirect influence of supply chain integration on firm performance through competitive advantage was established to be significant and positive. It was also observed that the inclusion of competitive advantage variable in the model having supply chain integration improved the explained variance from 30% to 34.6%. This means that the contribution of competitive advantage in the explained variance was modest at only 4.6%, meaning that supply chain integration was the stronger predictor of organizational performance. This is consistent with tests of mediation which showed that competitive advantage positively but partially mediates the connection linking supply chain integration implementation to organizational performance.

Objective three of the research was to determine the moderating role of environmental dynamism on the connection linking supply chain integration to organizational performance. In order to realise this objective, a PLS-SEM model with three latent variables was formulated and tested. The PLS-SEM two stage approach was employed so as to realise this objective. The analysis was carried out in two phases with phase one having the latent construct, environmental dynamism as the moderator. Phase two had each indicator of environmental dynamism as the moderator separately. These indicators which formed the latent construct, environmental dynamism were supplier integration, customer uncertainty, competitive intensity, technological uncertainty and government policy. On the model with environmental dynamism as the moderating variable, it was

inferred that environmental dynamism had a significant, negative moderating effect on the link connecting supply chain integration to firm performance.

Supplier uncertainty was established to have an insignificant negative moderating role on the relationship whereas customer uncertainty had a significant negative moderating effect. Both competitive intensity and technological uncertainty were established to have a nonsignificant positive moderating effect on the relationship. Finally, government policy was determined to have a significant, negative moderating effect on the relationship. The explained variance of firm performance in this model was found to be 35%. This is a slight increase of 5% relative to when supply chain integration was the only latent variable. This affirms that supply chain integration is a strong predictor of firm performance.

The fourth and final aim of the research was to establish the combined influence of supply chain integration, competitive advantage and environmental dynamism on performance of the firm. This objective was realised by formulation and test of PLS-SEM model with four latent constructs. The PLS-SEM paths for this model were five in total. The path linking supply chain integration to organizational performance measuring the direct influence was positive and significant. The paths linking supply chain integration to competitive advantage together with competitive advantage to organizational performance were also established to be positive and statistically significant. These two paths represented the mediating effect. The path linking environmental dynamism to firm performance was found to be positive but nonsignificant. Finally, the moderating effect was found to be negative and significant. As can be noted, all the coefficients for the paths of the combined model were found to be significant except the path linking environmental dynamism to organizational performance. However, the place of environmental dynamism was taken up by the moderating effect latent variable which was found to be significant. Thus, it can be concluded that the combined model was significant. The explained variance of firm performance for the combined model was 38.3%. It can be noted that this is the highest explained variance among the four models. This was to be expected since the combined model had the direct, mediating and moderating effects which were all found to be significant when tested separately.

### 6.3 Conclusions of the Research

A key conclusion of this research is that if a firm implements supplier, internal and customer integrations, it will enhance its firm performance through improved financial performance, increased employee motivation and greater customer satisfaction (Huo & Zhao, 2010; Koufteros et al., 2014). Integration with suppliers enables the firm to go beyond its organisation's boundaries in order to easily synchronize processes (Pakurar et al., 2019). In contrast, internal integration tears down functional departmental barriers thus fostering optimal synchronisation of internal processes (Wong et al., 2011). Customer integration enables the customer to participate in product creation, thus maximizing their expectations and satisfaction (Lau et al., 2010).

A second conclusion of the study is that supply chain integration results in enhanced competitive advantage. This is through lower product pricing relative to the competition and higher quality products. Competitive advantage also results in lower lead-times and delivery of products/services to the customer the way they expected. It also leads to the capability of the company to respond to fluctuations in the volume of production, time to market, the product mix and introduction of new products at short notice (Ploenhad et al., 2019; Shakkya, 2013; Feng et al., 2013; Zubir & Sundram, 2014).

A third conclusion of the study is that competitive advantage leads to enhanced firm performance through improved financial performance, increased employee motivation and customer satisfaction. If a firm is able to price its products lower in the market (due to low production cost) and is able to deliver its products faster, then customer satisfaction will be enhanced (Vencataya et al., 2016). Customer satisfaction can also be increased if an organization has a reliable delivery of high-quality products. Finally, a firm which is flexible in its operations, that is, has the ability to react faster to customer change in terms of new commodities or changes in volume of demand, then it is expected to satisfy customers better than the competition.

A fourth conclusion of the study is that as the degree of environmental dynamism increases, the strength of the connection linking supply chain integration implementation to organizational performance is also expected to increase. This means that in highly

dynamic environments, firms tend to forge closer alliances with their suppliers and customers in order to mitigate the negative consequences of the uncertainty (Kamasak et al., 2016; Fynes et al., 2004). Customer uncertainty was also found to have a strong effect on the connection linking supply chain integration to organizational performance irrespective of the level of supplier uncertainty, competitive intensity and technological uncertainty. This is to be expected since the customer is the ultimate focus of all firm's activities (Lau et al., 2010).

A final conclusion of the study is that uncertainty in government policy has a significant effect on the link connecting integration of supply chain to organizational performance irrespective of the level of supplier uncertainty, competitive intensity and technological uncertainty. This means that government policy should be as predictable as possible to enable organizations make sound strategic decisions in light of the regulatory environment in which they operate. It also means that government should provide a conducive environment for firms to operate in terms of favourable policies in taxation, counterfeits, trademarks and patents, transportation infrastructure and energy costs (Jacoby & Hodge, 2004; Li & Atuahene-Gima, 2001).

## 6.4 Implication of the Research

Although it is critical to compare the findings of this study to those of earlier studies, an assessment of the implications serves as the foundation for theoretical and practical improvements. As a result, the subsections below highlight the research's contributions to knowledge, theory, practice, and policy.

### 6.4.1 Contribution to Knowledge

A major contribution to knowledge of this study is that implementation of supply chain integration results in enhanced performance of the firm. Effectively this finding complements the pool of knowledge on positive link connecting supply chain integration implementation to firm performance as supported by theory and empirical findings (Koufteros et al., 214; Aduku & Ayertey, 2015; Subburaj et al., 2020).

Next, a contribution of this study is that it considered all the three dimensions of supply chain integration: supplier integration, internal integration and customer integration as

advocated by various researchers (Ganbold, 2017; Baharanchi, 2019; Iranban, 2019; Subburaj et al., 2020). This was to obtain the complete estimation of their effect on organizational performance. This research therefore addresses the weakness of previous studies which only used some but not all dimensions of supply chain integration (Huo, 2012; Huang et al., 2014; Beheshti et al., 214a; Yeu & Van Thai, 2017; Danese & Romano, 2011).

Another contribution of this study is that it used the balanced scorecard approach to measure performance as advocated by Kaplan and Norton (1992). The study used customer, financial, internal and employee dimensions which are considered superior to traditional-based financial measures since it seeks to complement financial measures of historical performance (Bhagwat & Sharma, 2017).

Also, a contribution of this study is that it considered competitive advantage as a mediating factor on the connection linking integration of the supply chain to company performance. This is in congruence with recommendations of past researchers on the need to explore mediating variables that could bring out the connection linking supply chain integration to firm performance fully (Zubir & Sundram, 2014; Vencataya et al., 2016). The findings were that competitive advantage positively but partially mediate the link connecting supply chain integration implementation to company performance. This means that supply chain integration implementation leads to competitive advantage and this subsequently results in enhanced firm performance. This adds to findings by past researchers (Reklitis et al., 2012; Dikshit & Trivedi, 2012; Akmal et al., 2018; Baah & Jin, 2019). This study therefore helps to settle the debate on the mediating influence of competitive advantage on the connection linking supply chain integration to company performance.

Moreover, a contribution of this study is that it considered all the five aspects of competitive advantage. These are price/cost, quality, speed, dependability and flexibility as they provide comprehensive sources of competitive advantage in the firm as argued by Shakkya (2013). This is therefore an improvement over previous studies which used some but not all aspects of competitive advantage (Baah & Jin, 2019; Timilsina, 2017).

Furthermore, the research contributes to knowledge in relations to methodology. It applied the mediation approach as averred by Klarner et al. (2013) and Nitzl et al. (2018). This is in recognition of the conceptual and methodological problems associated with the approach by Baron and Kenny (1986) as pointed out by Hayes (2013).

A further contribution of this study is that it considered moderating influence of environmental dynamism on the connection linking supply chain integration implementation to organizational performance. This is consistent with arguments by various researchers (Lin et al., 2013; Lee et al., 2016) on the need to explore the role of moderating variables in order to bring out fully the connection linking supply chain integration to company performance. The findings show that environmental dynamism is a significant moderating factor on the relationship, which is in congruence with the outcomes of past scholars (Huang et al., 2014; Srinivasan et al., 2011). The finding therefore adds to the debate on the moderating role of environmental dynamism on the connection linking supply chain integration implementation to firm performance. Another finding was that customer uncertainty and government policy individually moderate the connection linking supply chain integration implementation to performance of the firm whereas supplier uncertainty, competitive intensity and technological uncertainty do not. This is a further addition to the literature on the individual moderating roles of these dimensions of environmental dynamism.

Additionally, a contribution of the study is that it used all the five dimensions of environmental dynamism in the moderation analysis. These were supplier integration, customer uncertainty, competitive intensity, technological uncertainty and government policy. This was to bring out the full spectrum of the moderating effect on integration of the supply chain and performance of the company as suggested by scholars (Muddaha et al., 2018; Gonzalez-Zapatero et all., 2019). This is an improvement over some past studies which used some but not all dimensions of environmental dynamism in the moderating role of environmental dynamism on the connection linking suply chain integration to firm performance (Fynes et al., 2004; Huang et al., 2014; Peng & Lai, 2019). A further contribution of this study investigated the combined effect of supply chain integration, competitive advantage, and environmental dynamism on company

performance and found it to be significant. This is one of the very few studies to have these variables combined in a single model. This study therefore opens up the arena in the literature for more research in this area.

