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GRADUATE PROGRAM

THE EFFECT OF INFORMATION TECHNOLOGY CAPABILITIES ON SUPPLY CHAIN INTEGRATION (IN THE CASE OF IMPORT-EXPORTER OF GENERAL ITEMS LOCATED IN ADDIS ABABA)

BY

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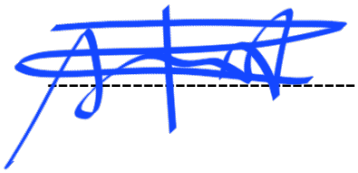
SHEMELIS ZEWDIE (PHD) ----------	

Declaration

I hereby declare that this study entitled “The effect of information technology capabilities on supply chain integration (in case of import exporter of general items located in Addis Ababa” is my work towards the Master of Arts in Logistics and Supply Chain Management and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgments have been made in the text.

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Date: - June /2024

Certification

This is to certify that Genet Eyassu has carried out her research work on the topic entitled **"The effect of information technology capabilities on supply chain integration (in case of import exporter of general items located in Addis Ababa"** as a partial fulfilment of the requirement of Masters of Arts Degree in Logistics and Supply Chain Management. This study fulfils the requirement to obtain an academic degree from the university.

ADVISOR: MATHEWOS ENSERMU (PHD)

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Abstract

The study has been conducted with the aim of investigating the effect of information technology capabilities (data consistency, cross functional application and supply chain applications) on supply chain integration (internal, customer and supplier integrations). The study employed an explanatory research design and both quantitative and qualitative research approaches were utilized. Accordingly, by selecting supply chain manager/ officer using purposive sampling form 150 companies that has been selected from 240 companies using simple random sampling, a questionnaire was distributed for those 150 managers/officers of import exporter of general items companies 132 were collected with a response rate of 88%. The data was analyzed using SPSS version 26. Pearson's correlation matrix was used to show the relationship between the dependent and the independent variables. It was proven that there was a positive and significant correlation between the independent and dependent variables. The researcher also employed multiple regression analysis method to analyze the effect of information technology capability variables on supply chain integration variables. The Empirical findings of the study showed that all information technology capability indicators (data consistency, cross functional application and supply chain applications) have a positive and significant effect on supply chain integration (internal, customer and supplier integrations) based on the above findings it is better to improve the Integrative inventory management, data integration, ERP, Real-time searching of logistics-related operating data and Real-time integration and connection among internal functions of the supply chain, Supply chain planning applications, transaction applications, real- time supply chain and customer relationship management applications with internal applications of the organization.

Key words: *Information technology capability, data consistency, cross functional application, supply chain application, supply chain integration, internal integration, customer integration, supplier integration*

List of Acronyms

EI: External Integration

II: Internal Integration

IT: Information Technology

SCI: Supply Chain Integration

SCM: Supply Chain Management

SPSS: Statistical Program for Social Science

ERP: Enterprise Resource Planning

IT: Information Technology

RBV: Resource Based View

ICT: Information Communication Technology

Chapter One: Introduction

1.1. Background of the study

Since the 1990s, supply chain management (SCM) has emerged as a global hotspot for corporate management research and practical implementation. According to Stevens, the supply chain is an interconnected set of processes that include organizing, coordinating, and managing the movement of raw materials, components, and completed commodities from the supplier to the client. According to Lee and Billington, the supply chain is a network mechanism that businesses use to acquire raw materials to make semi-finished or finished goods and then distribute them to customers via sales channels. Additionally, they held the view that a supply chain was a system of facilities and means of distribution that handled the tasks of acquiring raw materials, converting them into intermediate and final goods, and distributing those goods to clients. The 1980s saw the invention of the supply chain management idea, and the early 1990s saw the publication of a huge number of studies on the subject. "Embracing every effort involved in producing and delivering a final product, from the supplier's supplier to the customer's customer," is how the Supply Chain Council of America defines the SCM.

Supply chain management (SCM) has been contemplated as an effective strategy for organizations that streamlines internal and external activities to improve performance and competitiveness. Nowadays, organizations are competing on the supply chain for providing quick delivery, an innovative and diverse range of products, and services to satisfy customer needs and create value for them. Thus, SCM has become a prevalent topic of research for academicians, practitioners, and organizations to make it responsive and innovative Alam, et al (2014), Beheshti, et al (2014), Ayoub, et al (2017). Supply chain management has become an increasingly important management tool to help organizations improve their business operations. As globalization and the development of information technology (IT) have changed relationship structure and brought the organizers closer, the supply chain has emerged as a competitive weapon that causes organizations to collaborate and integrate with external partners (Stevens, 1989, Mentzer, et al. 2001).

Among other factors, Supply chain integration is widely considered by both practitioners and researchers as a vital contributor to supply chain performance. Noor, Veera, and Shereen, (2021) Flynnet al. (2010) define SCI as “the degree to which a manufacturer strategically collaborates

with its SC partners and collaboratively manages intra- and inter-organizational processes, in order to achieve effective and efficient flows of products and services, information, money, and decisions, to provide maximum value to the customer". Flynnet al., (2010) also put SCI comprises collaborating firms teaming up to manage intra- and inter-organizational resources and procedures. SCI helps firms gain a competitive advantage and improve performance (Sanders and Premus, 2005).

Supply chain integration (SCI) is a key component of competitive advantage whilst striving to improve organizational productivity and profitability through the internal, supplier, and customer integration (Asnordin, Sundram&Noranee, 2021). Where close relationships among supply chain partners are lacking, organizations no longer compete profitably (Huang, Yen & Liu, 2014). In addition, supply chain integration incorporates core practices required to achieve higher levels of supply chain performance (Sundram, et al 2018).

As stated by Feyissa et al (2018) Supply chain integration (SCI) is often studied by considering its dimensions. Some authors break it down into internal integration (II) and external integration (EI) (Wong, et al 2013); others consider upstream (supply-side), downstream (customer-side), and II (Baharanchi, 2009; Xueet al.,2013); yet others break SCI into supplier integration, customer integration and II (Flynn, et al 2010, Lii and Kuo, 2016). Likewise, internal integration is regarded as an important supply chain integration dimension recent studies view internal integration as a unique higher-order organizational capability (Baruaet, al 2004).

The SCI construct comprises three dimensions including internal, supplier, and customer integration to capture multidimensionality (Flynn, Huo& Zhao, 2010, Wong, Boon-Itt& Wong, 2011, Rasib, Sundram&Noranee, 2020). Supplier integration entails interaction and collaboration activities, information sharing, and supplier participation in a focal organization's procurement and production processes, whereas client collaboration entails connecting with customers, sharing market and inventory information, and following up with customers for feedback on its services and products (Zhao et al. 2008, Gimenez and Ventura 2005). Internal integration is defined as a firm's ability to structure its organizational strategies, procedures, and activities into interactive, synchronized processes to meet the needs of its customers (Cespedes, 1996; Kahn and Mentzer, 1996; Kingman-Brundage et al., 1995; Lee et al., 1997). Internal integration

encompasses information sharing among organizational functions, strategic cross-functional working together, and collaboration.

In recent decades, the development of information technology (IT) has rapidly changed the conditions for doing business around the world. With its power to provide timely, accurate, and reliable information, IT has led to better performance of both the focal firm and the partners in the supply chain (Jin, 2006). The use of IT is considered as a prerequisite for the effective control of today's complex supply chains. According to the resource-based view (RBV), IT, as a unique resource, can assist companies in building SCI capability, which helps improve their performance (Huo, et, al 2015).

IT is defined as technological capability utilized for acquiring, processing and transmitting information to support organizational decision-making (Jimenez-Jimenez, et al 2019) and facilitating communication, coordinating, and collaborating between numerous parties along the supply chain. The supply chain literature generally classifies information technologies into two categories – (1) intra-organizational (cross functional) IT and (2) inter-organizational (supply chain)IT (Zhang, et al 2011, 2016, Gonz -alvez-Gallego, et al 2015; Dong, et al 2009). As per the definition by Bhakoo and Choi (2013), inter-organizational IT reflects "the technology-based infrastructure that acts as a conduit for facilitating transactions, sharing information with supply chain partners, coordinating activities and establishing governance structures between firms." On the contrary, intra-organizational IT are "information technologies and/or practices used to share information within a firm" (Savitskie, 2007). Another important element of IT infrastructure is inter- and intra-organizational data consistency (Fuchset, al 2018). Rai et al. (2006) defined data consistency as the degree to which common data definitions and consistency in stored data have been established across a focal firm's supply chain. Data consistency is seen as a critical need while designing data structures (Shin, 2003). It determines the data structure and is an important internal control necessity concerning inter and intra-organizational systems (Angeles, 2012). This input control attempts to ensure error-free, consistent data, which is a key capacity for connecting intra- and inter-organizational IT and thereby contributing to improved SCI (Rai et al 2006). Given the foregoing, IT capabilities can be divided into three categories: (1) cross-functional (intra-organizational) application capability, (2) supply chain (inter-organizational)

application capability, and (3) data consistency as an application control goal ensuring the quality of data input across these integrative applications (Sanders and Premus, 2012).

To conduct this investigation on the effect of IT capabilities dimensions which are cross functional application, supply chain application and data consistency on supply chain integration (internal, supplier and customer integration) import and export companies are chosen for the reason they have a great deal of supply chain activities with both abroad and domestic suppliers and customers

1.2. Statement of the Problem

As valuable, rare, imitable, and non-substitutable resources, IT can help companies gain sustainable competitive advantages in supply chains through enhancing relationship specific asset, facilitating information sharing and building long-term cooperative relationships (Subramani, 2004; Zhang, et al 2016) .IT resources enable companies to share information in real time, so resource allocations can be coordinated throughout supply chains (Huo, et al 2015). IT provides one of the most important tools for cooperation within a company and among supply chain members (Li, et al 2009). IT, as an infrastructure support both inside the organization itself and within its upstream, has been recognized as a critical factor in the improvement of supply chain management (SCM) (Gupta and Capen, 1996, Koh and Saad, 2006). IT advancements such as radio-frequency identification (Angeles, 2009), the Internet of things (Tu, 2018), analytics for big data (Brinch, 2018), and cloud and blockchain technologies (Treiblmaier, 2018), to name a few, have played critical roles in facilitating supply chain integration (SCI).

IT is a critical facilitator for reliable and fast information sharing across businesses, and so is generally regarded as an essential component of SCI (Kearns and Lederer, 2003; Rai et al., 2006; Sanders, 2007). For instance, Liu et al (2016) acknowledged that matching the appropriate IT competency with the SCI of a company can lead to its superior performance. Davis, et al (2014) demonstrated that e-Business technology positively affects product information integration and intra- and inter organizational collaboration. Cai, et al (2016) indicated that there exist positive interactive effects of outside-in and spanning IT capability on supply chain collaboration. Evelyne, et al (2017) found that information exchange can promote operations integration. Rai, et al (2006) also showed that IT infrastructure integration for supply chains can promote supply chain process integration. Huo, et al. (2015) identified the positive effects of IT for suppliers and customers on the coordination with suppliers and customers. Han, et al (2017) claimed that transactional and operational IT can improve process integration capability Yu, et al (2017) studied the effect of IT and marketing capabilities on supply chain integration and found positive impact. Furthermore (Vickery, et al 2003, Paulraj and Chen, 2007, Li, et al 2009, Xu, et al 2014, Yu, 2015, Liu, et al, 2016, Zhang, et al, 2016) explicitly documented the positive effect of IT on SCI.

Even though many studies, found a positive impact of IT on supply chain integration, There is substantial cross-study heterogeneity among different types of IT skills, as well as a dearth of consensus in the research on the impact of IT on SCI. For example, Rai et al. (2006) and Kim et al. (2013) discovered that IT capabilities can increase SCI, and this, in turn, enhances efficiency. Yet, Sinkovics et al. (2011) discovered that IT competence (operationalized as a single "IT integration" construct) does not boost SCI (also referred to as a single "cooperativeness" construct). other studies also found that many factors influence the efficacy of IT in SCI, for instance, partner dependence, IT appropriability, relationship effectiveness and long-term relationships contribute to the use of IT (Daugherty, et al, 2009, Prajogo, Olhager, 2012, Seggie, et al, 2006). Besides, many companies have no effective application of network IT in SCI (Thun, 2010). Sheffield (2019) argued that assimilation of IT resources in supply chain management has its benefits but at a cost. Likewise, Ganbold, et al, (2021) found data consistency, have negative impact on internal integration. Considering the above arguments, the results exposed inconsistency in the literature of the effect of IT on SCI.

Additionally, Previous empirical studies in this field predominantly operationalized the constructs of IT capability and SCI as single constructs for instance, Peng, et al (2016) regarded IT capability as a single construct, Noor, et al (2021) also put IT capabilities and SCI as a single construct yafet, (2018) viewed as a single construct when he studied The Role of Information Technology in Logistics and Supply Chain Management Performance. However, only few studies viewed IT capability and SCI as a multidimensional construct, thus this shows there is deep empirical evidence gap in the area of IT capabilities (cross functional application, supply chain application and data consistency) on SCI (supplier, customer and internal integration) as a multidimensional construct.

