UNIVERSITI TEKNOLOGI MARA

VALUE CHAIN MANAGEMENT PRACTICES AND SUPPLY CHAIN PERFORMANCE IN MANUFACTURING INDUSTRY: THE MEDIATING ROLE OF SUPPLY CHAIN INTEGRATION

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 20 June 2025 to conduct the final examination of Noor Asleena Binti Asnordin on her Doctors of Philosophy thesis entitled "Value Chain Management Practices and Supply Chain Performance in Manufacturing Industry: The Mediating Role of Supply Chain Integration" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The Panel of Examiners was as follows:

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ABSTRACT

The purpose of this study is to investigate the relationship of three factors: value chain management practices (VCMP) that consists of professional human resource, firm infrastructure, procurement and information and communication technology, supply chain integration (SCI) and supply chain performance (SCP) among manufacturing industry employees in Malaysia. It presents a conceptual model in which VCMP implementation can affect SCP either directly or indirectly, via SCI. This study is perhaps one of the few to address the effect of VCMP towards the overall performance of the SCP in consideration of the mediation effect of SCI. The research design for this study employ quantitative method of stratified random sampling and survey questionnaires that have been developed based on detailed analysis of relevant literature. A pilot study has been conducted to check the strength of the VCMP in Malaysia manufacturing industry, and hierarchical regressions analysis was used to test the relationship between VCMP, SCI and SCP. A total of 379 questionnaires were distributed to manufacturing firms in Johor, Klang Valley and Pulau Pinang. Furthermore, the study sample is focused on the manufacturing sector with respondents from the sector itself. A total of 6 variables of value chain management practices and supply chain integration towards supply chain performance with 35 items have been developed; professional human resource, firm infrastructure, procurement supplies services, information and communication technology, supply chain integration and supply chain performance. In addition, the result of this research presents a good and better recommendation of overcoming the problem of value chain management practices in supply chain for manufacturers who consider in advancing their firm's performance. Manufacturing companies in Malaysia need to understand and realize that value chain management practices can bring major benefit towards company's performance and at the same time make own manufacturing company as industrial paradigm of the ideal manufacturing sector. The study successfully manages to obtain 95% of valid responses from the Malaysian manufacturing industry which shows that there is an encouraging level of implementation in value chain management practices among the manufacturing firms, with influence of supply chain integration as mediator to increase the firm's supply chain performance in a single setting. Moreover, the mediating effects of supply chain integration in Malaysia manufacturing industry have been explained further. Furthermore, this research contributes to the development of a contingency theory of value chain management practices suggesting that the impacts of value chain management practices on supply chain performance vary under different levels of supply chain integration. An organization needs to consider each component of value chain management practices to ensure long-term business operation and the outcome of this research also provide additional insight into supply chain performance. The implications are discussed to provide insights for future research in this area. In addition, the study contributes to the supply chain management literature by clarifying the mediating effects of supply chain integration on the relationship between value chain management practices and supply chain performance. The study offers a foundation for future research in diverse manufacturing contexts.

Keywords: Value chain management practices, Supply chain integration, Supply Chain performance

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Noor Asleena Asnordin
September 2025

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LIST OF ABBREVIATIONS

Abbreviations

CEDAR	Centre for Entrepreneur Development and Research
FMM	Federation of Malaysian Manufacturers
HR	Human Resource
ICT	Information and Communication Technology
MIDA	Malaysia Investment Development Authority
MITI	Ministry of International Trade and Industry
MOF	Ministry of Finance
PHR	Professional Human Resource
RBV	Resource-Based View
SC	Supply Chain
SCI	Supply Chain Integration
SET	Social Exchange Theory
SMI	Small and Medium Industries
UNIDO	United Nations Industrial Development Organization
VCM	Value Chain Model
VCMP	Value Chain Management Practices

CHAPTER 1
INTRODUCTION

1.1 Introduction

This opening chapter seeks to bring to shed the light on the subject and the purpose of this thesis. In specific, this chapter contains the background of study where it will explain why researcher chooses value chain management practices, why selecting the manufacturing sector as the study area, and why conducting the study in Malaysia. It will also explain issue that occurs in the problem statement. With the problem identified, it will help build the research questions and objectives on what and how to conduct this study. Next, there will be evidence from previous research to elucidate this study in the justification of current research. This study will also educate future researcher and readers on the study's contribution in terms of theoretical and managerial contributions. Furthermore, it enlightens on what are the barriers and limitations of conducting this study. Lastly, a thesis outline is presented in a diagrammatic form to show how different chapters of this study related to the entire process of research.