Finaly and crucially, the findings also advance the supply chain integration, competitive advantage, environmental dynamism and performance relationship studies in the context of a developing country, Kenya. Supply chain integration is a comparatively new management phenomenon in this part of the world as most of the studies have been done in Europe, the Americas and Asia where most economies are developed. Hence it is expected that the outcomes of this research will encourage firms to take up supply chain integration practices in this region.

### 6.4.2 Contribution to Theory

Four theories underpinned this research. These are resource-based perspective, resource dependence theory, systems theory and network theory with resource-based view as the overarching theory. The study had integration of supply chain which comprised customer, supplier, and internal integrations. It was argued that if an organisation develops linkages with customers and suppliers, the resultant connection should provide competitiveness to the firm (Feng et al., 2010). The study also posited that internal integration, achieved through tearing down functional silos and sharing information across functions should lead to competitiveness and enhanced firm performance (Fawcett et al., 2007). To the extent that a firm has integrated its activities internally and externally relative to its competitors, it can be argued that such a firm possess a resource that is rare, non-substitutable, valuable and imperfectly imitable consistent with resource-based view. This is also consistent with network and systems theories. This is affirmed by the results of this study.

This study took the position that in order to enhance performance, a key management strategy is to reduce uncertainty in the environment. A way of achieving this is to forge closer relations with suppliers and customers, which is part of supply chain integration. The empirical results of this study affirm that supply chain integration leads to competitive advantage which in turn leads to better firm performance. These results are

consistent with the argument of resource dependence theory as propagated by Pfeffer and Salancik (2003), Davis and Adam Cobb (2010) and Mensing (2013).

This study posited that organisational performance is not only dependent on how the organisation effectively liaises with its immediate partners; it as well depends on how those partners collaborate with their own business associates, consistent with network theory. Strategic business networks enable a firm to access resources, new technologies, information and new markets which enhances scope and scale economies, learning and enables organisations to attain their strategic goals (Gulati et al., 2000). The outcomes of this study affirm that adopting a network approach enables a firm to be competitive and post enhanced firm performance.

### 6.4.3 Contribution to Practice and Policy

The outcomes of this research have fairly straight implications for policy and practice. The research determined that implementation of supply chain integration led to enhanced competitive advantage as had been found out by Wijetunge (2017) and Baah and Jin (2019). Competitive advantage in turn led to improved firm performance. This conclusion is therefore a wakeup call on firms that have not integrated their activities internally, with suppliers or with customers to do so in order to upscale their competitive advantage. Organizations should also increase their competitiveness by producing at lower cost in order to realize lower prices of their products in the market. Moreover, they should produce quality products and be able to reach the market fast. Finally, organizational managers should work on the dependability of their products and have inbuilt flexibility in their operations so as to react fast to changes in customer preferences and demand volume.

This study had government policy as a moderating variable as advocated by Jacoby and Hodge (2004). The study found out that government policy was a significant factor on the connection linking supply chain integration implementation to firm performance. There is therefore the need for government to reduce the level of uncertainty by formulating and enforcing predictable policies on taxation, counterfeits, trademarks, patents and the general regulatory environment. The government is called upon to enhance coordination

among the various agencies in order to improve service delivery. The government should also provide a conducive environment for doing business by providing relevant infrastructure such as reliable road networks, reliable and affordable energy such as fuel and electricity.

### 6.5 Recommendations

The study established that implementation of supply chain integration leads to enhanced competitive advantage and overall organizational performance. It is therefore recommended that firms integrate their activities. They should establish active customer-relationship management programmes as well as actively collaborate with their suppliers. These should reduce demand and supplier uncertainty. The firms should also integrate their internal activities by breaking down functional silos, sharing information across functions and deploying cross-functional teams as argued by Fawcett et al. (2007). Implementation of supply chain integration reduces technological uncertainty resulting in greater predictability of the environment (Xiao, Petkova, Molleman, & van der Vaart, 2019). This would enable the firm to better cope with the competitiveness in the sector in which it operates and thus enhancing overall firm performance.

The study found that enhanced competitive advantage leads to greater firm performance. Firms should therefore work on their competitiveness through production of low-cost products which will lead to lower pricing relative to the competition. They should also produce high quality products which can be delivered to the market faster. The firms should also strengthen their dependability and flexibility in terms of coping with changing customer tastes and volumes (Zubir & Sundram, 2014; Ploenhad et al., 2019). These actions should lead to better firm performance as found out in the study.

In the study, it was found that government policy was a significant moderating factor in the connection linking supply chain integration to company performance. The study thus recommends that governments formulate, implement and enforce policies on counterfeits and patents to protect their inventors. From this finding, it is also recommended that governments provide conducive environments for doing business in terms of predictable

and affordable energy. Finally, it is recommended that governments should provide good road networks.

### 6.6 Shortcomings of the Study

The research has drawbacks that could possibly lead to key researchable areas by future researchers. One shortcoming was that the rate of response was fairly low. This was one of the reasons why PLS-SEM approach was used. A higher number of responses would have enabled the use of covariance-based SEM. This would have probably resulted in more robust and valid results, something which future researchers may consider. This research applied survey research design. This technique has the drawback of not accounting for additional factors effecting competitive advantage or firm performance in the hypothesized linkages in the setting of large industrial enterprises in Kenya. A research design which can address this issue is experimental research design, which also results in higher internal validity, something which future researchers may take up.

Another limitation of this study is that it applied the Likert scale meaning that perceptual measures were used in generating data for all the variables. Measures of perception are bound to vary across time and also among individuals. It would be expected that objective data would provide more valid and robust findings for hypothesised relationships between research variables. Hence, future scholars should strive at using direct measures for the variables in order to enhance the validity of the outcomes. The context of this research was large manufacturing firms in Kenya. Therefore, the findings may not be generalizable to all manufacturing firms and also across other parts of the world. To increase the level of generalizability, studies that take into account small manufacturing firms or even in other sectors such as the service industry should be carried out. This also includes carrying out studies in other areas of the world other than only in Kenya.

The moderating variable for this study was environmental dynamism which is one among other determinants of environmental uncertainty (the others being munificence, hostility and complexity). This was done to narrow down the focus of the study which would otherwise have been too broad. To that extent, this was a limitation. Therefore, future

research should consider munificence, hostility and complexity as possible moderating variables in the link connecting supply chain integration to firm performance. The study was conducted in the context of moderate or medium level of environmental dynamism. The outcomes are therefore limited to this environment. Other researches should be carried out in the context of more stable and high environmental uncertainty.

### 6.7 Proposed Areas for Further Research

This study had a low response rate which necessitated the use of PLS-SEM as data analysis method. Future researchers should strive to have higher response rates to enable the use of more robust techniques such as covariance-based SEM in data analysis. This would be expected to result in more valid and generalizable findings. In terms of research design, the research applied cross-sectional survey approach. This means that other factors which may affect the independent variables could not be controlled. Future researchers should consider to the extent possible, experimental research designs, so that changes in performance are rightly attributed to the relevant predictor variables.

The variables in the study were measured by use of perceptual data which tend to change over time and among different respondents. Future researchers should consider the use of objective data which are expected to bring out the relationships among the variables in the model more clearly and accurately. Future research should also be carried out in contexts other than large manufacturing firms. This research could be replicated in small manufacturing firms and in other sectors different from manufacturing and in particular in the service sector where there are few studies. The research could also be done in different parts of the world other than Kenya considering that they would have different cultural backgrounds.

One of the outcomes of this research is that the moderating role of some variables, notably environmental dynamism as a whole, customer uncertainty and government policy, were inconsistent with theory. It is therefore suggested that this is a knowledge gap which future researchers could address. Bearing in mind that only one aspect of environmental uncertainty; that is environmental dynamism was considered in the study, future research should factor in the other aspects of environmental uncertainty which are

hostility, munificence and complexity. This is so as to further knowledge on the link connecting supply chain integration implementation to company performance when these other dimensions of environmental uncertainty are moderating variables.

As already noted, this is one of very scanty studies which had uncertainty in government policy as a variable. More studies are therefore called for which have it as a variable particularly in countries or economies with weak institutional setups. Finally, given that the study was carried out in a medium level of environmental dynamism, it is suggested that future researches are carried out in environments with low and also with high levels of environmental dynamism. This is so as to shed more light of the link connecting supply chain integration implementation to company performance in these different environments.

### 6.8 Chapter Summary

The final chapter of this thesis report started with a summary and conclusions of the study. This was followed by a presentation of the contribution of the research to theory, knowledge, policy and practice. Next was recommendations from the study before limitations were presented. The chapter ended with suggestions for future research.