In Ethiopia IT and SCI has been studied by different authors yet both are in different context and in separate manner. for instance bruik , (2021) investigated the role of supply chain digitalization Yafet, (2018) has seen IT from logistics and supply chain performance perspective most of the studies undertaken in Ethiopia, have seen information technology from the perspective of supply chain performance and operational performance (Selamawit,2018,Girma,2019, tatek 2019 , Mulat 2019, Demissie,2020, Yaregal ,2017) are the few among others. However, many studies rarely found the direct effect of IT on supply/operational performance Li, et al., (2009), Devaraj,

et al. (2007) showed that there is no direct benefit of e-Business technology on operational performance. Li, et al. (2009) and Zhanget, al. (2016) claimed that IT has no direct effect on supply chain performance. SCI has also been studied in Ethiopia. Nevertheless, its impact on operational and supply chain performance has investigated (Feyissa 2018, Akele, 2020; Zergaw, 2020). As far as the researcher's knowledge goes, only Berhane (2019) investigated the role of ICT on SCI and supply chain performance, yet ICT is considered as single construct in his study. Moreover, the majority of the studies focused on specific cases area. This indicates that there is a shortage of empirical evidence in the area and at the sectoral level.

Furthermore, problems related with information technology and supply chain integration are proven to be found while the researcher informally obtain information from the employees and customers of import exporter of general items companies.

Considering the above limitations in this area of study, the researcher was motivated to uncover the effect of IT capabilities (cross-functional application, supply chain application, and data consistency) on SCI (supplier, customer, and internal integration) as a multidimensional construct in the sector of import and export of general items.

To address the objective of the research: the following research questions were developed.

1.3. Research questions

To what extent data consistency capability affects supply chain integration (internal, supplier and customer integration)

To what extent cross functional application capability affects supply chain integration (internal, supplier and customer integration)

To what extent supply chain application capability affects supply chain integration (internal, supplier and customer integration)

1.4. Research objectives

1.4.1. General objective of the study

The general objective of this study is to investigate the effect of Information technology capabilities on supply chain integration.

1.4.2. Specific objectives

To examine the effect of data consistency capability on supply chain integration (internal, supplier and customer integrations)

To examine the effect of cross functional application capability on supply chain integration (internal, supplier and customer integrations)

To examine the effect of supply chain application capability on supply chain integration (internal, supplier and customer integrations)

1.5. Research hypothesis

H1: Data consistency capability has a positive and significant effect on internal integration.

H2: Cross functional application capability has a positive and significant effect on internal integration.

H3: Supply chain applications capability has a positive and significant effect on internal integration.

H4: Data consistency capability has a positive and significant effect on customer integration.

H5: Cross functional application capability has a positive and significant effect on customer integration.

H6: Supply chain applications capability has a positive and significant effect on customer integration.

H7: Data consistency capability has a positive and significant effect on supplier integration.

H8: Cross functional application capability has a positive and significant effect on supplier integration.

H9: Supply chain applications capability has a positive and significant effect on supplier integration.

1.6. Significance of the study

This study will provide empirical evidence on the effect of IT capabilities (cross-functional, supply chain applications, and data consistency) on supply chain integration for import and exporter of general items companies that have strong connections to overseas and domestic suppliers and customers. As a result, various parties will benefit from the study.

Managers: The result of the study will provide important managerial insights for import and export companies to sustain their competitive advantages by improving their performances through IT and SCI practices throughout the upstream and downstream supply chains.

Policy makers: This investigation will also help the policy makers make legislation to help expand the IT infrastructure for digital marketing and e-commerce in Ethiopia, which could help improve supply chain integration.

Future researchers: The study will have a significant impact on academicians and researchers who are interested in the areas of information and communication technology and supply chain integration.

1.7. Scope of the study

This study is delimited to;

Conceptually, the effects of IT capabilities (data consistency, cross-functional application, and supply chain application,) and SCI (supplier, customer, and internal integration) geographically, the study focused on the import and exporter of general items companies located in Addis Ababa. Methodologically, only cross-sectional data were used for the study, and supply chain manager/officer of 150 import and exporter of general items companies were included as sample companies.

1.8. Organization of the paper

This paper is organized in to five chapters. The first chapter presents the introduction part which contains background of the study, statement of the problem, research questions, objectives of the study, hypothesis of the study, significance of the study, scope of the study, the second chapter insights literature review which is about a conceptual, theoretical and empirical aspect of the

study. The third chapter contains research methodology which includes research design and approach, sample design, population, sampling instrument and data collection techniques, methods of data analysis and interpretation different tests and ethical consideration. In chapter four, correlation and regression analysis are included. Finally, chapter five contains summery of the study, conclusion and recommendation research contribution and limitation and direction for future research

Chapter Two: Review of Related Literatures

2.1 Introduction

In this chapter concepts and definitions of supply chain integration, concepts and definitions of information technology, different theories which supports the study, empirical findings and conceptual framework are included

2.2. Concepts and definitions of supply chain integration

Flynn, et al. (2010) define SCI as "the degree to which a manufacturer strategically collaborates with its SC partners and collaboratively manages intra- and inter-organizational processes, in order to achieve effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the customer". Thus, the ultimate goal of SCI is to provide maximum value to the customer by enhancing collaboration among SC partners. Other definitions highlight several characteristics of SCI: alignment of SC members and relationships (Annan, et al, 2016), alignment of SC goals and objectives as well as linkages through information transparency (Carter, et al, 2009) and intra- and inter-firm collaborations and linkages (Teixeira, et al, 2012). Most importantly, SCI facilitates a seamless flow of materials and information across the SC (Prajogo and Olhager, 2012)

Integration in a broader organizational sense has been defined by Turkulainen &Ketokivi (2012) as "the quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment". The integration of information flows across supply chain partners is labelled "information integration", while the integration of physical flows is represented by the coordination of decision- making among partners on operational processes and is labelled "coordination of operational decisions". Coordination is defined after Dutton &Ragins (2017) as "the process people use to create, adapt and re-create [supply chain] organizations".

Danese & Bortolotti, (2014) explained SCI as Combining something in such a way that it becomes a full part of something else is what is known as integration. More specifically, supply chain integrations are network links of an organization or firm with its business partners such as customers and suppliers by integrating their relationships, functions and processes (Hassini, Surti& Searcy, 2012).

2.3. Types of Supply chain integration

Supply chain integration (SCI) is often studied by considering its dimensions. Some authors break it down into internal integration (II) and external integration (EI) (Wonget, al, 2013) others consider upstream (supply-side), downstream (customer-side) and II (Baharanchi, 2009, Xueet al, 2013) yet others break SCI into supplier integration, customer integration and II (Flynn, et al, 2010, Lii and Kuo, 2016).

Stevens & Johnson (2016) outlined two perspectives of supply chain integration which encompasses internal integration and external integration. According to Prajogo& Olhager (2012), the aspect or perspective of internal integration involves establishing close relationships between various functions in a business organization or a firm such as material management, order management, inventory and warehouse management. The perspective of external integration encompasses (Abbasi&Mohamadi, 2020) forward integration of resource flow from ultimate supplier to manufacturer and later to the customer or end-user and (Akrout et al, 2016) backward integration of information from ultimate customers, to manufacturers, to ultimate suppliers (Leuschner, Rogers &Charvet, 2013). Sheikh & Rana (2014) view that supply chain integration can be achieved successfully by firms in a supply chain through strategic partnering among trading partners in a supply chain and effective knowledge sharing practices

According to supply chain literature, The SCI construct comprises three dimensions including internal, supplier and customer integration to capture multidimensionality (Flynn, Huo& Zhao, 2010, Wong, Boon-Itt & Wong, 2011, Rasib, Sundram&Noranee,2020).Supplier integration entails interaction and coordination of activities, information sharing, and supplier participation in a focal organization's procurement and production processes, while client integration entails communication and contact with customers, sharing market and inventory information, and following up with customers for feedback on its services and products (Zhao et al., 2008; Gimenez and Ventura, 2005). Internal integration is defined as a firm's ability to structure its organizational strategies, practices, and activities into cooperative, aligned methods to meet the needs of its customers (Cespedes, 1996; Kahn and Mentzer, 1996; Kingman-Brundage et al., 1995; Lee et al., 1997). Internal integration entails information sharing among internal functions, strategic cross-functional cooperation, and collaboration.

2.4. Concepts and definitions of information and communication technology

The definition of IT capability is combinations of IT-based resources and with other resources implement in value-adding way (Chen vd, 2015, Fink, 2011). Many researches have been conducted about IT capability from different viewpoints. At first concept, IT capability is defined by Ross etc. (1996), as the ability to control its IT expense and cost, and deliver in time to realize the firm's targets. Then Bharadwaj, (2000) defines organizational IT capability as a firm's ability to mobilize and deploy IT based resources. Sambamurthy and Zmud (2000) define IT Capability as unification of IT-based assets and routines that support business conduct in value-adding methods. Zeng and Huang (2003) defined IT capability as a competence that a firm mobilizes its related IT resources to achieve operation goals. Santhanam and Hartono (2003) define IT capability as an aggregate concept/feature of the firm (Fink and Neumann, 2007 Guo, et al, 2008 Lim, et al, 2012, Fink, 2011).

Carr & Smeltzer (2002) explained information technology as the use of automated purchasing systems, supplier links through electronic data interchange, computer-to-computer links with key suppliers and finally systems of information.

Information technology is also defined as a branch of technology related to the study, use and processing of data for automatic retrieval, storage and organization. Transfer, control, presentation, conversion, exchange, and delivery (Witten & Cameron, 2008).

Tan et al (2009) as application of Information and Communication Technologies tools including computer network, software and hardware required for internet connection. Based on this review and align with aforementioned views, term information technology will cover wide range of information processing and computer application in organizations. It will cover systems of information, Internet, information and communication related technologies, and their infrastructure including computer softwares, networks and hardwares, which processes or transmit information to enhance the effectiveness of individuals and organizations. However, term information technology also includes any computer application and required packages of hardwares, Computer Aided Manufacturing, Computer Aided Design, Electronic Data Interchange and Enterprise Resource planning that positively affects the productivity of cooperation.

Technology trends (2019) defines information technology as “information technology refers to anything related to computing technology. The internet for example, comes under the umbrella term IT.so does computer hardware, software, and networking

Another definition of IT capability is a technological capability that is utilized to gather, manage, and send information to assist with organizational decision-making (Jimenez-Jimenez et al, 2019) as well as to promote interaction, coordination, and collaboration among multiple supply chain stakeholders.

2.5. Classification of IT capabilities

IT capabilities are divided into three categories: (1) cross-functional (intra-organizational) application capability, (2) supply chain (inter-organizational) application capability, and (3) data consistency as a program control objective that ensures the accuracy of data input across these integrative applications (Sanders and Premus, 2012).

The supply chain field often defines information technology into two main groups: (1) intra-organizational IT and (2) inter-organizational IT (Zhang et al, 2011, 2016, Gonz-alvez-Gallego et al, 2015; Dong et al, 2009).. As per the definition by Bhakoo and Choi (2013), **inter-organizational** IT reflects “the technology-based infrastructure that acts as a conduit for facilitating transactions, sharing information with supply chain partners, coordinating activities and establishing governance structures between firms.” On the contrary, **intra-organizational IT** are “information technologies and/or practices used to share information within a firm” (Savitskie, 2007). Another critical component of IT infrastructure is data consistency between and within organizations (Fuchs et al, 2018). Data consistency is seen as a critical need while designing data structures (Shin, 2003). It determines the data structure and is an important internal control necessity for both inter and intra-organizational systems (Angeles, 2012). This input control, which attempts to preserve error-free, uniform information, is a critical skill for the seamless functioning of intra- and inter-organizational IT, leading to the enhancement of SCI (Rai et al, 2006).

Cross-functional usage capability allows for the incorporation of data and information systems inside a firm through the implementation of enterprise resource planning (ERP), real-time data seeking of inventory and operational data, and information sharing, interaction, and cooperation

among the firm's functional departments. Supply chain application capacity enables connections between different parties in the supply chain, closer coordination among supply chain members, and integration of their company's operations to improve the effectiveness and efficiency of cross-organizational business processes. The latter is frequently accomplished through the use of vendor and client relationship management tools. Furthermore, data consistency enables common and consistent descriptions of data across cross-functional applications and supply chain applications, as well as uniformity in data held throughout the supply chain (Ganbold et al, 2021).

2.6. Theoretical framework

2.6.1. Resource based theory

The RBV illustrates that a firm's source of the sustainable competitive advantages forms the internal resources. (Ganbold, et al, 2020). It is noted by Barney (1991) that a firm creates its own value by integration heterogeneous and steady resources that are valuable, imitable, rare and non-substitutable. Adopting a resource-based perspective, information systems researchers have identified various IT related resources that serve as potential sources of competitive advantage.

Furthermore, as stated by the RBV, a company is the collection of various kinds of resources which can be transformed into its unique capabilities, enabling it to generate sustainable competitive advantages (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). Thus, a company can be regarded as a "resource bundle" consisting of a series of resources or capabilities. Among all the resources, IT is considered one of the most crucial for companies (Huo et al., 2015) to help them construct unique capabilities, such as SCI (Huo, 2012; Wong, 2013).