1.2 Background of the Study

In the current era of intense global competition, the performance of supply chains has moved beyond being viewed as a purely operational function. It is increasingly recognized as a central driver of organizational survival and long-term competitiveness. Firms today rely on efficient and resilient supply chains to create value, achieve cost efficiency, and maintain responsiveness to rapidly changing markets (Christopher, 2022). Weaknesses in this area rarely remain contained. Interruptions such as delivery delays, production bottlenecks, or supplier failures can escalate into financial setbacks, eroded customer trust, and diminished market presence (Ivanov et al., 2020). For manufacturing firms in particular, where synchronization and precision are paramount, even minor inefficiencies may result in substantial operational disruptions and reputational risks (Chopra & Meindl, 2021).

Although technologies such as automation, predictive analytics, and digital integration have been adopted widely, many organizations still fall short of achieving the agility and resilience required to navigate uncertainties in global demand, supply risks, and sustainability pressures (Sodhi & Tang, 2021). These persistent challenges highlight the importance of examining what types of organizational resources and capabilities can underpin stronger supply chain performance and contribute to competitive advantage. The Resource-Based View (RBV) offers a useful theoretical lens to investigate these issues. According to RBV, firms gain sustained advantage not simply from their external market positioning but from their ability to acquire, develop, and deploy unique internal resources and capabilities that are valuable, rare, and difficult to replicate (Barney, 1991). Applying this framework to supply chains shifts the analytical focus toward how resources such as digital technologies, inter-organizational collaboration, managerial skills, and integration processes can be transformed into distinctive capabilities. These capabilities enable firms to improve efficiency, strengthen resilience, and innovate in an increasingly volatile business environment.

Building on this perspective, the present study seeks to identify the critical determinants of supply chain performance while emphasizing the role of strategic firm-specific resources. By situating supply chain management within the RBV framework, the research aims to demonstrate how internal resources, when effectively aligned with supply chain processes, can be leveraged to sustain competitive advantage in a complex and uncertain global economy. Malaysia's supply chain performance has experienced both progress and persistent challenges over the last several years. The World Bank's 2023 Logistics Performance Index (LPI) shows Malaysia climbing 15 spots to 26th globally, placing it second in ASEAN after Singapore. This achievement highlights upgrades in infrastructure, trade facilitation, and digital logistics adoption. Nonetheless, unresolved issues such as regulatory misalignments, cross-border frictions, and shortages of specialized labor continue to hold back efficiency and resilience.

Rising costs present another obstacle for firms. As reported by The Malaysian Reserve (2023), inflation has driven up warehouse rentals and freight rates, pressuring companies across industries. Even so, Malaysia maintains a pivotal role in global supply networks, particularly in technology manufacturing. Its contribution to semiconductor production is significant—about 13 percent of global packaging and testing takes place in Malaysia—demonstrating its importance in international supply chains.

To sustain and strengthen this role, Malaysia is actively investing in automation, sustainability initiatives, and collaborative practices among stakeholders. PwC Malaysia (2023) notes that workforce development remains a crucial factor in maintaining competitiveness.

Meanwhile, participation in regional frameworks such as the Regional Comprehensive Economic Partnership (RCEP) provides opportunities to reduce trade barriers and improve logistics efficiency. Taken together, these developments illustrate a supply chain environment that is dynamic but still constrained by underlying vulnerabilities. Beyond Malaysia's experience, it is important to consider the global context. Supply chains today form highly complex systems linking suppliers, producers, distributors, and consumers (Sharma & Joshi, 2023). These networks are becoming increasingly decentralized and multifaceted, shaped by diverse actors and varied organizational structures (Seyedghorban et al., 2020). Such changes allow companies to exploit worldwide resources and build resilience, while also adding new layers of coordination and governance challenges.

A key barrier facing global supply chains is insufficient visibility. Many firms cannot fully track materials and products across their networks, nor do they have access to accurate, real-time data (Ivanov & Dolgui, 2020). Limited information flow hampers decision-making, causing delays and misalignment between supply and demand (He & Wang, 2020). Without end-to-end visibility, organizations risk accumulating excess inventory that drains capital or experiencing shortages that compromise customer satisfaction. In addition to visibility problems, structural design plays an important role in shaping supply chain outcomes. Hendiani, Liao and Jabbour (2020) argue that while prior studies emphasize integration and information sharing, the impact of organizational structure itself is less frequently examined. Even advanced information systems cannot compensate for poorly designed supply chains. Structures misaligned with customer requirements may ultimately prevent firms from reaching high performance levels.

The human dimension also deserves closer attention. Supply chain operations and professional human resources (PHR) have often been studied separately despite being deeply connected (Barnes & Liao, 2012). Jang and Ardichvili (2020) highlight PHR in operations management as a promising research area. Employees are not only operators but also decision-makers who directly influence outcomes.