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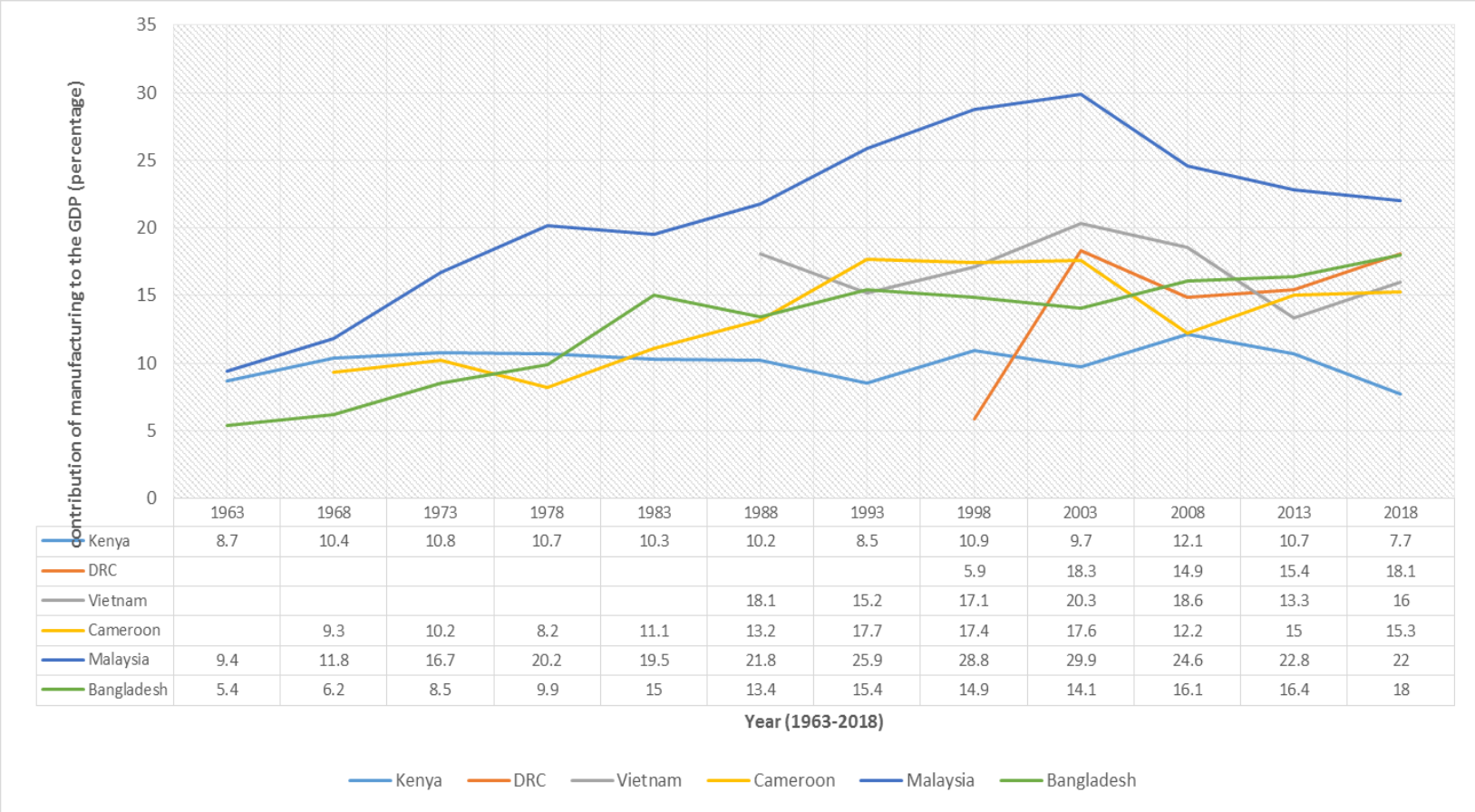
# APPENDICES

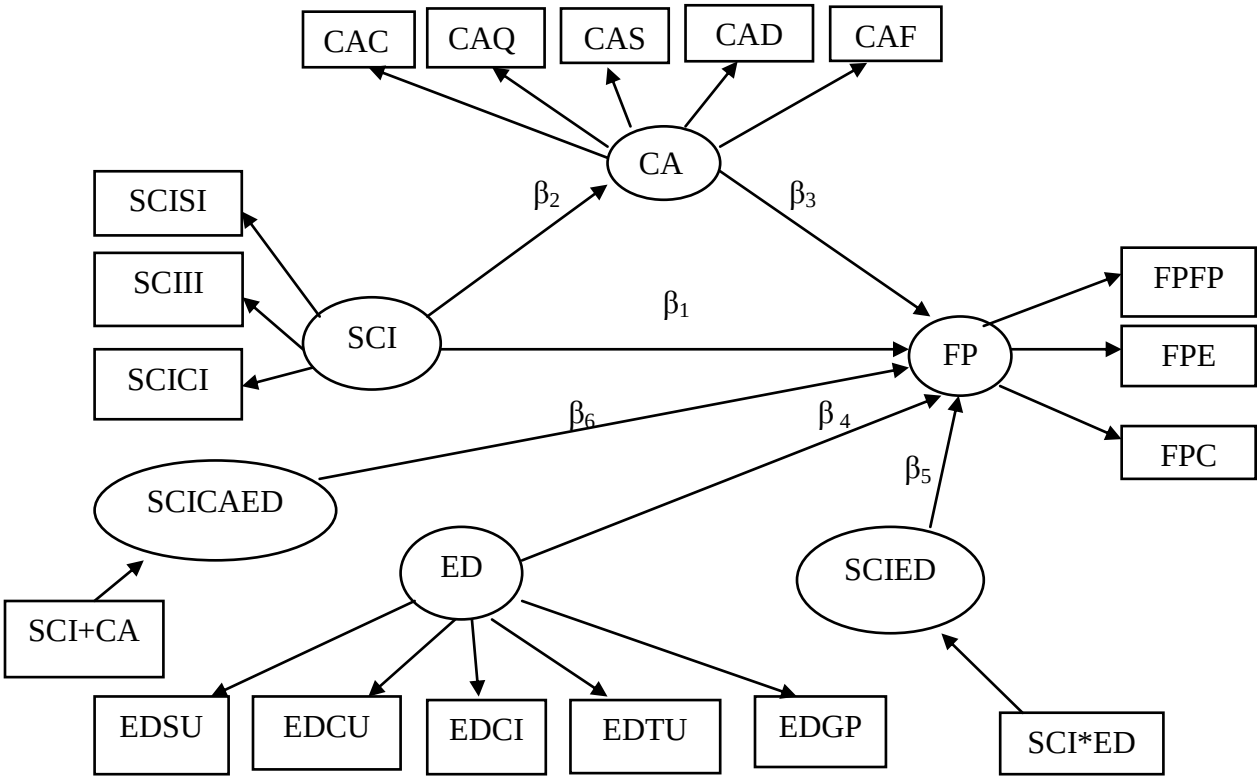
## Appendix I: Comparing the Contribution of Manufacturing on Gross Domestic Product of Kenya with Selected Countries




| | 1963 | 1968 | 1973 | 1978 | 1983 | 1988 | 1993 | 1998 | 2003 | 2008 | 2013 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kenya | 8.7 | 10.4 | 10.8 | 10.7 | 10.3 | 10.2 | 8.5 | 10.9 | 9.7 | 12.1 | 10.7 | 7.7 |
| DRC | | | | | | | | 5.9 | 18.3 | 14.9 | 15.4 | 18.1 |
| Vietnam | | | | | | 18.1 | 15.2 | 17.1 | 20.3 | 18.6 | 13.3 | 16 |
| Cameroon | | 9.3 | 10.2 | 8.2 | 11.1 | 13.2 | 17.7 | 17.4 | 17.6 | 12.2 | 15 | 15.3 |
| Malaysia | 9.4 | 11.8 | 16.7 | 20.2 | 19.5 | 21.8 | 25.9 | 28.8 | 29.9 | 24.6 | 22.8 | 22 |
| Bangladesh | 5.4 | 6.2 | 8.5 | 9.9 | 15 | 13.4 | 15.4 | 14.9 | 14.1 | 16.1 | 16.4 | 18 |

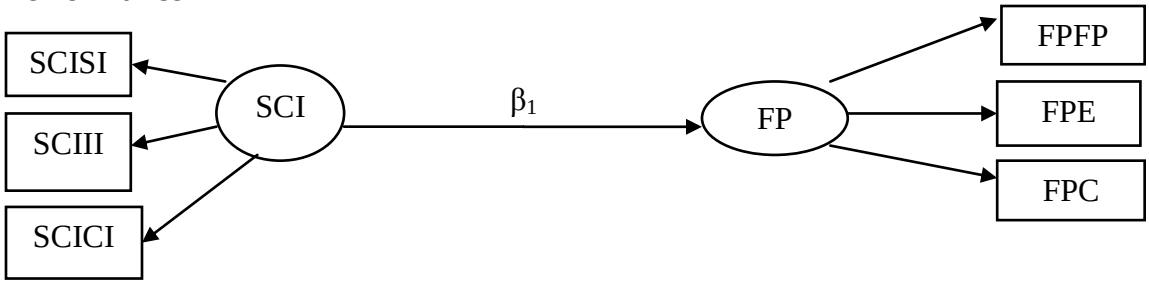
Source: World Bank Data https://data.worldbank.org/indicator/nv.ind.manf.kd.zg?view=chart

**Appendix II: Partial Least Square-Structural Equation Model Diagram of the Study**

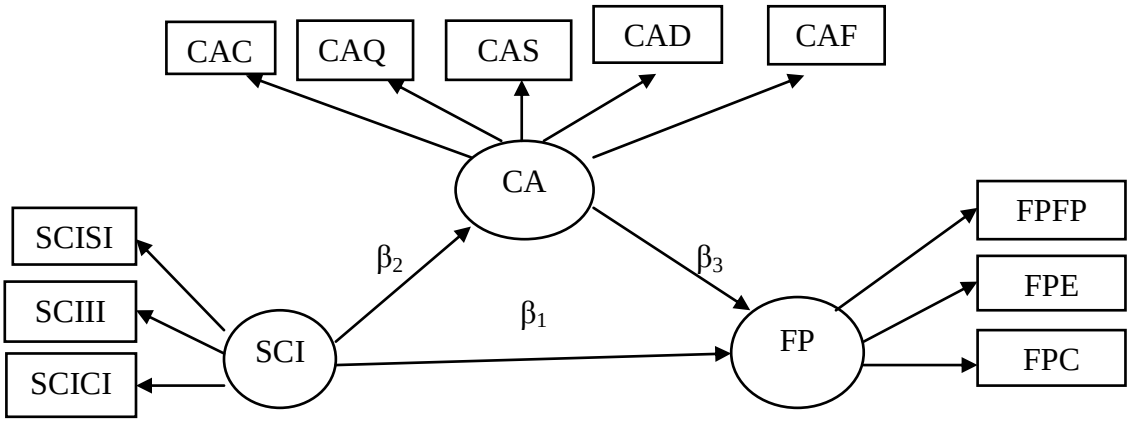



SCISI= Supplier Integration, SCIII= Internal Integration, SCICI= Customer Integration, CAC= Cost, CAQ= Quality, CAS= Speed, CAD= Dependability, CAF= Flexibility, EDSU= Supplier Uncertainty, EDCU= Customer Uncertainty, EDCI= Competitive Intensity, EDTU= Technological uncertainty, EDGP= Government Policy, FPFP= Financial Performance, SCI= Supply Chain Integration, CA= Competitive Advantage, ED= Environmental Dynamism, FP= Firm Performance, FPE= Employee, FPC= Customer, β= Path Coefficient.