According to research studies based on the resource-based view theory, a firm's ability to develop and apply new technologies, or IT capabilities, to its internal procedures leads to long-term competitive advantage (Agan, 2011, Daugherty et al., 2009, Hsu, 2013, Rai et al., 2006, Byrd et al., 2008, Tan et al., 2010, Saeed et al., 2011). IT capability is characterized as a technological capacity to obtain, manipulate, and disseminate information to assist in company decision-making (Grover and Malhotra, 1999), as well as to promote interaction, coordination, and collaboration across numerous supply chain stakeholders. Effective deployment of IT infrastructure is a forerunner to improved IT capability (Bharadwaj, 2000; Gunasekaran et al, 2017). Thus, the literature suggests that IT competency results in effective SCI projects and

improved performance outcomes in firms (Devaraj, et al, 2007, Bi, et al, 2013, Fuchs, et al, 2018).

The resource-based argument relies on the idea that a company's persistent competitive edge and success are dependent on its distinct assets and skills, which are hard to replicate (Barney, 1991). A dominating concept in the strategic collaboration and SCI schools of research (Perdana et al., 2019). According to the resource-based view, internalization founded on interaction, sharing of knowledge, and collaboration among departments is essential for building and sustaining a firm's partnership with its clients and vendors, and thus acquiring an edge at the supply chain level.

According to the resource-based view (RBV), IT, as a unique resource, can assist companies in building SCI capability, which helps improve their performance (Huo, et al, 2015). IT resources enable companies to share information in real time, so resource allocations can be coordinated throughout supply chains (Huo, et al, 2015). IT provides one of the most important tools for cooperation within a company and among supply chain members (Li, et al, 2009). For instance, Liu, et al (2016) acknowledged that matching the appropriate IT competency with the SCI of a company can lead to its superior performance.

The RBV became a useful tool for exploring the value of IT and its relationship to firm performance and competitive advantage and thus many scholars have recognized the value of RBV in IT research (Wernerfelt, 1984). Applying Barney's VRIN framework can determine if a resource is a source of sustainable competitive advantage, and, it is believed that IT as a resource can help firms obtain sustainable competitive advantage (Chi & Sun, 2015).

2.6.2. The IT capability theory

The IT capability theory is the ability of an enterprise to mobilize and deploy IT-based resources in support of and for the improvement of business strategies and work processes (Bharadwaj, 2000). It suggests that the success of a firm relies on its ability to integrate, build, and reconfigure internal and external competencies to achieve new forms of competitive advantage. Thus, IT capability that presents the characteristics of rarity, appropriability, non-reproducibility, and non-substitutability can lead to a competitive advantage (Wade & Hulland, 2004).

2.6.3. Relational view theory

Dyer and Singh (1998) is first explored in different levels of depth to get a thorough understanding of the theory. The theory implies that relational rents can be generated from the joint efforts of alliance partners that invest in relation-specific assets, share knowledge, combine complementary resources and use effective governance mechanisms. These activities forge an idiosyncratic relationship that is difficult to imitate for competitors, thus giving a competitive advantage.

Dyer & Singh (1998) have systematically examined interorganizational rent-generating processes. They identified four sources that generate relational rents: Investments in relation-specific assets, interfirm knowledge sharing routines, the combining of complementary resources and effective governance mechanisms. Firms can achieve supernormal profits by developing an idiosyncratic relationship with their alliances through these processes. The aim is to move away from arm's length market relationships, because competitors can easily duplicate this exchange relationship since there is nothing unique about the interactions between buyer and seller. What follows from the joint efforts of the partnering firms in forging a relationship beyond arm's length, is that rents are jointly generated and owned by partnering firms. Relational rents are then part of the network or dyad. A relational rent is defined by Dyer and Singh (1998) as: "A supernormal profit jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners" (Dyer and Singh, 1998).

The resource-based perspective theory emphasizes the company and its edge over others from within-firm resource perspectives, whereas the relational approach to concept (Dyer and Singh, 1998, Lavie, 2006, Arya and Lin, 2007) concentrates on competitive benefits related to inter-firm assets arising from sharing information and other kinds of working together among multiple companies (Gulati and Garguilo, 1999).

Mesquita et al. (2008) provide scientific proof for the complementarity of resource-based and relational perceptions concepts, demonstrating that the edge over rivals gained via inter-firm acquisition of information, buyer-supplier connected administration, as well as other inter-organizational assets cannot be stated solely by the resource-based view. This prompted some

scholars to propose modifications to the resource-based perspective theory that is similar to the key conceptions of the relational view theory, including the concept of structural rent.

For instance, Lai et al. (2012) and Xu et al. (2014) argued that in a modern extremely interdependent business climate, organizations must leverage addition to their in-house assets as well as their outside assets through closer ties alongside vendors and clients to acquire an edge over their competitors. Barratt and Oke (2007) showed empirically that joint actions might improve visibility along with data transfer among two supply chain parties. Such visibility could be gained by the focus of the company's efforts to obtain the latest data about client tastes for operational scheduling and projection reasons (Vanpoucke et al, 2017). Furthermore, the knowledge transfer reliability and cross-organizational transparency resulting from vertical integration may help firms handle in collaboration the issues connected with external hazards. (Drees and Heugens, 2013)

2.6.4. Organizational capability theory

According to the organizational capability theory, unique capabilities are sources of sustainable competitive advantages for a company. Organizational capability can be understood as the ability that an organization repeatedly implements production tasks directly or indirectly related to companies, thus creating values by improving the efficiency of inputs and outputs (Huo, 2012). Integration is considered as a special type of organizational capability; supplier and customer integration represent core dynamic capabilities of the company in coordinating external suppliers and customers (Huo, 2012, Schrey€ogg and Kliesch-Eberl, 2007, Teece, et al, 1997, Verona, 1999, Wong, 2013). Liu, et al (2016) found that the fit between SCI and IT competency can lead to superior operational and financial performance for companies.

Organizational capabilities are defined as a firm`s capacity to deploy its resources, tangible or intangible, to perform a task or activity to improve performance (Amit and Schoemaker, 1993, Grant, 1991, Teece, et al, 1997). Helfat and Peteraf (2003) define organizational capability as ‘the ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result’. Organizational capabilities are fundamental to firms` ability to solve effectively their organizational problems Dynamic capabilities are defined as the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (Teece, et al, 1997).

2.7. Empirical Review

2.7.1 The effect of information technology capabilities on supply chain integration

The exchange of information and knowledge is so important that supply chain partners should consider the use of an enterprise planning system to promote the exchange of information and knowledge (Govindan, et al 2014). Information sharing results in benefits for all of the supply chain partners. Information and knowledge sharing can help spread the risks, costs, and gains for supply chain partners (Stock, Boyer & Harmon, 2010). Organizational success first depends upon the performance of the supply chains in which the organization functions as a partner (Wong, Boon-Itt& Wong, 2011).

Recently with development of IT, the concepts of supply chain design and management have become a popular operations paradigm. The complexity of supply chain management has also forced companies to go for online communication systems. For example, the Internet increases the richness of communications through greater interactivity between the firm and the customer (More &Basu, 2013). This illustrates an evolution in supply chain towards online business communities (Gil-Or, 2010). I T decreases transaction costs between buyers and suppliers and creates a more relational/cooperative governance structure, leads to closer buyer-supplier relationships (Drnevich&Croson, 2013), may decrease trust-based interorganizational partnerships and removes a human element in buyer-supplier interaction, while trust is built on human interaction (Ghobakhloo, et al, 2011).

Successful SCI depends on the immediate exchange of operational and strategic knowledge on activities (Prajogo and Olhager, 2012; Prajogo et al., 2018). IT is a critical driver of accurate and current data exchange among companies and consequently is frequently regarded as a key driver of SCI (Kearns and Lederer, 2003; Rai et al., 2006; Sanders, 2007). IT skills are acknowledged as a vital aspect enabling SCI activities and hence leading to improved efficiency in operations.

Davis, et al. (2014) demonstrated that e-Business technology positively affects product information integration and intra- and interorganizational collaboration. Cai, et al. (2016) indicated that there exist positive interactive effects of outside-in and spanning IT capability on supply chain collaboration. Evelyne, et al (2017) found that information exchange can promote operations integration. Rai et al. (2006) showed that IT infrastructure integration for supply chains can promote supply chain process integration. Huo, et al (2015) identified the positive

effects of IT for suppliers and customers on the coordination with suppliers and customers. Huo, et al (2015) identified the positive effects of IT for suppliers and customers on the coordination with suppliers and customers. Han, et al (2017) claimed that transactional and operational IT can improve process integration capability Yu, et al, (2017) studied the effect of IT and marketing capabilities on supply chain integration and found positive impact. Furthermore (Vickery, et al, 2003, Paulraj and Chen, 2007, Li, et al, 2009, Xu, et al, 2014, Yu, 2015, Liu, et al, 2016, Zhanget, al, 2016) explicitly documented the positive effect of IT on SCI

2.7.1.1. The effect of information technology capabilities (cross functional, supply chain application and Data consistency) on internal integration

It is often recognized that the power of IT in the modern day is a key component of supply chain performance improvement and serves as a foundation for success in SCM. Aral and Weill discovered that variations in IT competence lead to variations in business performance by fortifying and expanding the reach of IT assets. Nowadays, with IT's ability to increase flexibility and optimize overall performance, supply chain management (SCM) heavily relies on IT to fortify its weak points. When information technology is implemented properly, it can help a business increase profitability, productivity, and supply chain performance. Nonetheless, many businesses' staff members lack IT expertise; as a result, the business must assist in ensuring that its workers receive the essential IT training.

The Resource-Based The Resource Based View (RBV) of IT mentions that the IT resources in the organization can be the competitive capability of the organization. Bharadwaj points out that firm's IT infrastructure, employees' IT skills, and IT reconfigurability are firm's unique resources. Every single IT resource is exclusive and difficult to obtain. The mixture of the IT resources created a powerful organizational capability. The relationship between IT capability and organization performance is becoming more complex than ever before Bharadwaj points out that various IT capabilities could be sources of competitive advantage. However, there is only few studies have discovered the RBV of IT capability, and most of the analyses to data were conceptual nature.

Studies centered around the resource-based perspective concept have stated that an organization's capacity to create and apply new technologies, or IT capabilities, to its procedures results in a

lasting competitive edge (Agan, 2011, Daugherty et al., 2009; Hsu, 2013; Rai et al., 2006). Byrd et al., 2008; Tan et al., 2010; Saeed et al., 2011).

Evelyne, et al (2017) found that information exchange can promote operations integration. Rai, et al (2006) also showed that IT infrastructure integration for supply chains can promote supply chain process integration.

A subsequent study, influenced by developments in IT solutions for company workflow integration, has identified IT skills as a significant component enabling SCI projects. It has demonstrated that IT capabilities can be established based on aggregate lessons through the deployment of IT in an integrated fashion to assist business operations (Prajogo et al., 2016, 2018).

Ganbold et al. (2021) observed that data consistency harmed internal integration. This is due to researchers discovering that group conversations are a crucial driver for the corporate integration of procedures (e.g., Lapide, 2005; Grimson and Pyke, 2007). In addition, arranging discussions at a driven-by event instead of a frequent schedule can lessen the danger of staff overload (Rouzies et al., 2005) and is observed to promote multidisciplinary productivity. (Dawes and Massey, 2005). Similarly, cross-functional interface capacity enhances organizational integration. This skill is critical for improving a company's internal operations by facilitating regular interaction, teamwork, and the exchange of relevant information among its divisions. In addition, internalization was not discovered to be strongly linked with vendor integration. Ganbold et al. (2021) Multidisciplinary usage abilities allow the combining of information and data platforms inside an organization through the implementation of enterprise resource planning (ERP), current seeking of inventory and operating data, exchange of data, and interaction among the firm's functional divisions.

Based on the theoretical empirical evidence the following hypothesis are developed:

H1: Data consistency capability has a positive and significant effect on internal integration

H2: Cross functional capability has a positive and significant effect on internal integration

H3: supply chain applications capability has a positive and significant effect on internal integration

2.7.1.2. The effect of information technology capabilities (cross functional, supply chain application and Data consistency) on supplier integration

Data consistency between and within organizations is one aspect of IT infrastructure (Fuchs et al. 2018). Scholars indicate considerable data consistency issues in big distributed databases (Pitoura and Bhargava, 1999), with significantly higher issue rates in scattered systems across lines of authority, such as supply chains (Rai et al, 2006). Data consistency is seen as a critical need while designing data structures (Shin, 2003). It determines the data structure and is an important internal monitoring need for both cross and intra-organizational systems (Angeles, 2012). Ganbold et al. (2021) supply chain application capabilities enhance customer and supplier integration (Devaraj et al., 2007; Heim and Peng, 2010). There is a favorable connection between supply chain application competence and integrating vendors. Cross-functional application capability is found to have positive impact on a manufacturer's integration with supplier. The level of cross-functional application capability is likely to positively influence supplier integration Ganbold, et al (2021) Large data sets can be readily accessed and stored in the SC (Gupta et al., 2019; Katal et al., 2013).