Ou et al. (2010) point out that strong HR practices are critical for successful implementation and continuous improvement of supply chain systems. Professional human resources are especially critical in driving supply chain performance in the manufacturing industry.

Unlike service-based sectors, manufacturing supply chains demand precise coordination across procurement, production, logistics, and distribution, which requires professionals equipped with both technical knowledge and strategic decision-making abilities (Haq et al., 2023). Beyond routine operations, human capital in this context supports innovation, problem-solving, and quality enhancement, which are all essential for sustaining efficiency and competitiveness (Haq et al., 2023). Moreover, well-structured HR practices—such as skills training, knowledge transfer, and performance evaluation—contribute to building a flexible and responsive workforce capable of adapting to supply chain disruptions and technological shifts (Haq et al., 2023). When human capital strategies are aligned with supply chain objectives, firms are more likely to achieve resilience and long-term competitive advantage in volatile global markets (Haq et al., 2023).

Technology serves as another vital enabler. Information and communication technology (ICT) facilitate the exchange of data across organizational boundaries and enhances collaboration (Wang, Zhang & Goh, 2021). Numerous scholars view ICT as a central determinant of effective supply chains (Singh & Teng, 2016). From this perspective, Irfan et al. (2020) note that alignment of ICT across partner firms signals coordinated investment and synchronized operations, which strengthen collective performance. Closely linked to ICT is the concept of supply chain integration (SCI). SCI encompasses internal processes, supplier collaboration, and customer connectivity, all of which contribute to competitiveness and efficiency (Kim et al., 2020). Research consistently shows that firms lacking integration struggle to compete effectively (Golgeci et al., 2020). Nevertheless, integration requires suitable organizational and operational conditions to deliver tangible benefits (Wong et al., 2021).

A further complication arises from inconsistent definitions of integration and performance. Scholars have employed different metrics and interpretations, complicating cross-study comparisons (Gimenez & Donk, 2012; Hussain, 2020). Shin et al. (2021) emphasize that meaningful evaluation of SCI's impact on performance depends on examining the specific variables used to measure both constructs.

Hussain (2020) stresses that supply chain performance assessment itself remains underexplored, leaving an important research gap. These challenges gained urgency during the COVID-19 pandemic, which represented a major disruptive shock to global and national supply chains.

Manufacturers were confronted with simultaneous pressures: rising demand for essential goods, shortages of inputs, and production capacity limits (Queiroz, 2020; Kumar & Singh, 2021). Ivanov (2021) described this as a dual disruption affecting both supply and demand, with potential to trigger systemic breakdowns without immediate corrective action. Malaysia's supply chains were further constrained by the Movement Control Order (MCO). Restrictions on business activity resulted in significant losses. MITI (2021) estimated that investments worth RM62.5 billion, supporting more than 112,000 jobs, were severely impacted. In only the first two weeks of the MCO, the manufacturing sector registered losses of RM64.6 billion in production and RM32 billion in exports, reflecting the severe disruption to national and global supply participation.

Given that manufacturing contributes heavily to Malaysia's GDP, employment, and trade, the economic fallout was substantial. According to MIDA (2022), Malaysia continues to attract foreign direct investment in manufacturing, ranging from electronics to renewable energy industries such as solar panels. Yet, Schmidt and Sinha (2021) caution that even after lockdowns were lifted, the challenge lay in rebuilding coordinated, timely, and efficient supply chain operations under heightened uncertainty. Queiroz, Dolgui and Fosso (2020) argue that scenario-based assessment enhances preparedness and recovery. Kumar and Singh (2020) note that the crisis particularly strained supply of medical equipment and essential goods. Ivanov and Dolgui (2020) warn that unless vulnerabilities are addressed, the economic consequences may be extended.

The experience of COVID-19 and the MCO highlights a critical lesson: supply chain performance depends not only on external conditions but also on how effectively firms mobilize internal resources and capabilities. This recognition provides the foundation for applying the Resource-Based View (RBV). RBV suggests that organizations achieve sustainable advantage by developing and deploying unique resources—human, technological, and structural—that competitors cannot easily replicate.

Grounding this study in RBV allows for a deeper examination of how these firm-specific resources can be transformed into capabilities that protect and enhance supply chain performance, even under highly uncertain and disruptive conditions. The COVID-19 pandemic and the subsequent Movement Control Orders (MCO) have significantly disrupted manufacturing operations, exposing vulnerabilities in supply chains and emphasizing the need for resilient practices.