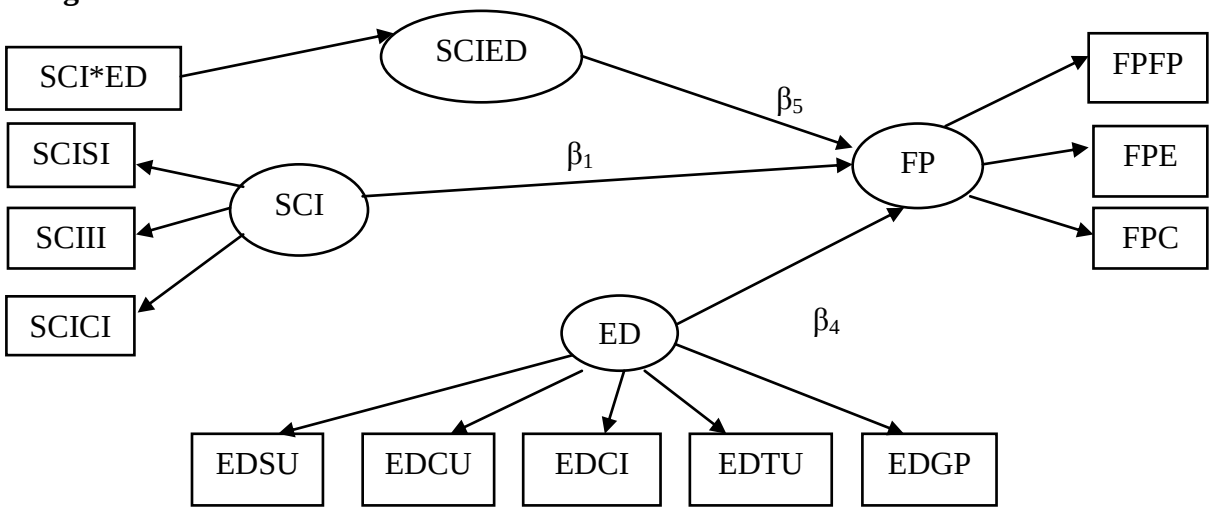
**Appendix II a: Direct Relationship between Supply Chain Integration and Firm Performance**



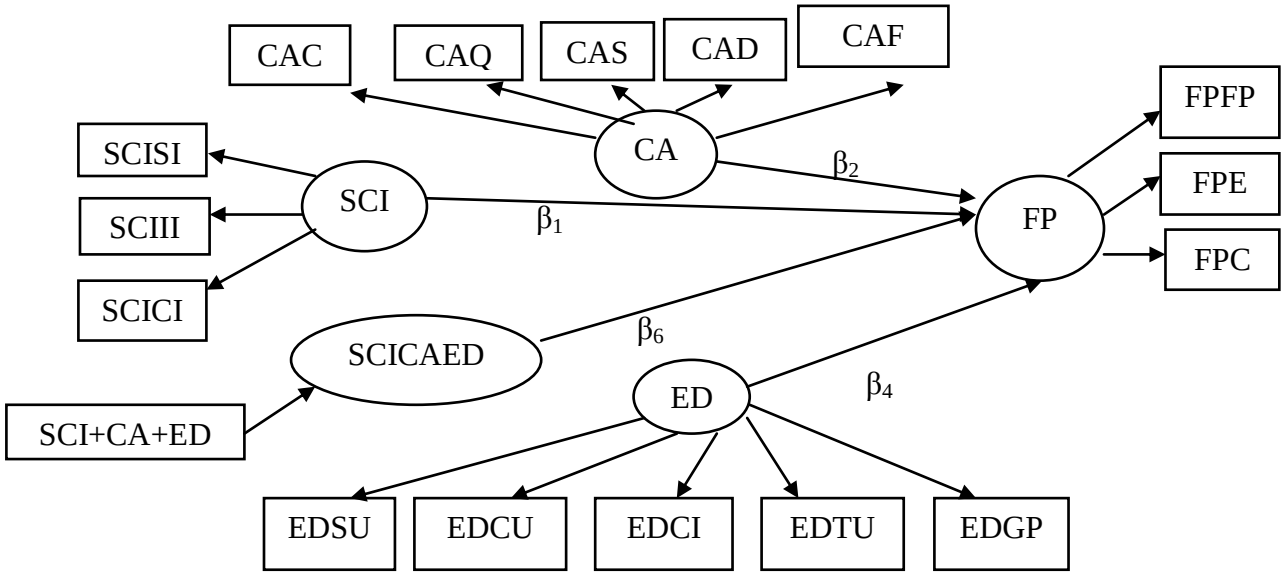
**Appendix II b: PLS-SEM diagram for Mediation of Competitive Advantage on Supply Chain Integration and Firm Performance**




**Appendix II c: Environmental Dynamism as moderator between Supply Chain Integration and Firm Performance**



**Appendix II d: Combined effect of Supply Chain Integration, Competitive Advantage and Environmental Dynamism on FP**



**Appendix III Operationalisation of Supply Chain Integration**

**a. Supplier Integration** (Chatzoudes & Chatzoglou, 2011; Huang, Yen & Liu, 2014; Ganbold, 2017; Uwamahoro, 2018; Pakurar et al., 2019; Flynn et al., 2010)

| | |
|---|---|
| SI 1 | Build strategic partnerships with suppliers |
| SI 2 | Seek assurance of quality from suppliers |
| SI 3 | Provision of information to suppliers for quality production |
| SI 4 | Suppliers' participation in product development |
| SI 5 | Information system integration with suppliers |
| SI 6 | Establishment of quick ordering systems with suppliers |
| SI 7 | Packaging customisation with suppliers |
| SI 8 | Sharing of gains from cooperation with suppliers |
| SI 9 | Use of vendor managed inventory |
| SI 10 | Continuous information programs |

**b. Internal Integration** (Baharanchi, 2009; Chatzoudes & Chatzoglou, 2011; Danese & Romano, 2013; Annan et al., 2016; Yuen & Thai, 2017; Iranban, 2019)

| | |
|---|---|
| II 1 | Use of cross functional management |
| II 2 | Coordination with marketing team |
| II 3 | Awareness of strategic plans |
| II 4 | Periodic interdepartmental meetings |
| II 5 | Degree of information sharing |
| II 6 | Data integration through enterprise resource planning systems |
| II 7 | Rate of data integration information process |
| II 8 | Alignment of systems across all functional units |
| II 9 | Visibility of processes |

**c. Customer Integration** (Ganbold, 2017; Uwamahoro, 2018; Danese & Romano, 2011; Pakurar et al., 2019; Flynn et al., 2010)

| | |
|---|---|
| CI 1 | Information sharing with customers through ICT |
| CI 2 | Extent of customer integration through ICT |
| CI 3 | Periodic meeting with customers |
| CI 4 | Awareness of customer requirements |
| CI 5 | Measurement of customer satisfaction |
| CI 6 | Alignment of firm activities and process with customer needs |
| CI 7 | Feedback by customers |
| CI 8 | Action on feedback |
| CI 9 | Handling of customer complaints |
| CI 10 | Contribution of customers to firm values |
| CI 11 | Determination of future customer expectations |

## Appendix IV Operationalisation of Competitive Advantage

**a. Cost** (Chatzoudes & Chatzoglou, 2011; Vencataya et al., 2016; Odock, 2016)

| | |
|---|---|
| CC 1 | Unit production cost |
| CC 2 | Capacity utilisation |
| CC 3 | Inventory turnover |

**b. Quality** (Chatzoudes & Chatzoglou, 2011; Vencataya et al., 2016; Odock, 2016)

| | |
|---|---|
| CQ 4 | Service level- Number of customer complaints |
| CQ 5 | Production quality- Products scrapped or returned |

**c. Speed** (Ragu-Nathan et al., 2006; Chatzoudes & Chatzoglou, 2011; Vencataya et al., 2016; Odock, 2016)

| | |
|---|---|
| CS 6 | Equipment changeover time |
| CS 7 | Order lead time |
| CS 8 | Time to solve customer complaints |
| CS 9 | Design time |
| CS 10 | Speed of introduction of new products |

**d. Dependability** (Shakkya, 2013; Vencataya et al., 2016)

| | |
|---|---|
| CD 11 | Machine down-time |
| CD 12 | Number of times customer promises not met in time e.g. in a quotation |

**e. Flexibility** (Shakkya, 2013; Venkataya, 2014; Odock, 2016)

| | |
|---|---|
| CF 13 | Ability to change production due to change in demand volume |
| CF 14 | Ability to quickly introduce new products |
| CF 15 | Wide variety of product mix |
| CF 16 | Capability of company to vary time of delivery to meet demand |