Retail firms can obtain a competitive edge by implementing and integrating various strategies such as Business Intelligence, RFID, IoT, and others into their supply chain (Waller & Fawcett, 2013). Big data practices offer several advantages, including enhanced data quality, integration, visualization, and storage. However, for these BDA techniques to be implemented in the SC, enterprises need supporting components. To execute BDA techniques in the SC, organizations would also have to deal with issues like capital investment, employer skill, database scalability, etc. By putting in place particular procedures for the corresponding SCs, the big data can be easily accessed and quality, reliability, consistency, scalability, and flexibility of data can be achieved (Katal, Wazid et al., 2013; Chae et al.

From the theoretical and empirical evidence, the following hypothesis are developed

H4: Data consistency capability has a positive and significant effect on supplier integration

H5: Cross functional capability has a positive and significant effect on supplier integration

H6: supply chain applications capability has a positive and significant effect on supplier integration

2.7.1.3. The effect of information technology capabilities (cross functional, supply chain application and Data consistency) on customer integration

Cross-functional teams are being used by organizations more and more to handle supply chain (SC) disruptions. These teams can search for or obtain pertinent information by utilizing their wide range of contacts and experience, which will help them create integrated countermeasures and strengthen the resilience of their company. Cross-functional teams have the capacity, but they frequently fail to realize the potential advantages of information scouting for efficiently handling interruptions. This study intends to investigate whether and how cross-functional teams can fully utilize information scouting to ensure the resilience of their organization by drawing on group information-processing theory.

The positive effect of IT on SCI has been identified through the use of some specific technologies such as electronic data interchange (Hill and Scudder, 2002) and e-Business technology (Daviset, al, 2014, Devaraj, et al, 2007, Sanders, 2007). Furthermore, IT can help companies enhance the stability of cooperative relationships (Sanders, 2008, Sanders and Premus, 2005, Subramani, 2004). Due to its positive role in supply chains, IT is considered as an important enabler of supply chain coordination (Hill and Scudder, 2002), supply chain collaboration (Chae, et al, 2005) and SCI

Data consistency greatly enhances customer integration. Customer integration is likely to benefit from significantly standardized and consistent data sent throughout the supply chain, increasing the information exchange and coordination environment for the focus organization and its customers. Ganbold et al. (2021) discovered that supply chain application capabilities enhance customer and supplier integration. (Devaraj et al., 2007; Heim and Peng, 2010). Also discovered was a favorable influence of supply chain applications on client and vendor integration. The combination of cross-functional applications improves the transparency of supply chain processes and coordinates the execution of cross-organizational activities and business operations. Nevertheless, Ganbold et al (2021) could not find any substantial association between cross-functional applications and customer integration.

Based on theoretical and empirical evidence, the following hypothesis are developed

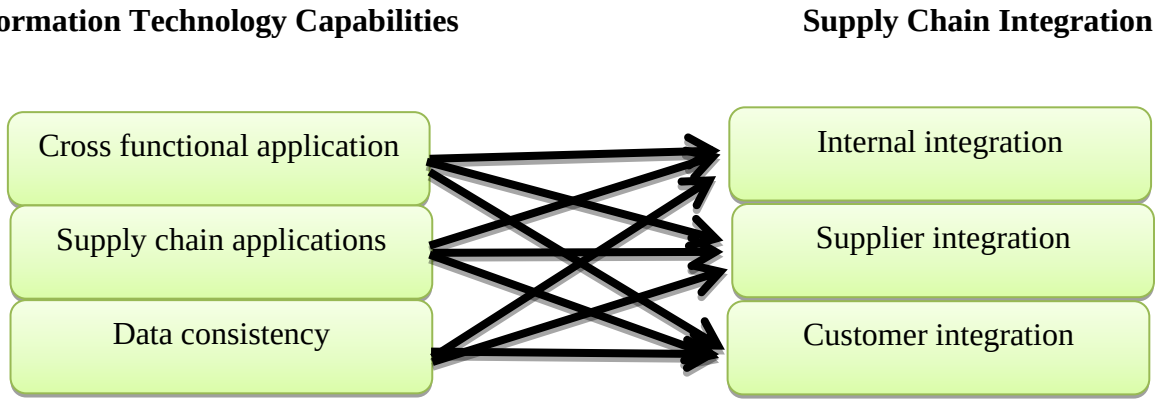
H7: Data consistency capability has a positive and significant effect on customer integration

H8: Cross functional capability has a positive and significant effect on customer integration

H9: supply chain applications capability has a positive and significant effect on customer integration

2.8. Conceptual framework

Based on the three dimensions of information technology capabilities (cross-functional application, supply chain applications, and data consistency) and to see the effect on the three dimensions of supply chain integration (internal integration, supplier integration, and customer integration), the following conceptual framework is developed.



The model is adopted from Ganbold, et al (2021) and modified by the researcher

Figure 1:Conceptual framework

Chapter Three: Research Methodology

3.1. Introduction

In this chapter, research design and approach, sampling design which includes target population, sample size determination and sampling technique and procedure, data collection techniques, methods of data analysis and interpretation, and ethical considerations different tests and assumptions are incorporated.

3.2. Research Design

The research design enables the researcher to answer the basic research question. According to saunders, Lewis and Thornhill (2009) showed that the choice of research design depend on the objective of the study, the availability data source, the cost of obtaining the data and the availability of time. A research design is the preparation of conditions for the collection and analysis of the data required either to solve the research problem or to achieve the research purpose (Kothari, 2004). In this study, an explanatory research design was employed to test the causal relationship between the independent and dependent variables. Descriptive research design also used to describe facts as it is.

3.3. Research approach

Saunders et al (2012) state that there are two types of research approaches: the deduction approach and the induction approach. The study used deduction approach because the conceptual framework or research hypotheses are built based on the previous studies. A deduction approach adopts current theories and concepts to justify research relationships. Deductive approach is searching for an explanation of the causal relationships between variables by collecting data in most cases using a quantitative method. It helps in generalizing from the chosen sample to the whole population (Sekaran, 2003).

3.4. Research method

According to Creswell (2003), the quantitative survey research design is critical for establishing quantifiable causes and effects between the variables of the study. Both quantitative and qualitative methods of data collection were employed. A quantitative survey method in the form of a cross-sectional study has been used.

3.5. Sampling design

3.5.1. Target population

According to Sekeran (2001), a population is described as "the entire group of people, events, or things of interest that the researcher wishes to investigate." The target population of this study was 240 import-exporters of general items companies located in Addis Ababa.

3.5.2. Sample size determination

When the target population size is known, Yamane's (1967) provides a simplified formula to calculate sample size. His formula is presented as follows.

$$n=\frac{N}{1+Ne^2}$$

Where, n= sample size

N= population size

e= the desired level of precision (5%)

Based on Yamane's formula the sample size of the study is calculated. For business and social science research a confidence level of 95 percent, margin of error ± 5 percent is acceptable (Krejcie and Morgan, 1970).

$$\frac{240}{1+240(0.05^2)}$$

n=150

3.5.3. Sampling technique and procedure

240 companies engaged in import and exports of general items located in Addis Ababa are selected as the target population, and 150 of them has taken as a sample. Accordingly, since the companies are homogenous in nature, they were selected using simple random sampling. Furthermore, Since the nature of the information used in the study is strategic, which requires knowledge of internal, supplier, and customer relationships, the person included in the sample should be an important source who is well aware of the intended company's supply chain management role and is familiar with internal processes, purchasing and distribution processes, and customer and supplier relationship management. Phillips (1981) supports the respondents'

choices, demonstrating that high-ranking informants are more dependable sources of information than low-ranking ones.

Therefore, in this study, 1 respondent in each company (the supply chain manager or officer of import and export companies of general items) has been taken by using purposive sampling technique.

3.6. Data Source and Collection Method

3.6.1. Primary and secondary data sources

There are two types of data: primary data and secondary data. Primary data is collected for a specific issue. It could be either qualitative, such as interviews, semi-structured or unstructured; focus groups; observations; and case studies; or quantitative, such as interviews, semi-structured or unstructured; focus groups; observations; and case studies (Saunders et al., 2012). Based on the research questions and objectives, this study was employed primary data, which was gathered from primary sources.

3.6.2. Data collection method

A questionnaire is considered a key tool in collecting data and is the most widely used tool in social science research (Lancaster, 2005). Since this is an explanatory study, the data were collected using a structured questionnaire. A total of 36 items was prepared and distributed for this survey including 2demographic characteristics questions which completed by supply chain managers/ officers of import exporter of general items companies located in Addis Ababa

3.7. Validity and reliability

3.7.1. Validity

Validity refers to the extent to which an instrument measures what it is supposed to measure (Bryman and Bell, 2007). In this study, In order to ensure content validity of the scale, all measurement items were directly quoted from extant literature.

Questionnaire Design

A survey method was used for data collection. Thus, the questionnaire has three parts. These are:- Background Information, Supply chain integration Questionnaire (SCI), and Information technology capabilities questionnaire (ITC) Self-administered questions were used to obtain

background information of respondents relevant to the study. Participants were asked to provide information with regard to their gender and experience in their respective organizations.

The second part of the questionnaire was to measure Supply chain integration by using a five – point Likert response scale developed by (Flynn et al. ,2010, Narasimhan and Kim ,2002, Zhao et al. ,2011)) that includes strongly disagree (1), disagree (2), neutral (3), agree (4) and strongly agree (5).

The Third part of the questionnaire was to measure the Information technology capabilities impact by using a five - point Likert response scale developed by (Rai et al. 2006, Flynn et al. 2010, Narasimhan and Kim 2002, Zhao et al. 2011) includes strongly disagree (1), disagree(2), neutral(3), agree (4) and strongly agree (5)

3.7.2. Reliability

According to Bryman and Bell, (2007), reliability analysis is concerned with the internal consistency of the research instrument. Adams (2005) also stated that reliability is a measure of the consistency of collected data through time and among respondents, while validity refers to whether the items measure what they are supposed to measure. The questionnaire was tested using Cronbach's alpha reliability measurement scales. Alpha values of 0.7 or higher are considered to be adequately reliable. Values between 0.5 and 0.7 are acceptable, while values below 0.5 are considered to be less reliable. A measuring instrument is reliable if it provides consistent results. Hence, in this study the internal consistency for all items of the instrument was tested using Cronbach's alpha method. Therefore, the researcher used the above mentioned literature into consideration and tested the reliability of the items which were developed for respondents.

Table 1 reliability test

Table 3.1 reliability test

Variable	Cronbach's Alpha	N of items
Internal integration	.824	6
Customer integration	.804	7
Supplier integration	.787	8
Data consistency	.822	4
Cross functional application	.815	5
Supply chain application	.857	4

Own survey, 2023

As shown in the table 3.1. The results revealed that, the internal integration scale with 6 items (α=.824), the customer integration scale with 7 items (α=.804), the Supplier integration scale with 8 items (α=.787), Data consistency scale with 4 items (α= .822), Cross functional application scale with 5 items (α=.815), and the supply chain application scale with 4 items (α = .857), This results proves the reliability of all questions used to assess the study since the alpha of all the variables turned out to be more than .70.

3.8. Data Processing and Analysis

3.8.1. Data Processing

Before processing the responses, the completed questionnaires were edited for completeness and consistency. Hence, this data processing procedure has two consecutive phases: First data cleanup in which the collected raw data was edited to detect errors and omissions in response and to cross check method, whether the questions are answered accurately and uniformly. The next phase is the process of assigning numerical or other symbols was followed. Coding involves assigning numbers or other symbols to answers so that responses can be grouped into limited number of classes and categories. This helps to reduce the response into a limited number of categories or classes and then the process of classification or arranging large volume of raw data in to groups with common characteristics was applied.

3.8.2. Data Analysis

Statistical Package for Social Science (SPSS) software version 26 was employed to analyze and present the data through the statistical tools used for this study, namely reliability test, frequency analysis for background information, correlation, normality linearity, multi-collinearity tests multiple regression analysis. The results were presented using tables.

3.8.2.1. Descriptive analysis

Descriptive analysis techniques were used to analyze the results of descriptive statistics to describe the Demographic and general results which presented by tables frequency distributions and percentages.

3.8.2.2. Inferential Analysis:

Inferential statistics allow researchers to infer from the data through analysis the relationship between two variables; differences in a variable among different subgroups; and how several independent variables might explain the variance in a dependent variable. (Sekaran, 2000)

Therefore, the inferential statistical methods that are used for the study are explained as follows: -.

The Pearson Correlation analysis

As stated on Alwadaei (2010) Correlation Analysis: is to show the strength of the association between the variables involved. Inter-correlations coefficients (r) were calculated by using the Pearson's Product Moment. Field (2006) also state that the output of correlation matrix can be the correlation coefficient that lies between -1 and +1 within this framework, a correlation coefficient of +1 indicates a perfect positive relationship, and a correlation coefficient of -1 indicates a perfect negative relationship; whereas a coefficient of 0 indicates no liner relationship. While, for correlations purpose the descriptors developed by Davis (1971) was used.

Interpretation of strength of correlation coefficient

Value of coefficient Relation between variables 0.70-1.00 Very strong association, 0.50-0.69 Substantial association, 0.30-0.49 Moderate association, 0.10- 0.29 Low association, and 0.01-0.09 negligible association. (Alwadael, 2010)

Multiple Regression Analysis

Multiple regression analysis takes into account the inter-correlations among all variables involved. This method also takes into account the correlations among the predictor scores. Multiple regression analysis more than one predictor is jointly regressed against the criterion variable (Cohen & Swerdlik, 2002). This method is used to investigate the effect of information technology capabilities variables (Data consistency, Cross functional application, Supply chain application) on Supply chain integration (Internal integration, Customer integration, and Supplier integration).

Regression functions

The equation of multiple regressions on this study is generally built on around two sets of variables, namely dependent variables Supply chain integration (internal, customer, and supplier integrations) and independent variables Information technology capabilities (Data consistency, cross functional application and supply chain application). The basic objective of using

regression equation on this study is to make the researcher more effective at describing, understanding, predicting, and controlling the stated variables.

Table 2: Regression variables

Independent variables	Dependent variables (supply chain integration)
Data consistency	Internal integration
Cross functional Applications	Customer integration
Supply chain applications	Supplier integration

The multiple regression models applied in this study explained as follows

Model 1,2,3

$Y1=\beta0+\beta1x1+ \beta2x2+ \beta3x3+£$

$Y2= \beta0+\beta1x1+ \beta2x2+ \beta3x3+£$

$Y3= \beta0+\beta1x1+ \beta2x2+ \beta3x3+£$

Where;

Y1= Internal integration

Y2= Customer integration

Y3= Supplier integration

X1= data consistency

X2= Cross functional applications

X3 Supply chain applications

£=the residual value/error term.

Where Y1, Y2, Y3 are the dependent variables- Supply chain integration (internal, customer, and supplier integrations) X_1, X_2, X_3 are the independent variables Information technology capabilities (Data consistency, cross functional application and supply chain application). β_1 is the intercept term- it gives the mean or average effect on Y1, Y2, Y3 of all the variables

excluded from the equation, although its mechanical interpretation is the average value of Y when the stated independent variables are set equal to zero. B1, β2, β3, refers to the coefficient of their respective independent variable which measures the change in the mean value of Y, per unit change in their respective independent variables.

3.9. Ethical Consideration

Researchers need to consider ethical issues throughout the research process and remain sensitive to the impact of the study and its results on those who participate and supporters to the study (Saunders et al. 2003). According to Leedy and Ormrod (2010), most ethical issues fall into one of the following four categories: informed consent, confidentiality, security, and honesty. In terms of ethics, all information and data from respondents will be treated confidentially, which means that the nature and quality of the participants will remain unknown, and no information was recorded to link respondents with their responses. The researcher was clearly informed respondents about the purpose of the research, allowing them to participate with full consent. The responses to the questionnaire are not exposed to third parties, but the researcher were used them only for academic purposes. And finally, the researcher prepared report for the findings with complete honesty.

Chapter 4: Data Analysis and Interpretation

4.1. Introduction

A total of One hundred fifty questionnaires were distributed for supply chain managers /officers of one hundred fifty imports – exporter of general items companies' respondents and out of 150 questionnaires, 132 of them were collected. Therefore, the response rate stood at 88% percent which show the response rate is greater than the acceptable range for analysis. Accordingly, the analysis of this study is based on the number of questionnaires collected.

4.2. Descriptive statistics

4.2.1. Background information of respondents at import exporters of general items

Table 3: Respondents background information

No.	Item		Frequency	Percent	Valid Percent	Cumulative Percent
1.	Gender	Male	75	56.8	56.8	56.8
2.		Female	57	43.2	43.2	100.0
3.		Total	132	100.0	100.0	
		1-5 years	99	75.0	75.0	75.0
		5-10 years	33	25.0	25.0	100.0
		Total	132	100.0	100.0	

Own survey, 2023

As indicated in table 7 item one shows the gender distribution. Thus 56.8% of them are male respondents while 43.2 are female this shows male respondents are greater in number. In the same table item two, respondents experience is presented, accordingly 75% of them work from 1-5 years for their organizations the remaining 25% respondents work for their organization from 5- 10 years therefore, the shows that majority of respondents stayed in their organization from 1 year up to five years.

4.3. Results of Inferential Statistics

4.3.1. Pearson's Product Moment Correlation Coefficient between IT capability variables and supply chain integration variables

Table 4: Correlation Analysis

Correlations							
		SCIII=	SCICI	SCISI	ITCDC	ITCCFA	ITCSCA
SCIII	Pearson Correlation	1	.794**	.705**	.525**	.794**	.737**
	Sig. (2-tailed)		0	0	0	0	0
	N	132	132	132	132	132	132
SCICI	Pearson Correlation	.794**	1	.791**	.562**	.818**	.762**
	Sig. (2-tailed)	0		0	0	0	0
	N	132	132	132	132	132	132
SCISI	Pearson Correlation	.705**	.791**	1	.517**	.848**	.686**
	Sig. (2-tailed)	0	0		0	0	0
	N	132	132	132	132	132	132
ITCDC	Pearson Correlation	.525**	.562**	.517**	1	.481**	.277**
	Sig. (2-tailed)	0	0	0		0	0.001
	N	132	132	132	132	132	132
ITCCFA	Pearson Correlation	.794**	.818**	.848**	.481**	1	.675**
	Sig. (2-tailed)	0	0	0	0		0
	N	132	132	132	132	132	132
ITCSCA	Pearson Correlation	.737**	.762**	.686**	.277**	.675**	1

	Sig. (2-tailed)	0	0	0	0.001	0	
	N	132	132	132	132	132	132
** Correlation is significant at the 0.01 level (2-tailed).							

Pearson's Product Moment Correlation Coefficient was used to determine the relationship between:

- Data consistency capability and internal integration
- Cross functional application capability and internal integration
- Supply chain applications capability and internal integration
- Data consistency capability and supplier integration
- Cross functional application capability and supplier integration
- Supply chain applications capability and supplier integration
- Data consistency capability and customer integration
- Cross functional application capability and customer integration
- Supply chain applications capability and customer integration

As indicated on the above table, Pearson's Product Moment Correlation Coefficient shows that, there is a positive and significant relationship between data consistency and internal integration implied by ($r = .525$, $p < 0.01$) also there is a positive and significant relationship between cross functional application and internal integration implied by ($r = .794$, $p < 0.01$) in addition to this a positive and significant relationship was found between supply chain application and internal integration implied by ($r = .737$, $p < 0.01$) moreover the correlation coefficient implied that, there is a positive and significant relationship between data consistency and supplier integration implied by ($r = .562$, $p < 0.01$) and there is a positive and significant relationship between cross functional application and customer integration implied by ($r = .818$, $p < 0.01$) additionally a positive and significant was found between supply chain application and customer integration implied by ($r = .762$, $p < 0.01$) likewise, there is a positive and significant relationship between data consistency and supplier integration implied by ($r = .517$, $p < 0.01$) also there is a positive and significant relationship between cross functional application and supplier integration implied by ($r = .848$, $p < 0.01$) additionally there is a positive and significant relationship between supply chain application and supplier integration implied by ($r = .686$, $p < 0.01$)

The above correlation results can be concluded there is a positive and significant relationship between all IT capabilities (data consistency, cross functional application and supply chain application) and supply chain integration variables (internal, customer and supplier integrations)

4.3.2. Linear regression Assumption tests

4..3.2.1. Testing for outliers

Outliers are extreme values which are either on one or a set of variables (Tinsley and Brown, 2000). Outliers can cause negative effects on data analysis. For example, data can contain collinearities and non-normality which can lead to negative variance estimates (Brown, 2006). These effects can deform statistical results which cannot be generalized. Outliers can occur as "a result of an error in the data file (e.g., entry of an incorrect value), a programming error (e.g., an error in recoding or transforming variables or a failure to identify missing data values correctly), or the presence of a valid but exceptional data point" (Tinsley and Brown, 2000). Testing for outliers was conducting for this study and it was proven there are no outliers (see appendix)

4.3.2.2. Normality test

Table 5: Tests of normality II&ITC

Table 4.1 Tests of Normality for (Internal integration and IT capabilities (data consistency, cross functional application, supply chain applications)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Studentized Residual	.067	132	.200*	.986	132	.211

Table 6: tests of normality CI & ITC

Table 4.2 Tests of Normality for (Customer integration and IT capabilities (data consistency, cross functional application, supply chain applications)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Studentized Residual	.058	132	.200*	.988	132	.298

Table 7: Tests of normality SI & ITC

Table 4.3 Tests of Normality for (Supplier integration and IT capabilities (data consistency, cross functional application, supply chain applications)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Studentized Residual	.074	132	.070	.984	132	.130

Normality focuses on the extent to which the sample data distributes according to normal distribution (Hair et al., 2010). To check the normality of the data the normality test was conducted using SPSS version 26 and the above three tables result shows that in a Shapiro-Wilk test the p value is 0.211 and kolmogorov-Smirnov test p value is 0.200 which both tests p value is > 0.05 for (Internal integration and IT capabilities (data consistency, cross functional application, supply chain applications) , Shapiro-Wilk test the p value is 0.298 and kolmogorov-Smirnov test p value is 0.200 which both tests p value is > 0.05 for (Customer integration and IT capabilities (data consistency, cross functional application, supply chain applications) and Shapiro-Wilk test the p value is .130 and kolmogorov-Smirnov test p value is 0.070 which both tests p value is > 0.05 for (Supplier integration and IT capabilities (data consistency, cross functional application, supply chain applications) which indicates that the data are normally distributed as inferred by (Shapiro and Wilk, 1965) and the visual inspection of their Histogram, normal Q-Q plots showed that the three dependent variables scores were approximately normally distributed (see in the appendix B).

The researcher also used skewness and kurtosis to evaluate the normality of the observed items. Skewness is “a measure of the asymmetry of the probability distribution of a real-valued random variable”. On the other hand, kurtosis refers to “the peaked or flatness of the distribution compared to the normal distribution” (Landau and Everitt, 2003). Values of skewness can be positive, negative, or zero. Skewness’s value, which is zero, indicates a perfectly symmetrical distribution, whilst a positive skewness value indicates that the tail on the right side is longer. On the contrary, a negative value refers to left- tailed. On the other hand, a kurtosis value is zero for normal distributions, whilst it is negative for flat distributions (low kurtosis) and a positive value for peaked distributions (high Kortosis). Skewness and kurtosis should be between should be within the +2 to -2 range and Skewness and kurtosis z Should by somewhere in the span of -1.96 to + 1.96 when the data are normally distributed. (Lewis-Beck, Bryman & Liao 2004). Thus, for the (Internal integration and IT capabilities (data consistency, cross functional application, supply chain applications) Skewness 0.067 and kurtosis is -0.488, (Customer integration and IT capabilities (data consistency, cross functional application, supply chain applications) Skewness -0.065 and kurtosis is 0.063, (Supplier integration and IT capabilities (data consistency, cross functional application, supply chain applications) Skewness 0.208 and kurtosis is -0.502,which is a very good range that indicated anormal distribution.

4.3.2.3. Assessing Linearity Assumption

Linearity defines the dependent variable as a linear function of the predictor (independent) variables. Standard multiple regression can only accurately estimate the relationship between dependent and independent variables if the relationships are linear in nature. As there are many instances in the social sciences where non-linear relationships occur (e.g., anxiety), it is essential to examine analyses for non- linearity. If the relationship between independent variables and the dependent variable is not linear, the results of the regression analysis will under-estimate the true relationship. This under- estimation carries two risks: increased chance of a Type II error for that independent variables, and in the case of multiple regression, an increased risk of Type I errors (over- estimation) for other independent variables that share variance with that independent variables. If linearity is violated all the estimates of the regression including regression coefficients, standard errors, and tests of statistical significance may be biased (Keith, 2006). Regarding this information, linearity test was checked and the researcher found out all

independent variables has a significantlinearity with the dependent variables. (See Appendix)

4.3.2.4. Assessing Multicollinearity test

Table 8: Multicollinearity test

Model	Tolerance	VIF mean
ITCDC	0.765	1.308
ITCCFA	0.451	2.218
ITCSCA	0.541	1.847

Multicolinearity refers to the assumption that the independent variables are uncorrelated. The researcher is able to interpret regression coefficients as the effects of the independent variables on the dependent variables when collinearity is low. The more variables overlap (correlate) the less able researchers can separate the effects of variables (Keith, 2006). If this assumption is not satisfied, autocorrelation is present. Multicollinearity can result in misleading and unusual results, inflated standard errors, reduced power of the regression coefficients that create a need for larger sample sizes (Jaccard et al., 2006; Keith, 2006).

As Myers, (1990) denotes that collinearity VIFs less than 10 and the tolerance values are greater than 0.1.is considered to be lower to suggest no multicollinearity influence among explanatory independent variables in the model As the results shows in the above table the mean of VIF scores and tolerance values of the data also fell within the acceptable range for all the variables. On the basis of such evidence,the researcher can conclude that the data set is in a good condition.