## Appendix V Operationalisation of Environmental Dynamism

**a. Supplier Uncertainty** (Tachizawa, 2009; Merschmann & Thonemann, 2010; Luo & Yu, 2016; Ganbold & Matsui, 2017)

| | |
|---|---|
| SU 1 | Material delay frequency |
| SU 2 | Critical material quality |
| SU 3 | Supplier lead time variance |
| SU 4 | Frequency of change in demand |
| SU 5 | Frequency of change in raw material/component prices |
| SU 6 | Level of rejection of material/component |

**b. Customer Uncertainty** (Tachizawa, 2009; Merschmann & Thonemann, 2010; Luo & Yu, 2016; Bae, 2017; Peng & Liu, 2019; Gonzalez-Zapatero et al., 2019)

| | |
|---|---|
| CU 1 | Frequency of order change by customers |
| CU 2 | Unpredictability of demand |
| CU 3 | Frequency of change in customer preference |
| CU 4 | Frequency of change in customer delivery schedules |

**c. Competitive Intensity** (Jansen et al., 2006; Tachizawa, 2009; Luo & Yu, 2016; Bae, 2017; Peng & Liu, 2019)

| | |
|---|---|
| CI 1 | Difficulty in predicting competitor strategies |
| CI 2 | Frequency of change of competitor promotional strategies |
| CI 3 | Number of competitors in the industry |
| CI 4 | Incidences of counterfeits |
| CI 5 | Ease of entry into the industry |
| CI 6 | Unpredictability of product price changes in the industry |

**d. Technological Uncertainty** (Ruiz-Ortega et al., 2013; Ganbold & Matsui, 2017; Gonzalez-Zapatero et al., 2019)

| | |
|---|---|
| TU 1 | Rate of obsolescence in technology |
| TU 2 | Ease of imitation of the technology |
| TU 3 | Rapidity of change in production technology |
| TU 4 | Rapidity of change in information and communication technology |

**e. Government Policy** (Boon-itt & Wong, 2011; Annan et al., 2016; Bae, 2017)

| | |
|---|---|
| GP 1 | Degree of government policy change on taxes and tariffs |
| GP 2 | Government action on counterfeit |
| GP 3 | Government action on trademarks and patents |
| GP 4 | Government policy/action on roads |
| GP 5 | Unpredictability of change in cost of energy |
| GP 6 | Unpredictability of availability of adequate energy |

**Appendix VI Operationalisation of Firm Performance**

**a. Financial Performance** (Cao & Zhang, 2011; Gayem & Dowlatkhah, 2016; Wijetunge, 2017)

| | |
|---|---|
| FP 1 | Operating Income |
| FP 2 | Total Assets |

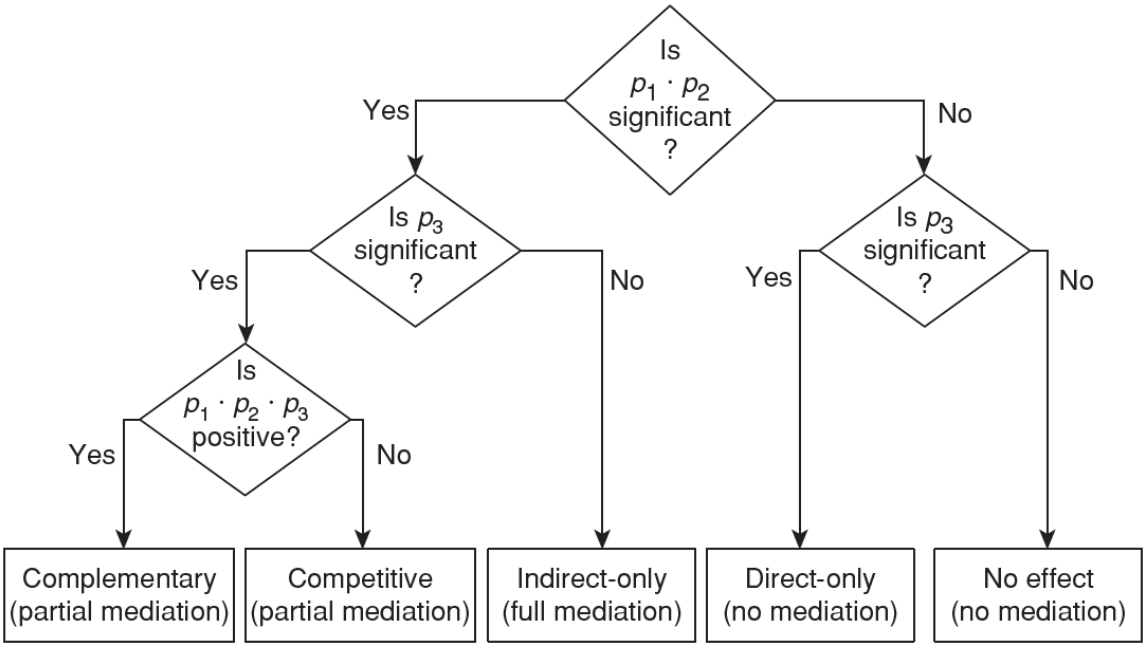
**b. Employee Motivation** (Banker & Mashruwala, 2007; Bhagwat & Sharma, 2017)

| | |
|---|---|
| E 1 | Recommend the firm's products/services to a friend |
| E 2 | Availability of training opportunities at work place |
| E 3 | Availability of promotion at the place of work |
| E 4 | Recommend someone to work in this place |

**c. Customer Satisfaction** (Banker & Mashruwala, 2007; Bhagwat & Sharma, 2017)

| | |
|---|---|
| C 1 | Availability of products/service when needed |
| C 2 | Availability of good value products/services for the price paid |
| C 3 | Availability of helpful sales personnel |
| C 4 | Recommend firm's products/services to a friend |

**Appendix VII: Mediation Analysis**




Source: Hair et al. (2021)

**Appendix VIII Questionnaire**

**Section A Firm Profile**

1. Firm's name: _____

2. What manufacturing sector is your firm in?

| | |
|---|---|
| Motor vehicle Assemblies & Accessories | [ ] |
| Leather Products & Footwear | [ ] |
| Textile & Apparels | [ ] |
| Timber, Wood products & Furniture | [ ] |
| Energy, Electrical & Electronics | [ ] |
| Metal & Allied | [ ] |
| Paper & Paperboard | [ ] |
| Pharmaceutical, and Medical Equipment | [ ] |
| Food, Beverages & Tobacco | [ ] |
| Building, Construction and Mining | [ ] |
| Plastics & Rubber | [ ] |
| Chemical & Allied | [ ] |

3. Kindly indicate your firm ownership status

Local ownership (fully) [ ]
Foreign ownership (fully) [ ]
Joint locally and foreign owned (kindly indicate the percentage of each)
Locally: _____ percent Foreign: _____ percent

4. Number of full-time staff _____
5. Please indicate length of existence of the firm: _____ Years
6. What is your designation? (kindly tick appropriate box)

General Manager [ ] Supply Chain Manager [ ] Operations Manager [ ]

Any other? kindly indicate: _____

**Section B Supply Chain Integration**

1. Using the following scale, kindly show the extent to which you are in agreement with the following statements.

**1: Never 2: Low Degree 3: Moderate 4 : High Degree 5 : Very High Degree**

| | **Supplier Integration** | | | | | |
|---|---|---|---|---|---|---|
| 1 | Strategic alliances with suppliers have been built by the firm | 1 | 2 | 3 | 4 | 5 |
| 2 | Quality assurance is sought from suppliers by the firm | 1 | 2 | 3 | 4 | 5 |
| 3 | The company provides information to suppliers for quality production | 1 | 2 | 3 | 4 | 5 |
| 4 | Suppliers are involved when developing a product | 1 | 2 | 3 | 4 | 5 |
| 5 | Information exchange through information system integration with suppliers have been established | 1 | 2 | 3 | 4 | 5 |
| 6 | Fast ordering systems have been set up with suppliers | 1 | 2 | 3 | 4 | 5 |
| 7 | Packaging customisation with suppliers have been achieved | 1 | 2 | 3 | 4 | 5 |
| 8 | The gains as a consequence of collaboration with suppliers are shared equally | 1 | 2 | 3 | 4 | 5 |
| 9 | Our vendors largely manage inventory for our firm | 1 | 2 | 3 | 4 | 5 |
| 10 | Continuous information programs have been achieved | 1 | 2 | 3 | 4 | 5 |

2. Kindly use the guidelines below to mark the degree of your agreement to the following statements

**1=Never 2=Low Degree 3=Moderate 4 = High Degree 5 = Very High Degree**

| | **Internal Integration** | | | | | |
|---|---|---|---|---|---|---|
| 1 | Cross functional management is widely used | 1 | 2 | 3 | 4 | 5 |
| 2 | The coordination with marketing team is successful | 1 | 2 | 3 | 4 | 5 |
| 3 | There is awareness of strategic plans to the appropriate parties within the firm | 1 | 2 | 3 | 4 | 5 |
| 4 | Periodic interdepartmental meetings are commonly utilised | 1 | 2 | 3 | 4 | 5 |
| 5 | Sharing of information inside the firm is extensive | 1 | 2 | 3 | 4 | 5 |
| 6 | Integration of data among internal functions is attained via ERP systems | 1 | 2 | 3 | 4 | 5 |
| 7 | The degree of data integration information process is great | 1 | 2 | 3 | 4 | 5 |
| 8 | Alignment of systems across all functional units have been achieved | 1 | 2 | 3 | 4 | 5 |
| 9 | There is a visibility of processes inside the firm | 1 | 2 | 3 | 4 | 5 |