4.3.2.5. Assessing Relationship between residual variable and independent variables

If Durbin-Watson values lies between 1.5 and 2.5 it shows there is no relationship between residual variable and independent variable, hence in this study the Durbin-Watson value shows **1.941** for (Internal integration and IT capabilities (data consistency, cross functional application, supply chain applications) , **1.862** for (Customer integration and IT capabilities (data consistency, cross functional application, supply chain applications) and **1.823** for (Supplier integration and IT capabilities (data consistency, cross functional application, supply chain applications) that indicated there is no relationship between the residual variables and the independent variables (see the appendix)

4.3.2.6. Test for Homoscedasticity

The data was tested for hetroscedasticity, and the scatterplot output shows that, it appears that the spots are diffused and do not form a clear specific pattern so it can be concluded that the regression model does not occur hetroscedasticity problem for all cases. (See appendix)

4.3.3. Regression Analysis

To answer the objective of the study, three types of multiple regression models was undertaken the first one was to see if IT capability variables (data consistency, cross functional application and supply chain application) has effect on internal integration and the second one to examine their effect on customer integration lastly to evaluate the effect of IT capabilities on supplier integration

4.3.3.1. Regression for the effect of IT capabilities (data consistency, cross functional application and supply chain application) on internal integration

Table 9: Regression analysis for ITC variables & II

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.859[a]	.738	.732	.25781	1.941

a. Predictors: (Constant), ITCSCA, ITCDC, ITCCFA

b. Dependent Variable: SCIII

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	23.934	3	7.978	120.029	.000[b]
	Residual	8.508	128	.066		
	Total	32.441	131			

a. Dependent Variable: SCIII

b. Predictors: (Constant), ITCSCA, ITCDC, ITCCFA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	.381	.221		1.722	.088		
	ITCDC	.253	.062	.210	4.066	.000	.765	1.308
	ITCCFA	.333	.052	.431	6.390	.000	.451	2.218
	ITCSCA	.264	.042	.388	6.299	.000	.541	1.847

a. Dependent Variable: SCIII

This part of study was conducted to measure the effect of information technology capabilities (data consistency, cross functional application and supply chain application) on internal integration. To test this hypothesis multiple regression analysis was undertaken. The result shows that all the independent variables (IT capability variables) significantly predict internal integration. F (3, 128) = 120.029, p<.05 as shown by ANOVA table. The R^2 for the overall model was .738 and the adjusted R^2 was 0.732(73.2%) this implies that 73.2 % of the variance in internal integration is explained by information technology capabilities (data consistency, cross functional application and supply chain application) indicators.

The above coefficient table represents the unique contribution of the each independent variable which can be explained with each hypothesis developed.

H1: Data consistency capability has a positive and significant effect on internal integration

The first predictor; Data consistency is a statistically significant indicator as the result shows (β=.210 t= 4.066 p= 0.000). This means keeping other independent variables constant, as the beta value of 0.210 indicates that if there is a one-unit increase in data consistency capability there will be a 21% increase in internal integration. Hence, H1 was supported by the result

Data consistency is considered as a key requirement in creating data architecture (Shin, 2003). It defines the structure of the data and is a key internal control requirement for both inter- and intra-organizational systems (Angeles, 2012). This input control that aims to maintain error-free, consistent data is an important capability for integration of intra- and inter-organizational IT, thereby contributing towards the improvement of SCI (Rai et al., 2006)

Data consistency in supply chains will be enabled by common data definitions for key entities,

such as customer and product, as well as automated systems for accurate data capture. This consistency should enable process integration (Huber 1990; Malone et al. 1987), including the integration of information, financial, and physical flows. Data consistency and cross-functional SCM application integration) suggest that both are critical elements of IT infrastructure integration in this context. However, data consistency is relatively more important, in comparison to cross-functional application integration, suggesting the high degree of importance of data quality and standards as facilitators of process integration. Arun et al (2006)

H2: Cross functional capability has a positive and significant effect on internal integration

The second predictor cross functional applications capability is a statistically significant effect on internal integration as the result shows (β=.431 t= 6.390 p= 0.000). This indicates that keeping other independent variable constant, as the beta value of 0.431 indicates that if there is a one – unit increase in cross functional application capability there will be a 43.1 % increase in internal integration. Accordingly, H2 was supported.

This result is supported by the Ganbold, O., and (2021) study. cross-functional application capability significantly improves internal integration. This capability is indispensable to streamlining firm's internal operations, supporting frequent communication, collaboration and articulation of necessary information among the functional units in the organization.

H3: supply chain applications capability has a positive and significant effect on internal integration

The third predictor; supply chain applications capability is a statistically significant indicator as the result shows (β=.388 t= 6.299 p= 0.000). This means keeping other independent variables constant, as the beta value of 0.388 indicates that if there is a one-unit increase in supply chain applications capability, there will be a 38.8 % increase in internal integration. Hence, H3 was supported by the result.

In general as explained by the multiple regression analysis, all IT capability variables predict the internal integration especially cross functional application followed by supply chain applications has a high effect on internal integration

4.3.3.2. Regression for the effect of IT capabilities (data consistency, cross functional application and supply chain application) on customer integration

Table 10: Regression analysis for ITC variables& CI

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.892[a]	.796	.791	.19902	1.862

a. Predictors: (Constant), ITCSCA ,ITCDC, ITCCFA

b. Dependent Variable: SCICI

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	19.741	3	6.580	166.136	.000[b]
	Residual	5.070	128	.040		
	Total	24.811	131			

a. Dependent Variable: SCICI

b. Predictors: (Constant), ITCSCA, ITCDC, ITCCFA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
	(Constant)	.823	.171		4.820	.000		
	ITCDC	.257	.048	.245	5.353	.000	.765	1.308
	ITCCFA	.288	.040	.426	7.155	.000	.451	2.218
	ITCSCA	.242	.032	.407	7.490	.000	.541	1.847

a. Dependent Variable: SCICI

This part of study was conducted to measure the effect of information technology capabilities (data consistency, cross functional application and supply chain application) on Customer integration. To test this hypothesis multiple regression analysis was undertaken. The result shows that all the independent variables (IT capability variables (data consistency, cross functional application and supply chain application) are significantly predict internal integration. $F(3, 128) = 166.136, p<.05$ as shown by ANOVA table. The R^2 for the overall model was .796 and the adjusted R^2 was 0.791 (79.1%) this implies that 79.1 % of the variance in Customer integration is explained by information technology capabilities (data consistency, cross functional application and supply chain application) indicators.

The coefficient table presented above indicated the unique contribution of the each independent variable which can be explained with each hypothesis developed.

H4: Data consistency capability has a positive and significant effect on Customer integration

The forth predictor; Data consistency capability is statistically significant indicator as the result shows (β=.245 t= 5.353 p= 0.000). This means keeping other independent variables constant, as the beta value of 0.245 indicates that if there is a one-unit increase in data consistency capability there will be a 24.5% increase in customer integration. Hence, H4 was supported by the result

This result is supported by the study undertaken by Ganbold et al.,(2021) data consistency greatly enhances customer integration. The integration of clients is likely to benefit from significantly standardized and consistent data sent throughout the supply chain, increasing the knowledge exchange and coordination environment for the focus business and its clients.

H5: Cross functional capability has a positive and significant effect on customer integration

The fifth predictor cross functional applications capability is a statistically significant effect on internal integration as the result shows (β=.426 t= 7.155 p= 0.000). This indicates that keeping other independent variable constant, as the beta value of 0.426 indicates that if there is a one – unit increase in cross functional application capability there will be a 42.6 % increase in customer integration. Accordingly, H5 was supported.

Studies confirmed that IT can reinforce and stabilize interorganizational structures and arrangements in supply chain collaboration (Chae et al., 2005; Sanders and JEIM Premus, 2005)

Furthermore, Han et al. (2017) claimed that transactional and operational IT can improve process integration capability. These are client and vendor integrations. Internal cross-functional software (MRP, ERP, and others) was originally designed to optimize manufacturing procedures and enhance the scheduling of production, including purchasing operations. In this respect, the degree of cross-functional application capacity is likely to have a favorable impact on supplier integration. Ganbold, et al. (2021).

H6: supply chain applications capability has a positive and significant effect on customer integration

The six predictor; supply chain applications capability is statistically significant indicator as the result shows (β=.407 t= 7.490 p= 0.000). This means keeping other independent variables constant, as the beta value of 0.407 indicates that if there is a one-unit increase in supply chain applications capability, there will be a 40.7 % increase in customer integration. Hence, H6 was supported by the result.

The result has been supported by different authors for instance; supply chain application capability improves customer and supplier integration supporting the findings of previous studies (Devaraj et al., 2007; Heim and Peng, 2010). IT has become an indispensable tool for SCI (Chae et al., 2005; Li et al., 2009). IT promotes system integration through networks that facilitate information sharing with suppliers and customers, which helps suppliers improve their forecasting to timely supply parts and components as well as allows customers to provide constructive feedback. Previous studies confirmed that IT can reinforce and stabilize interorganizational structures and arrangements in supply chain collaboration (Chae et al., 2005; Sanders and JEIM Premus, 2005)

To generalized, as explained by the multiple regression analysis, all IT capability variables predict the customer integration especially cross functional application followed by supply chain applications has a high effect on customer integration

4.3.3.3. Regression for the effect of IT capabilities (data consistency, cross functional application and supply chain application) on Supplier integration

Table 11: Regression analysis for ITC variables & SI

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.873[a]	.761	.756	.21072	1.823

a. Predictors: (Constant), ITCSCA ,ITCDC, ITCCFA

b. Dependent Variable: SCISI

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	18.133	3	6.044	136.128	.000[b]
	Residual	5.683	128	.044		
	Total	23.816	131			

a. Dependent Variable: SCISI

b. Predictors: (Constant), ITCSCA, ITCDC, ITCCFA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	1.051	.181		5.818	.000		
	ITCDC	.160	.051	.156	3.155	.002	.765	1.308
	ITCCFA	.413	.043	.623	9.689	.000	.451	2.218
	ITCSCA	.130	.034	.222	3.787	.000	.541	1.847

a. Dependent Variable: SCISI

This part of study was conducted to measure the effect of information technology capabilities (data consistency, cross functional application and supply chain application) on Supplier integration. To test this hypothesis multiple regression analysis was employed. The result shows that all the independent variables which are IT capability variables (data consistency, cross

functional application and supply chain application) are significantly predict Supplier integration. $F(3, 128) = 136.128, p<.05$ as shown by ANOVA table. The R^2 for the overall model was .761 and the adjusted R^2 was 0.756 (75.6%) this implies that 75.6 % of the variance in Supplier integration is explained by information technology capabilities (data consistency, cross functional application and supply chain application) indicators.

The coefficient table presented above indicated the unique contribution of each independent variable which can be explained with each hypothesis developed.

H7: Data consistency capability has a positive and significant effect on Supplier integration

The seventh predictor; Data consistency capability is statistically significant indicator as the result shows (β=.156 t= 3.155 p= 0.002). This means keeping other independent variables constant, as the beta value of 0.156 indicates that if there is a one-unit increase in data consistency capability there will be a 15.6% increase in customer integration. Hence, H7 was supported by the result

H8: Cross functional capability has a positive and significant effect on Supplier integration

The eighth predictor cross functional applications capability is a statistically significant effect on supplier integration as the result shows (β=.623 t= 9.689 p= 0.000). This indicates that keeping other independent variable constant, as the beta value of 0.623 indicates that if there is a one – unit increase in cross functional application capability there will be a 62.3% increase in Supplier integration. Accordingly, H8 was supported.

The result also further explained as Cross-functional application capability is found to have positive impact on a manufacturer's integration with supplier. This is supported by prior research reporting a higher extent of supplier integration compared to customer integration in firms (e.g. Davis, 1993).

H9: supply chain applications capability has a positive and significant effect on supplier integration

The ninth predictor; supply chain applications capability is statistically significant indicator as the result shows (β=.222 t= 3.787 p= 0.000). This means keeping other independent variables constant, as the beta value of 0.222 indicates that if there is a one-unit increase in supply chain

applications capability, there will be a 22.2 % increase in supplier integration. Hence, H9 was supported by the result.

According to prior studies (Devaraj et al., 2007; Heim and Peng, 2010). The ability to use supply chain applications increases supplier and client integration. It can be viewed as a natural result of utilizing these technologies and creating corresponding skills, as they are often intended to promote external integration. Supply chain apps, as extensions of the company's uses, facilitate and support client and vendor integration.

As stated by findings of previous studies (Devaraj et al., 2007; Heim and Peng, 2010). Supply chain application capability improves customer and supplier integration. It can be considered as a natural outcome from exploiting these technologies and developing respective capabilities, since they are generally designed to improve external integration. Supply chain applications as an extension to firm’s internal applications instigate customer and supplier integration and support these activities.

This result is further explained by Huo et al. (2015) identified the positive effects of IT capabilities (especially supplier application) for suppliers and customers on the coordination with suppliers and customers.

In general, as explained by the multiple regression analysis, all IT capability variables predict the Supplier integration especially cross functional application followed by supply chain applications has a high effect on supplier integration.

Chapter Five: Conclusion and Recommendation

5.1 Introduction

The previous chapter presents data analysis based on empirical findings. Accordingly, this chapter presents conclusion of the results, recommendations forwarded, research Limitations and lastly direction for future research.

5.2. Summary of Major Findings

Based on the discussion that has been made in the analysis part the followingsummery was drawn Among the respondents worked as supply chain managers /officer in one hundred and fifty import-exporters of general items companies, there are a greater proportion of male (56.8%) respondents than female.