3. Using the guidelines below, kindly mark the degree of your agreement with the following statements

**1: Never 2: Low Degree 3: Moderate 4 : High Degree 5: Very High Degree**

| | **Customer Integration** | | | | | |
|---|---|---|---|---|---|---|
| 1 | Sharing of information through information and communication technology with customers have been achieved | 1 | 2 | 3 | 4 | 5 |
| 2 | Level of integration with customers through ICT is quite high | 1 | 2 | 3 | 4 | 5 |
| 3 | Periodic meetings with customers are commonly utilised | 1 | 2 | 3 | 4 | 5 |
| 4 | Our firm is conscious of its customer wants | 1 | 2 | 3 | 4 | 5 |
| 5 | Our company measures satisfaction of its customer regularly | 1 | 2 | 3 | 4 | 5 |
| 6 | Firm activities and processes are aligned with customer needs | 1 | 2 | 3 | 4 | 5 |
| 7 | Feedbacks from customers are encouraged | 1 | 2 | 3 | 4 | 5 |
| 8 | The firm utilises the feedbacks from its customers | 1 | 2 | 3 | 4 | 5 |
| 9 | The firm has systematic processes for addressing customer complaints | 1 | 2 | 3 | 4 | 5 |
| 10 | Customers contribute to the firm values | 1 | 2 | 3 | 4 | 5 |
| 11 | The firm has the ability to determine the future expectations of customers | 1 | 2 | 3 | 4 | 5 |

**Section C Competitive Advantage**

1. Kindly indicate the percentage change in the following cost indicators that your firm has experienced for the past 10 years.

| **Measures of Cost** | **0-10 %** | **11-20 %** | **21-30 %** | **31-40 %** | **0ver 40 %** |
|---|---|---|---|---|---|
| Reduced unit production cost | 1 | 2 | 3 | 4 | 5 |
| Improved capacity utilisation | 1 | 2 | 3 | 4 | 5 |
| Enhanced inventory turnover | 1 | 2 | 3 | 4 | 5 |

2. Kindly indicate the percentage change in the following quality indicators for the past 10 years.

| **Measures of Quality** | **0-10 percent** | **11-20 %** | **21-30 %** | **31-40 %** | **0ver 40 %** |
|---|---|---|---|---|---|
| Reduction in the number of customer complaints during warranty period | 1 | 2 | 3 | 4 | 5 |
| Reduction in the products scrapped | 1 | 2 | 3 | 4 | 5 |

3. Kindly indicate the percentage change in the following times that your firm experienced for the past 10 years.

| **Measures of Speed** | **0-10 %** | **11-20 %** | **21-30 %** | **31-40 %** | **0ver 40 %** |
|---|---|---|---|---|---|
| Improvement in equipment changeover time | 1 | 2 | 3 | 4 | 5 |
| Order lead time reduction | 1 | 2 | 3 | 4 | 5 |
| Decrease in time to solve customer complaints | 1 | 2 | 3 | 4 | 5 |
| Reduction in design time | 1 | 2 | 3 | 4 | 5 |
| Increase in speed of new product launch | 1 | 2 | 3 | 4 | 5 |

4. Kindly indicate the percentage change in the following dependability indicators for the past 10 years.

| **Measures of Dependability** | **0-10 %** | **11-20 %** | **21-30 %** | **31-40 %** | **0ver 40 %** |
|---|---|---|---|---|---|
| Decrease in machine down-town | 1 | 2 | 3 | 4 | 5 |
| Reduced number of times the customer promises not met | 1 | 2 | 3 | 4 | 5 |

5. Kindly indicate the degree in percentage to which the following flexibility measures have been enhanced in the past 10 years

| **Measures of Flexibility** | **0-10 %** | **11-20 %** | **21-30 %** | **31-40 %** | **0ver 40 %** |
|---|---|---|---|---|---|
| Ability to change production to fit the change in demand volume | 1 | 2 | 3 | 4 | 5 |
| Capability of introducing new products in case demand shifts | 1 | 2 | 3 | 4 | 5 |
| Capacity of introducing a wide assortment of product mix within a short time | 1 | 2 | 3 | 4 | 5 |
| Capability of the company to vary time of delivery to satisfy customers | 1 | 2 | 3 | 4 | 5 |

**Section D Environmental Dynamism**

1. Using the scale below, kindly indicate the degree to which your firm encounters supplier uncertainties.

**1: Never 2: Low Degree 3: Moderate 4 : High Degree 5 : Very High Degree**

| | **Supplier Uncertainty** | | | | | |
|---|---|---|---|---|---|---|
| 1 | There is high frequency of material delays from suppliers | 1 | 2 | 3 | 4 | 5 |
| 2 | Quality of critical materials from suppliers are highly unpredictable | 1 | 2 | 3 | 4 | 5 |
| 3 | Change of supplier lead time is quite high | 1 | 2 | 3 | 4 | 5 |
| 4 | There is a high and unpredictable frequency of change in demand | 1 | 2 | 3 | 4 | 5 |
| 5 | The frequency of change in prices of raw materials or components is very high | 1 | 2 | 3 | 4 | 5 |
| 6 | The level of rejection of materials/components from suppliers is high | 1 | 2 | 3 | 4 | 5 |

2. Using the scale below, kindly mark the extent of your agreement to the following statements concerning your customers

**1=Never 2=Low Degree 3=Moderate 4 = High Degree 5=Very High Degree**

| | **Customer Uncertainty** | | | | | |
|---|---|---|---|---|---|---|
| 1 | Frequency of order change by customers is high | 1 | 2 | 3 | 4 | 5 |
| 2 | There is high rate of unforeseen change in demand | 1 | 2 | 3 | 4 | 5 |
| 3 | The rate of change in customer preference is quite high | 1 | 2 | 3 | 4 | 5 |
| 4 | The change in customer delivery schedules is quite often | 1 | 2 | 3 | 4 | 5 |

3. Using a scale below, kindly indicate the degree of competitive intensity experienced by your firm in the industry

**1: Never 2: Low Degree 3: Moderate 4 : High Degree 5 : Very High Degree**

| | **Competitive Intensity** | | | | | |
|---|---|---|---|---|---|---|
| 1 | There is high difficulty in predicting competitor strategies | 1 | 2 | 3 | 4 | 5 |
| 2 | The frequency at which competitor promotional strategies change is high | 1 | 2 | 3 | 4 | 5 |
| 3 | There are many competitors in the industry | 1 | 2 | 3 | 4 | 5 |
| 4 | There are many incidences of counterfeits | 1 | 2 | 3 | 4 | 5 |
| 5 | Entry into the industry is very easy | 1 | 2 | 3 | 4 | 5 |
| 6 | The unpredictability of product price change in the industry is quite high | 1 | 2 | 3 | 4 | 5 |

4. Using the scale below, kindly indicate the extent of your agreement to the following statements concerning technology in your industry

**1=Never 2=Low Degree 3=Moderate 4 = High Degree 5 = Very High Degree**

| | **Technological Uncertainty** | | | | | |
|---|---|---|---|---|---|---|
| 1 | There is high rate of obsolescence of technology | 1 | 2 | 3 | 4 | 5 |
| 2 | Imitating technology is easy and rampant | 1 | 2 | 3 | 4 | 5 |
| 3 | The change in production technology is rapid | 1 | 2 | 3 | 4 | 5 |
| 4 | There is high rate of change in ICT | 1 | 2 | 3 | 4 | 5 |

5. Using the scale below, kindly mark the extent of your agreement to the statements below concerning government policies

**1: Never 2: Low Degree 3: Moderate 4 : High Degree 5 : Very High Degree**

| | **Government Policy** | | | | | |
|---|---|---|---|---|---|---|
| 1 | There is high degree of change on taxes and tariffs | 1 | 2 | 3 | 4 | 5 |
| 2 | There is high uncertainty on government action on counterfeits | 1 | 2 | 3 | 4 | 5 |
| 3 | There is high uncertainty on government action on infringement of trademarks and patents | 1 | 2 | 3 | 4 | 5 |
| 4 | Road network transportation is unpredictable | 1 | 2 | 3 | 4 | 5 |
| 5 | There is high unpredictability of change in energy cost (e.g. electric power) | 1 | 2 | 3 | 4 | 5 |
| 6 | Availability of adequate energy is highly unpredictable | 1 | 2 | 3 | 4 | 5 |

**Section E Firm Performance**

**$E_I$: Financial Performance**

1. Kindly mark the increase or decrease in percentage for the following indicators of performance that the firm has experienced for the last 10 years.

Percentage increase

| | 0-10% | 11-20% | 21-30% | 31-40% | Above 40% |
|---|---|---|---|---|---|
| Operating Income | 1 | 2 | 3 | 4 | 5 |
| Total Assets | 1 | 2 | 3 | 4 | 5 |

Percentage decrease

| | 0-10% | 11-20% | 21-30% | 31-40% | Above 40% |
|---|---|---|---|---|---|
| Operating Income | 1 | 2 | 3 | 4 | 5 |
| Total Assets | 1 | 2 | 3 | 4 | 5 |

**$E_{II}$: Employee Motivation**

2. Kindly mark the degree of your agreement to the following statements

**1: Never 2: Low Degree 3: Moderate 4: Large Degree 5: Very Large Degree**

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | I would recommend the company's products/services to a friend | 1 | 2 | 3 | 4 | 5 |
| 2 | Training opportunities are available at my work place | 1 | 2 | 3 | 4 | 5 |
| 3 | Promotion opportunities are available at my work place | 1 | 2 | 3 | 4 | 5 |
| 4 | I would recommend someone to work in this firm | 1 | 2 | 3 | 4 | 5 |

**$E_{III}$: Customer Satisfaction**

3. Kindly show the degree of your agreement to the following statements

**1: Never 2: Low Degree 3: Moderate 4: Large Degree 5: Very Large Degree**

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | The customer gets the products/services when they need | 1 | 2 | 3 | 4 | 5 |
| 2 | The customer feels that they get good value products/services for the paid price | 1 | 2 | 3 | 4 | 5 |
| 3 | The firm has helpful sales personnel | 1 | 2 | 3 | 4 | 5 |
| 4 | Customers recommend this company's products/services to their friends | 1 | 2 | 3 | 4 | 5 |

## Appendix IX List of Sample Companies

| COMPANY | | AREA | SECTOR |
|---|---|---|---|
| 1. | KENYA BUILDERS & CONCRETE LTD | Nairobi | Building, Construction and Mining (B C & M) |
| 2. | CENTRAL GLASS INDUSTRIES LTD | Nairobi | B C & M |
| 3. | SAJ CERAMICS LTD | Athi River | B C & M |
| 4. | EAST AFRICA PORTLAND CEMENT CO. LTD | Athi River | B C & M |
| 5. | MOMBASA CEMENT LTD | Nairobi | B C & M |
| 6. | SAVANNAH CEMENT | Nairobi | B C & M |
| 7. | AGRO CHEMICAL & FOOD COMPANY LTD | Nyanza | Food, Beverages and Tobacco (F B & T) |
| 8. | ALPINE COOLERS LTD | Nairobi | F B & T |
| 9. | BIO FOODS PRODUCTS LIMITED | Nairobi | F B & T |
| 10. | BROADWAY BAKERY LTD | Nairobi | F B & T |
| 11. | CADBURY KENYA LTD | Nairobi | F B & T |
| 12. | CHAI TRADING COMPANY LIMITED | Coast | F B & T |
| 13. | COAST MAIZE MILLERS LTD | Coast | F B & T |
| 14. | COASTAL BOTTLERS LIMITED | Coast | F B & T |
| 15. | CORN PRODUCTS KENYA LTD | Nairobi | F B & T |
| 16. | E & A INDUSTRIES LTD | Nairobi | F B & T |
| 17. | TROPICAL HEATH LTD | Nairobi | F B & T |
| 18. | ELDORET GRAINS LTD | Eldoret | F B & T |
| 19. | EAST AFRICAN SEA FOOD LTD | Nairobi | F B & T |
| 20. | FRIGOKEN LTD | Nairobi | F B & T |
| 21. | GOLD CROWN BEVERAGES (K) LTD | Coast | F B & T |
| 22. | GLOBAL ALLIED INDUSTRIES LTD | Nairobi | F B & T |
| 23. | KENSHOP SUPERMARKET (TI) HOT BREAD | Nyanza | F B & T |
| 24. | GONAS BEST LTD | Nairobi | F B & T |
| 25. | KENYA WINE AGENCIES LIMITED | Nairobi | F B & T |
| 26. | HIGHLANDS CANNERS LTD | Nairobi | F B & T |
| 27. | KIBOS SUGAR AND ALLIED INDUSTRIES | Nyanza | F B & T |
| 28. | INSTA PRODUCTS (EPZ) LTD | Nairobi | F B & T |
| 29. | KWALITY CANDIES & SWEETS LTD | Nairobi | F B & T |
| 30. | JETLAK FOODS LTD | Nairobi | F B & T |
| 31. | MAFUKO INDUSTRIES LTD | Nairobi | F B & T |
| 32. | KAPA OIL REFINERIES LTD | Athi River | F B & T |
| 33. | KENBLEST LIMITED | Nairobi | F B & T |
| 34. | KENYA TEA DEVELOPMENT AGENCY | Nairobi | F B & T |

| | | | |
|---|---|---|---|
| 35. | KENYA SEED COMPANY LTD | Eldoret | F B & T |
| 36. | MIRITINI KENYA LTD | Nairobi | F B & T |
| 37. | NESTLE KENYA LTD | Nairobi | F B & T |
| 38. | MUMIAS SUGAR COMPANY LTD | Western | F B & T |
| 39. | PALMAC OIL REFINERS LTD | Nakuru | F B & T |
| 40. | NAIROBI FLOUR MILLS LTD | Nairobi | F B & T |
| 41. | PEARL INDUSTRIES LTD | Nairobi | F B & T |
| 42. | PWANI OIL PRODUCTS LTD | Coast | F B & T |
| 43. | PREMIER FLOUR MILLS LTD | Nairobi | F B & T |
| 44. | RE-SUNS SPICES LIMITED | Nairobi | F B & T |
| 45. | PROMASIDOR (KENYA) LTD | Nairobi | F B & T |
| 46. | SMASH INDUSTRIES LTD | Nairobi | F B & T |
| 47. | UNGA GROUP LTD | Nairobi | F B & T |
| 48. | SPICE WORLD LTD | Nairobi | F B & T |
| 49. | UZURI FOODS LTD | Nairobi | F B & T |
| 50. | SUPER BAKERY LTD | Nairobi | F B & T |
| 51. | WESTERN KENYA EXPRESS SUPPLIERS | Western | F B & T |
| 52. | DPL FESTIVE LTD | Nairobi | F B & T |
| 53. | GOLDEN AFRICAN KENYA LTD | Kajiado | F B & T |
| 54. | NZOIA SUGAR COMPANY LTD | Webuye | F B & T |
| 55. | BAYER EAST AFRICA LTD | Nairobi | Chemical and Allied (C & A) |
| 56. | BOC KENYA LIMITED | Nairobi | C & A |
| 57. | CONTINENTAL PRODUCTS LTD | Nairobi | C & A |
| 58. | CROWN BERGER KENYA LTD | Nairobi | C & A |
| 59. | DELUXE INKS LTD | Nairobi | C & A |
| 60. | CHEMICALS & SOLVENTS E. A. LTD | Nairobi | C & A |
| 61. | EASTERN CHEMICALS INDUSTRIES LTD | Coast | C & A |
| 62. | COIL PRODUCTS (K) LIMITED | Nakuru | C & A |
| 63. | GALAXY PAINTS & COATING CO. LTD | Nairobi | C & A |
| 64. | KAPI LIMITED | Nakuru | C & A |
| 65. | IMAGING SOLUTIONS (K) LTD | Nairobi | C & A |
| 66. | KEN NAT INK & CHEMICALS LTD | Nairobi | C & A |
| 67. | ORBIT CHEMICAL INDUSTRIES LTD | Athi River | C & A |
| 68. | MATCH MASTERS LTD | Nairobi | C & A |
| 69. | ROK INDUSTRIES LTD | Nairobi | C & A |
| 70. | MILLY GLASS WORKS LTD | Coast | C & A |
| 71. | POLYCHEM EAST AFRICA LTD | Nairobi | C & A |
| 72. | PROTEA CHEMICALS | Nairobi | C & A |
| 73. | SADOLIN PAINTS (E.A.) LTD | Nairobi | C & A |

| | | | |
|---|---|---|---|
| 74. | SOILEX CHEMICALS LTD | Nairobi | C & A |
| 75. | SHREEJI CHEMICALS LTD | Coast | C & A |
| 76. | SUPA BRITE LTD | Nairobi | C & A |
| 77. | TROPIKAL BRAND (AFRIKA) LTD | Nairobi | C & A |
| 78. | TWIGA CHEMICAL INDUSTRIES LIMITED | Nairobi | C & A |
| 79. | PZ CUSSONS LTD | Nairobi | C & A |
| 80. | EVEREADY EAST AFRICA LIMITED | Nairobi | Energy, Electrical and Electronics (E E & E) |
| 81. | AUCMA DIGITAL TECHNOLOGY AFRICA LTD | Nairobi | E E & E |
| 82. | IBERAAFRICA POWER (EA) LTD | Nairobi | E E & E |
| 83. | CENTURION SYSTEMS LIMITED | Nairobi | E E & E |
| 84. | KENWESTFAL WORKS LTD | Nairobi | E E & E |
| 85. | MARSHALL FOWLER (ENGINEERS) LTD | Nairobi | E E & E |
| 86. | KENYA SCALE CO. LTD/AVERY KENYA LTD | Nairobi | E E & E |
| 87. | METSEC LTD | Nairobi | E E & E |
| 88. | RELIABLE ELECTRICALS ENGINEERS LTD | Nairobi | E E & E |
| 89. | METLEX INDUSTRIES LTD | Nairobi | E E & E |
| 90. | SOLLATEK ELECTRONICS (KENYA) LIMITED | Coast | E E & E |
| 91. | TEA VAC MACHINERY LIMITED | Eldoret | E E & E |
| 92. | POWER TECHNICS LTD | Nairobi | E E & E |
| 93. | BLOWPLAST LTD | Nairobi | Plastics and Rubber (P & R) |
| 94. | FIVE STAR INDUSTRIES LTD | Nairobi | P & R |
| 95. | COAST POLYTHENE BAGS | Coast | P & R |
| 96. | HI-PLAST LTD | Nairobi | P & R |
| 97. | KECI RUBBER INDUSTRIES | Nairobi | P & R |
| 98. | KENTAINERS LTD | Nairobi | P & R |
| 99. | KINGSWAY TYRES & AUTOMART LTD | Nairobi | P & R |
| 100. | METRO PLASTICS KENYA LIMITED | Nairobi | P & R |
| 101. | PACKAGING INDUSTRIES LTD | Nairobi | P & R |
| 102. | POLYBLEND LIMITED | Nairobi | P & R |
| 103. | RAFFIA BAGS (K) LTD | Nairobi | P & R |
| 104. | SAMEER AFRICA LTD | Nairobi | P & R |
| 105. | SIGNODE PACKAGING SYSTEMS LTD | Nairobi | P & R |
| 106. | PREMIER INDUSTRIES LTD | Nairobi | P & R |
| 107. | PYRAMID PACKAGING LTD | Eldoret | P & R |
| 108. | SPRINGBOX KENYA LTD | Nairobi | P & R |
| 109. | TECHPAK INDUSTRIES LTD | Nairobi | P & R |
| 110. | UNI-PLASTICS LTD | Nairobi | P & R |
| 111. | AFRO PLASTICS (K) LTD | Nairobi | P & R |