The experience of respondents indicates that the majority of the employees are within the range of 1 to 5 years of experience (75%) while consisting of all of the other ranges.

As indicated in the correlation result all information technology capabilities (data consistency, cross functional application and supply chain applications) indicators data consistency and internal integration implied by ($r = .525$, $p < 0.01$) cross functional application and internal integration implied by ($r = .794$, $p < 0.01$) supply chain application and internal integration implied by ($r = .737$, $p < 0.01$) data consistency and supplier integration implied by ($r = .562$, $p < 0.01$), cross functional application and customer integration implied by ($r = .818$, $p < 0.01$) supply chain application and customer integration implied by ($r = .762$, $p < 0.01$) between data consistency and supplier integration implied by ($r = .517$, $p < 0.01$) cross functional application and supplier integration implied by ($r = .848$, $p < 0.01$) supply chain application and supplier integration implied by ($r = .686$, $p < 0.01$) has a positive and significant correlation with supply chain integrations(internal, customer and supplier integrations)

Moreover, as indicated by the multiple regression analysis all information technology capability indicators significantly predict the dependent variable supply chain integration (internal, customer and supplier integrations)

The regression analysis that has been made for checking the effect of information technology capabilities variable on the internal integration, The result shows that all the independent

variables (IT capability variables) significantly predict internal integration. F (3, 128) = 120.029, p<.05 as shown by ANOVA table. The R^2 for the overall model was .738 and the adjusted R^2 was 0.732(73.2%) this implies that 73.2 % of the variance in internal integration is explained by information technology capabilities (data consistency, cross functional application and supply chain application) indicators.

The unique contribution of each independent variable explained as follows;

The first predictor; Data consistency is a statistically significant indicator as the result shows (β=.210 t= 4.066 p= 0.000). This means keeping other independent variables constant, as the beta value of 0.210 indicates that if there is a one-unit increase in data consistency capability there will be a 21% increase in internal integration. the second predictor cross functional applications capability is a statistically significant effect on internal integration as the result shows (β=.431 t= 6.390 p= 0.000). This indicates that keeping other independent variable constant, as the beta value of 0.431 indicates that if there is a one –unit increase in cross functional application capability there will be a 43.1 % increase in internal integration. The third predictor; supply chain applications capability is a statistically significant indicator as the result shows (β=.388 t= 6.299 p= 0.000). This means keeping other independent variables constant, as the beta value of 0.388 indicates that if there is a one-unit increase in supply chain applications capability, there will be a 38.8 % increase in internal integration.

On the other hand , the regression analysis that has been made for prediction the effect of information technology capabilities variables on the customer integration, The result shows that all the independent variables (IT capability variables (data consistency, cross functional application and supply chain application) are significantly predict internal integration. F (3, 128) = 166.136, p<.05 as shown by ANOVA table. The R^2 for the overall model was .796 and the adjusted R^2 was 0.791 (79.1%) this implies that 79.1 % of the variance in Customer integration is explained by information technology capabilities (data consistency, cross functional application and supply chain application) indicators.

In general as explained by the multiple regression analysis, all IT capability variables predict the internal integration especially cross functional application followed by supply chain applications has a high effect on internal integration

The unique contribution of each independent variable explains as follows;

The forth predictor; Data consistency capability is statistically significant indicator as the result shows (β=.245 t= 5.353 p= 0.000). This means keeping other independent variables constant, as the beta value of 0.245 indicates that if there is a one-unit increase in data consistency capability there will be a 24.5% increase in customer integration. The fifth predictor cross functional applications capability is a statistically significant effect on internal integration as the result shows (β=.426 t= 7.155 p= 0.000). This indicates that keeping other independent variable constant, as the beta value of 0.426 indicates that if there is a one –unit increase in cross functional application capability there will be a 42.6 % increase in customer integration. The six predictor; supply chain applications capability is statistically significant indicator as the result shows (β=.407 t= 7.490 p= 0.000). This means keeping other independent variables constant, as the beta value of 0.407 indicates that if there is a one-unit increase in supply chain applications capability, there will be a 40.7 % increase in customer integration.

To generalized, as explained by the multiple regression analysis, all IT capability variables predict the customer integration especially cross functional application followed by supply chain applications has a high effect on customer integration.

Furthermore, the regression analysis that has been made for prediction the effect of information technology capabilities variables on the supplier integration, The result shows that all the independent variables which are IT capability variables (data consistency, cross functional application and supply chain application) are significantly predict Supplier integration. F (3, 128) = 136.128, p<.05 as shown by ANOVA table. The R^2 for the overall model was .761 and the adjusted R^2 was 0.756 (75.6%) this implies that 75.6 % of the variance in Supplier integration is explained by information technology capabilities (data consistency, cross functional application and supply chain application) indicators.

The unique contribution of each independent variable explains as follows;

The seventh predictor; Data consistency capability is statistically significant indicator as the result shows (β=.156 t= 3.155 p= 0.002). This means keeping other independent variables constant, as the beta value of 0.156 indicates that if there is a one-unit increase in data consistency capability there will be a 15.6% increase in customer integration. The eighth predictor cross functional applications capability is a statistically significant effect on supplier integration as the result shows (β=.623 t= 9.689 p= 0.000). This indicates that keeping other independent variable constant, as the beta value of 0.623 indicates that if there is a one –unit increase in cross functional application capability there will be a 62.3% increase in Supplier integration. The ninth predictor; supply chain applications capability is statistically significant indicator as the result shows (β=.222 t= 3.787 p= 0.000). This means keeping other independent variables constant, as the beta value of 0.222 indicates that if there is a one-unit increase in supply chain applications capability, there will be a 22.2 % increase in supplier integration

In general as explained by the multiple regression analysis, all IT capability variables predict the Supplier integration especially cross functional application followed by supply chain applications has a high effect on supplier integration.

5.3. Conclusion

Based on the empirical findings of the study this research reached to the following conclusions.

- ✓ The result found from the Pearson correlation indicated that all information technology capability indicators (Data consistency, cross functional applications and supply chain applications) have positive and significant correlation with all supply chain integration variables (internal, customer and supplier integrations)
- ✓ As sown in the multiple regression analysis results, all information technology capability indicators (Data consistency, cross functional applications and supply chain applications) have positive and significant effect with all supply chain integration variables (internal, customer and supplier integrations) as explained their unique effect as follows;
- ✓ Data consistency positively and significantly affects the internal integration
- ✓ Cross functional applications positively and significantly affect the internal integration
- ✓ Supply chain applications positively and significantly affects the internal integration
- ✓ Data consistency positively and significantly affects the customer integration
- ✓ Cross functional applications positively and significantly affect the customer integration

- ✓ Supply chain applications positively and significantly affects the customer integration
- ✓ Data consistency positively and significantly affects the supplier integration
- ✓ Cross functional applications positively and significantly affect the supplier integration
- ➢ Supply chain applications positively and significantly affects the supplier integration

5.3. Recommendation

Based on empirical findings of the study the following recommendations are forwarded.

- ✓ The major findings from the correlation analysis shows the positive and significant relationship between all information technology capability indicators (Data consistency, cross functional applications and supply chain applications) and all supply chain integration variables (internal, customer and supplier integrations). It is advisable for import and export companies to consider all variables to improve their supply chain integration
- ✓ From all Information technology capability variables, cross functional application has a high effect on the three supply chain integration variables followed by supply chain applications. Accordingly, it is better to improve the Integrative inventory management, data integration, ERP, Real-time searching of logistics-related operating data and Real-time integration and connection among internal functions of the supply chain, Supply chain planning applications, transaction applications, real- time supply chain and customer relationship management applications with internal applications of the organization

5.4. Research contribution and Limitation

Instead of taking information technology and supply chain integration as a single construct, In this study the various dimension of information technology capabilities (Data consistency, cross functional applications and supply chain applications) and (internal, customer and supplier integrations) were studied. However, it would be better if other information technology capability dimensions were added and if these concepts were studied by evaluating their effect on operational performance. Unlike previous researches in the area mainly focus on the case study level this study was undertaken on import export industry.

5.5. Direction for future researches

Despite these variables of information technology capabilities and supply chain integration variables, other variables have to be considered by future researchers and it is better to align their effects on operational performance. Furthermore, it will be good if future researchers studied this topic in manufacturing industry.

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Appendix

Questionnaire

I am logistics and supply chain management Student at Addis Ababa University. The questionnaire is designed to seek information on the effect of information technology capabilities on supply chain integration. The data collected will be treated with strict confidentiality and it is only for academic purpose. In order to insure its confidentiality, do not write your name and you are kindly asked to answer the questions honestly and objectively as possible

PART ONE

Personal information

Gender Male ☐ Female ☐

Year of experience in the organization

Less than 1 year ☐

1 to 5 years ☐

5 to 10 years ☐

Above 10 ☐

PART TWO

Measuring of supply chain integration and information technology capabilities on the base of the following variables

Indicate to what extent each of the following statements are in relation to supply chain integration on a

1= strongly disagree 2= disagree 3= Neutral 4= Agree 5= strongly agree

Supply chain integration	1	2	3	4	5
Internal integration					
The use of periodic interdepartmental meetings among internal functions					
The use of cross functional teams in new product development					
The extent of strategic partnership among different internal functions					
Different internal functions jointly develop strategic plans in collaboration with each other					
Different internal functions monitor business processes together					
Different internal functions jointly develop and maintain measurement systems					
Customer integration					
The extent of our linkage with our major customer through information network					
The extent of sharing of market information by our major customer					
Our level of communication with our major customer					
The establishment of a quick ordering system with our major customer					
Our follow-up with our major customer for feedback					
The frequency of our contacts with our major customer					
Our major customer shares demand forecast with us					
Supplier integration					
Our level of information exchange with our major supplier through information network					
The establishment of a quick ordering system with our major supplier					
The extent of our strategic partnership with our major supplier					
Stable procurement through networking with our major supplier					
The participation level of our major supplier in our procurement and production processes					
The level of participation by our major supplier in our product design					
Our major supplier shares its inventory availability with us					
We share our demand forecast with our major supplier					

Information technology capabilities					
Data consistency					
Electronic data Interchange (EDI) coverage					
Automatic data capture systems are used (e.g. bar code) across the supply chain					
Definitions of key data elements (e.g. customer, order, and part number) are common across the supply chain					
Same data (e.g. order status) stored in different databases across the supply chain is consistent					
Cross-functional application					
Our Company has data integration among internal functions					
Enterprise application integration among internal functions					
Integrative inventory management					
Real-time searching of logistics-related operating data					
Real-time integration and connection among internal functions of the supply chain					
Supply chain application					
Supply chain planning applications (e.g. demand planning, transportation planning, manufacturing planning) communicate in real time					
Supply chain transaction applications (e.g. order management, procurement, manufacturing and distribution) communicate in real time					
Supply chain applications communicate in real time with internal applications of our organization (e.g. ERP)					
Customer relationship management applications communicate in real time with internal applications of our organization					

Appendix 2

Table 4.1 Tests of Normality for (Internal integration and IT capabilities (data consistency, cross functional application, supply chain applications)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Studentized Residual	.067	132	.200*	.986	132	.211

Table 3: tests of normality CI & ITC

Table 4.2 Tests of Normality for (Customer integration and IT capabilities (data consistency, cross functional application, supply chain applications)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Studentized Residual	.058	132	.200*	.988	132	.298

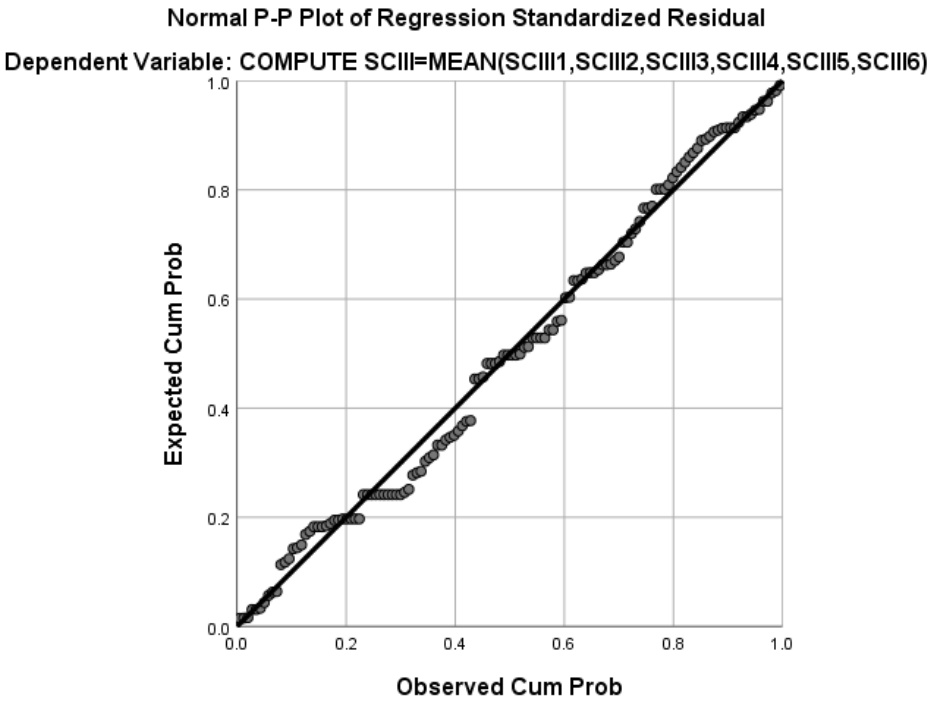
Table 4:Tests of normality SI & ITC

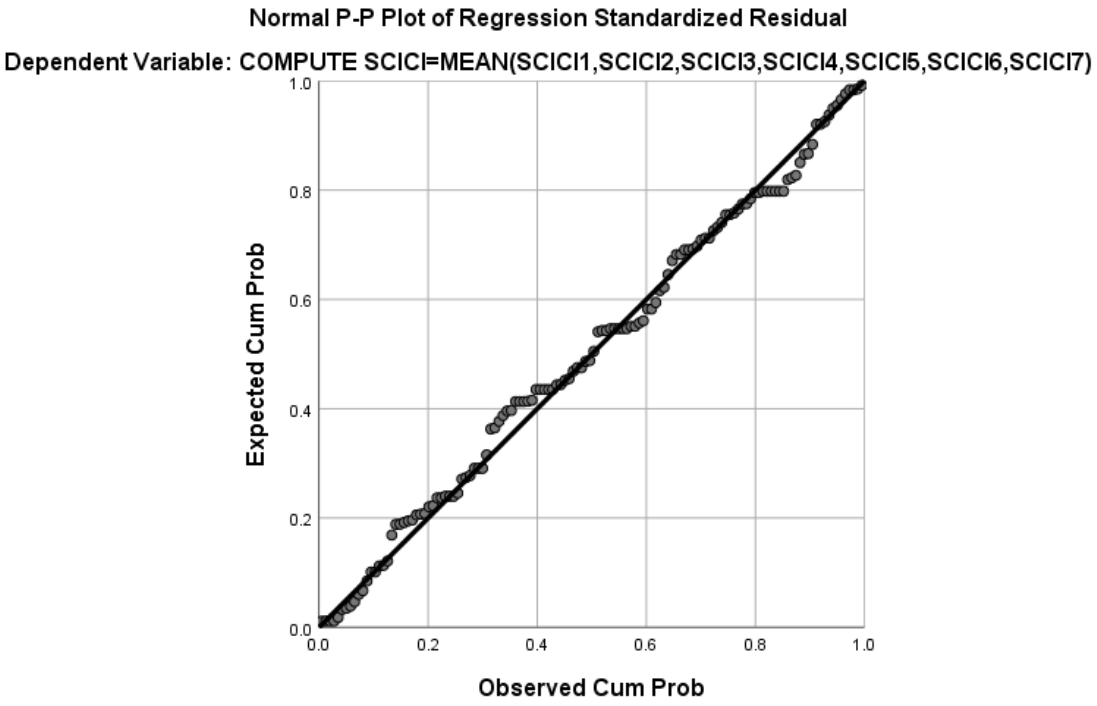
Table 4.3 Tests of Normality for (Supplier integration and IT capabilities (data consistency, cross functional application, supply chain applications)

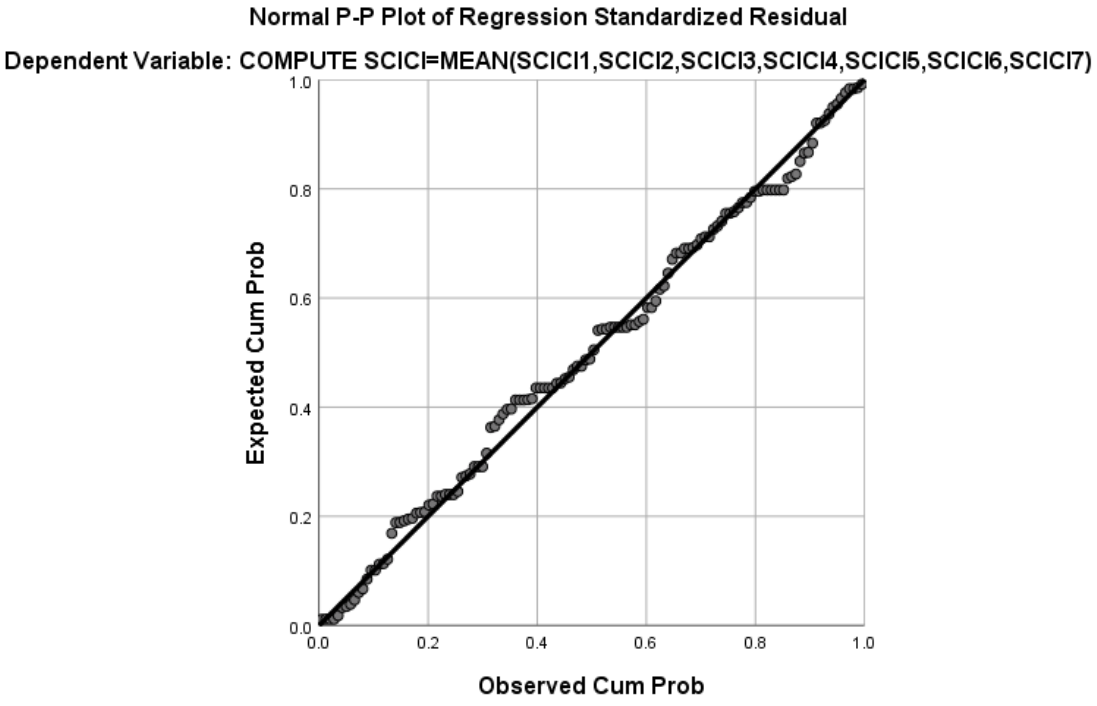
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Studentized Residual	.074	132	.070	.984	132	.130

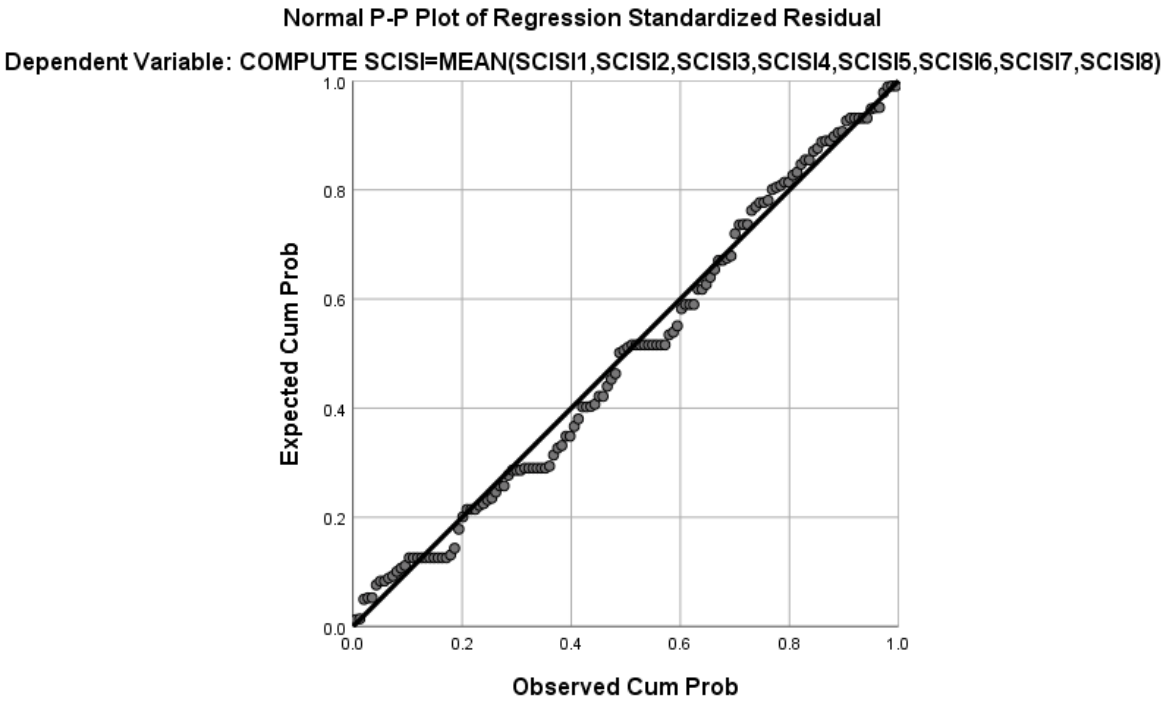
Table 4.4 multicollinearity test table

Model	Tolerance	VIF mean
ITCDC	0.765	1.308
ITCCFA	0.451	2.218
ITCSCA	0.541	1.847




Normal P-P Plot of Regression Standardized Residual
Dependent Variable: COMPUTE SCICI=MEAN(SCICI1,SCICI2,SCICI3,SCICI4,SCICI5,SCICI6,SCICI7)
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: COMPUTE SCICI=MEAN(SCICI1,SCICI2,SCICI3,SCICI4,SCICI5,SCICI6,SCICI7)
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0



Descriptive

No.	Item		Frequency	Percent	Valid Percent	Cumulative Percent
1.	Gender	Male	75	56.8	56.8	56.8
2.		Female	57	43.2	43.2	100.0
3.		Total	132	100.0	100.0	
		1-5 years	99	75.0	75.0	75.0
		5-10 years	33	25.0	25.0	100.0
		Total	132	100.0	100.0	

4.4.1. Pearson's Product Moment Correlation Coefficient

Table 4.6 correlations between IT capability variables and supply chain integration variables

Correlations					
	SCIII=	SCICI	SCISI	ITCDC	ITCSCA

						ITCCFA		
SCIII	Pearson Correlation	1	.794**	.705**	.525**	.794**	.737**	
	Sig. (2-tailed)		0	0	0	0	0	
	N	132	132	132	132	132	132	
SCICI	Pearson Correlation	.794**	1	.791**	.562**	.818**	.762**	
	Sig. (2-tailed)	0		0	0	0	0	
	N	132	132	132	132	132	132	
SCISI	Pearson Correlation	.705**	.791**	1	.517**	.848**	.686**	
	Sig. (2-tailed)	0	0		0	0	0	
	N	132	132	132	132	132	132	
ITCDC	Pearson Correlation	.525**	.562**	.517**	1	.481**	.277**	
	Sig. (2-tailed)	0	0	0		0	0.001	
	N	132	132	132	132	132	132	
ITCCFA	Pearson Correlation	.794**	.818**	.848**	.481**	1	.675**	
	Sig. (2-tailed)	0	0	0	0		0	
	N	132	132	132	132	132	132	
ITCSCA	Pearson Correlation	.737**	.762**	.686**	.277**	.675**		1
	Sig. (2-tailed)	0	0	0	0.001	0		
	N	132	132	132	132	132	132	
** Correlation is significant at the 0.01 level (2-tailed).								

Table 4.7 Regression for the effect of IT capabilities (data consistency, cross functional application and supply chain application) on internal integration

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.859[a]	.738	.732	.25781	1.941

a. Predictors: (Constant), ITCSCA, ITCDC, ITCCFA

b. Dependent Variable: SCIII

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	23.934	3	7.978	120.029	.000[b]
	Residual	8.508	128	.066		
	Total	32.441	131			

a. Dependent Variable: SCIII

b. Predictors: (Constant), ITCSCA, ITCDC, ITCCFA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	.381	.221		1.722	.088		
	ITCDC	.253	.062	.210	4.066	.000	.765	1.308
	ITCCFA	.333	.052	.431	6.390	.000	.451	2.218
	ITCSCA	.264	.042	.388	6.299	.000	.541	1.847

a. Dependent Variable: SCIII

Table 4.8 Regression for the effect of IT capabilities (data consistency, cross functional application and supply chain application) on customer integration

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.892[a]	.796	.791	.19902	1.862

a. Predictors: (Constant), ITCSCA ,ITCDC, ITCCFA

b. Dependent Variable: SCICI

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	19.741	3	6.580	166.136	.000[b]
	Residual	5.070	128	.040		
	Total	24.811	131			

a. Dependent Variable: SCICI

b. Predictors: (Constant), ITCSCA, ITCDC, ITCCFA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
	(Constant)	.823	.171		4.820	.000		
	ITCDC	.257	.048	.245	5.353	.000	.765	1.308
	ITCCFA	.288	.040	.426	7.155	.000	.451	2.218

	ITCSCA	.242	.032	.407	7.490	.000	.541	1.847

a. Dependent Variable: SCICI

Table 4.9 Regression for the effect of IT capabilities (data consistency, cross functional application and supply chain application) on Supplier integration

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.873[a]	.761	.756	.21072	1.823

a. Predictors: (Constant), ITCSCA ,ITCDC, ITCCFA

b. Dependent Variable: SCISI

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	18.133	3	6.044	136.128	.000[b]
	Residual	5.683	128	.044		
	Total	23.816	131			

a. Dependent Variable: SCISI

b. Predictors: (Constant), ITCSCA, ITCDC, ITCCFA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	1.051	.181		5.818	.000		
	ITCDC	.160	.051	.156	3.155	.002	.765	1.308
	ITCCFA	.413	.043	.623	9.689	.000	.451	2.218
	ITCSCA	.130	.034	.222	3.787	.000	.541	1.847

a. Dependent Variable: SCISI