| | | | |
|---|---|---|---|
| 112. | PLAST PACKAGING INDUSTRIES | Nairobi | P & R |
| 113. | J.A.R KENYA [EPZ] LTD | Nairobi | Textile and Apparels (T & A) |
| 114. | AFRO SPIN LTD | Nakuru | T & A |
| 115. | KAVIRONDO FILAMENTS LTD | Western | T & A |
| 116. | KENYA SHIRTS MANUFACTURERS CO. LTD | Coast | T & A |
| 117. | APEX APPARELS (EPZ) LTD | Nairobi | T & A |
| 118. | BARAKA APPARELS (EPZ) LTD | Nairobi | T & A |
| 119. | BLUE BIRD GARMENTS (EPZ) KENYA LTD | Coast | T & A |
| 120. | BROTHER SHIRTS FACTORY LTD | Nairobi | T & A |
| 121. | MIDCO TEXTILES (EA) LTD | Nairobi | T & A |
| 122. | MEGA GARMENT INDUSTRIES KENYA LTD | Coast | T & A |
| 123. | NAKURU INDUSTRIES LTD | Nakuru | T & A |
| 124. | PROTEX KENYA (EPZ) LTD | Nairobi | T & A |
| 125. | SPIN KNIT LIMITED | Nakuru | T & A |
| 126. | RUPA MILLS LTD | Eldoret | T & A |
| 127. | STORM APPAREL MANUFACTURERS CO. LTD | Nairobi | T & A |
| 128. | SILVER STAR MANUFACTURERS LTD | Nairobi | T & A |
| 129. | SUNFLAG TEXTILE & KNITWEAR MILLS LTD | Nairobi | T & A |
| 130. | VAJA MANUFACTURERS LIMITED | Nairobi | T & A |
| 131. | THIKA CLOTH MILLS LTD | Nairobi | T & A |
| 132. | KEMA (EA) LTD | Nairobi | T & A |
| 133. | SHAH TIMBER MART LTD | Nairobi | Timber, Wood Products and Furniture (T W P & F) |
| 134. | FURNITURE INTERNATIONAL LIMITED | Nairobi | T W P & F |
| 135. | TIMBER TREATMENT INTERNATIONAL LTD | Eldoret | T W P & F |
| 136. | NEWLINE LTD | Nairobi | T W P & F |
| 137. | WOODTEX KENYA LTD | Nairobi | T W P & F |
| 138. | TWIGA STATIONERS & PRINTERS LTD | Nairobi | T W P & F |
| 139. | TAWS LIMITED | Nairobi | T W P & F |
| 140. | PANESAR'S KENYA LTD | Nairobi | T W P & F |
| 141. | AFRICAN COTTON INDUSTRIES LTD | Coast | Pharmaceutical and Medical Equipment (P M & E) |
| 142. | ELYS CHEMICALS INDUSTRIES LTD | Nairobi | P M & E |
| 143. | BIODEAL LABORATORIES LTD | Nairobi | P M & E |
| 144. | KAM INDUSTRIES LIMITED | Nairobi | P M & E |
| 145. | REGAL PHARMACEUTICALS | Nairobi | P M & E |
| 146. | NOVELTY MANUFACTURING LTD | Nairobi | P M & E |
| 147. | PHARM ACCESS AFRICA LTD | Nairobi | P M & E |

| | | | |
|---|---|---|---|
| 148. | MANHAR BROTHERS (K) LTD | Nairobi | P M & E |
| 149. | REVITAL HEALTHCARE (EPZ) LTD | Coast | P M & E |
| 150. | BOOTH EXTRUSIONS LIMITED | Nairobi | Metal and Allied (M & A) |
| 151. | ALLOY STEEL CASTINGS LTD | Nairobi | M & A |
| 152. | ASP COMPANY LTD | Nairobi | M & A |
| 153. | DAVIS & SHIRTLIFF LTD | Nairobi | M & A |
| 154. | FARM ENGINEERING INDUSTRIES LTD | Nyanza | M & A |
| 155. | EAST AFRICA SPECTRE LIMITED | Nairobi | M & A |
| 156. | KENYA GENERAL INDUSTRIES LTD | Coast | M & A |
| 157. | HOBRA MANUFACTURING LTD | Nakuru | M & A |
| 158. | LAMINATE TUBES INDUSTRIES | Eldoret | M & A |
| 159. | MECOL LIMITED | Nairobi | M & A |
| 160. | NAPRO INDUSTRIES LIMITED | Nairobi | M & A |
| 161. | NAILS & STEEL PRODUCTS LTD | Nairobi | M & A |
| 162. | STEEL STRUCTURES LIMITED | Nairobi | M & A |
| 163. | ORBIT ENGINEERING LTD | Nairobi | M & A |
| 164. | SUPER STEEL & TUBES LTD | Eldoret | M & A |
| 165. | SHEFFIELD STEEL SYSTEMS LTD | Nairobi | M & A |
| 166. | TRITEX INDUSTRIES LTD | Coast | M & A |
| 167. | WELDING ALLOYS LTD | Nairobi | M & A |
| 168. | ASHUT ENGINEERS LTD | Nairobi | M & A |
| 169. | ALPHARAMA LTD | Nairobi | Leather Products and Footwear (L P & F) |
| 170. | DOGBONES LTD | Nairobi | L P & F |
| 171. | C & P SHOE INDUSTRIES LTD | Nairobi | L P & F |
| 172. | UMOJA RUBBER PRODUCTS LTD | Nairobi | L P & F |
| 173. | GENERAL MOTORS EAST AFRICA LIMITED | Nairobi | Motor Vehicle Assembly and Accessories (M V A & A) |
| 174. | AUTO ANCILLIARIES LTD | Nairobi | M V A & A |
| 175. | KENYA VEHICLE MANUFACTURERS LIMITED | Nairobi | M V A & A |
| 176. | BANBROS LTD | Athi River | M V A & A |
| 177. | MUTSIMOTO MOTOR COMPANY LTD | Nakuru | M V A & A |
| 178. | CMC MOTORS GROUP LTD | Nairobi | M V A & A |
| 179. | SOHANSONS LTD | Nairobi | M V A & A |
| 180. | AJIT CLOTHING FACTORY LTD | Nairobi | Paper and Paperboard (P & P) |
| 181. | CREATIVE PRINT HOUSE | Nairobi | P & P |
| 182. | ASL PACKAGING LIMITED | Nairobi | P & P |
| 183. | DODHIA PACKAGING LIMITED | Nairobi | P & P |
| 184. | ELLAMS PRODUCTS LTD | Nairobi | P & P |
| 185. | BUSINESS FORMS & SYSTEMS LTD | Nairobi | P & P |

| | | | |
|---|---|---|---|
| 186. | GENERAL PRINTERS LIMITED | Nairobi | P & P |
| 187. | CEMPACK LTD | Nairobi | P & P |
| 188. | ICONS PRINTERS LTD | Nairobi | P & P |
| 189. | KAKAMEGA PAPER CONVERTERS LTD | Western | P & P |
| 190. | INTERNATIONAL PAPER & BOARD SUPPLIES LTD | Nairobi | P & P |
| 191. | KARTASI INDUSTRIES LTD | Nairobi | P & P |
| 192. | KIM-FAY EAST AFRICA LTD | Nairobi | P & P |
| 193. | KUL GRAPHICS LTD | Nairobi | P & P |
| 194. | PAPERBAGS LIMITED | Nairobi | P & P |
| 195. | MODERN LITHOGRAPHIC (K) LTD | Nairobi | P & P |
| 196. | PRINT EXCHANGE LTD | Nairobi | P & P |
| 197. | PACKAGING MANUFACTURERS (1976) LTD | Coast | P & P |
| 198. | PRUDENTIAL PRINTERS LTD | Nairobi | P & P |
| 199. | RODWELL PRESS LTD | Coast | P & P |
| 200. | STANDARD GROUP LTD | Nairobi | P & P |

Source: Researcher (2022)

## Appendix X: Research License

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **795443**

Date of Issue: **18/March/2021**

**RESEARCH LICENSE**

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**Appendix XI: Introduction Letter**

# UNIVERSITY OF NAIROBI

## COLLEGE OF HUMANITIES & SOCIAL SCIENCES

### SCHOOL OF BUSINESS

Telephone: 0724-200311
Telegrams: "Varsity" Nairobi
Telex: 22095 Varsity

P.O. Box 30197
Nairobi, KENYA

16th November, 2020

**TO WHOM IT MAY CONCERN**

**INTRODUCTORY LETTER FOR RESEARCH**

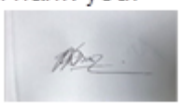
**MICHAEL KIPKORIR CHIRCHIR – REGISTRATION NO. D80/8284/2000**

The above named is a registered PhD candidate at the University of Nairobi, School of Business. He is conducting research on ***"Supply Chain Integration, Environmental Dynamism, Competitive Advantage and Performance of Large Manufacturing Firms in Kenya".***

The purpose of this letter is to kindly request you to assist and facilitate the student with necessary data which forms an integral part of the research project. The information and data required is needed for academic purposes only and will be treated in **Strict Confidence**.

Your co-operation will be highly appreciated.

Thank you.



**Prof. W. N. Iraki**

**Ag. Associate Dean, Graduate Business Studies**

**SCHOOL OF BUSINESS**