These disruptions have highlighted the critical role of human resource capabilities in ensuring that supply chains continue to operate efficiently under challenging conditions. In particular, professional human resources (PHR) are essential for coordinating complex operations, making informed decisions, and maintaining integration across procurement, production, and logistics functions. Prior studies have shown that firms with well-developed PHR capabilities achieve higher supply chain performance, including improved efficiency, responsiveness, and overall operational effectiveness. Therefore, this study focuses on PHR to examine how skilled human resources contribute to enhancing supply chain performance in the manufacturing sector, providing both theoretical insights and practical guidance for improving resilience and efficiency.

1.3 Problem Statement

Manufacturing firms face challenges in enhancing supply chain performance due to variations in resources, capabilities, and integration practices. Design factors such as professional human resources, firm infrastructure, procurement processes, and information and communication technology play a critical role in determining supply chain performance, yet empirical evidence on their effects remains limited, particularly in developing Asian contexts (Aloini et al., 2012; Zhang & Kuo, 2021). Although value chain management and supply chain integration are recognized as key drivers of performance, existing research provides insufficient understanding of how these factors influence outcomes across diverse manufacturing settings.

By applying the Resource-Based View (RBV) theory, this study aims to address these theoretical gaps while offering practical insights to enhance supply chain performance in Malaysian manufacturing firm. Malaysia is considered as one of the fastest growing economies in the South-east Asia and Asia Pacific region.

The country is perceived as having a steady growth based on the strong fundamentals of agro-economics and natural resources. The real GDP has been growing consistently over the 4 percent mark in 2019. Nevertheless, Malaysia's growth in recent times has been driven by the manufacturing and service sectors. This steady growth and economic prosperity have been a significant contribution through skilled manpower, low cost, political stability and large influx of foreign direct investment (FDI).

As such, Malaysia was seen as a very attractive investment destination by global multinational corporation (MNC) and other players. In order to achieve the remarkable growth, Malaysia should give more highlights on supply chain as supply chain management is an integration of various business processes such as demand planning and forecasting, procurement, manufacturing and assembly, distribution and return of effective and efficient management of flow of resources from point of origin to point of destination, in order to meet customer requirement (Stock & Boyer, 2009; Cao & Zhang, 2011). According to Bataineh and Hajar (2020), supply chain management includes the total connectivity between the upstream [supply and manufacturing] and downstream [distribution] value chain entities in order to achieve competitiveness. As such, the value chain management practices (VCMP) can also be addressed as the downstream of supply chain management (Seebacher & Winkler, 2013).

This highlights that there is insufficient integration of VCMP in supply chain management (SCM). The primary role of VCMP is to meet customer requirement in terms of providing one with the right product (Chen & Paulraj, 2004) of right quality (Saglietto, Fulconis & Forradellas, 2016) and quantity (Woo & Saghiri, 2011) from the right source (Ashby, Leat & Hudson-Smith, 2012) at the right price (Defee et al., 2010) and finally utilizing the right technology (Shepherd & Gunter, 2010). Moreover, SC also has been distinguished for its strategic role in coordinating business processes across trading partners and simultaneously to improve both the performance of an individual organisation (Ralston et al., 2015) and the performance of the entire supply chain (Yu, 2015; Rajesh & Ravi, 2015).

In order to compete, supply chain management seeks close integration with internal functions within firm and external linking with suppliers, customers and other channel members. This could be achieved through effective construction of various supply chain practices (Huang, Yen & Liu, 2014). Khajavi, Partanen and Holmstrom (2014) highlight that despite understanding the fundamentals of supply chain management, many business organizations remain unclear about the specific practices required to enhance performance. This uncertainty underscores the ongoing challenge of identifying and implementing effective strategies to optimize supply chain operations and achieve sustainable competitive advantages. Once the Covid19 pandemic occurred in the beginning of March 2020, it has impacted the whole world including the manufacturing industry and it has affected the supply chain of the manufacturers all around the world as well as Malaysia.

Despite of that, Malaysia has continued to attract huge investments in the manufacturing sector despite a challenging economic environment due to its highly-diversified economy, strong manufacturing foundation, developed infrastructure and connectivity, proactive Government policies and hardworking workforce (CEDAR, 2020). In addition, SC has captured the interest of many practitioners and scholars in recent years (Mishra & Singh, 2022). Nkrumah, Apam and Boadu (2020) emphasize that this popularity has been due to the fact that supply chain management is a vital element for operational success.

However, a continuous and sustained economic growth in the long run cannot be based on the low costs advantage alone; given the rapid expansion of the manufacturing sector in China, India and Vietnam. Thus, the only way Malaysia can capture more FDI primarily in the manufacturing sector is to be more productive and

cost efficient through excellent supply chain management practices and integration (Kumar & Singh, 2017 Migdadi & Yousif, 2018). Meantime, globalization has driven many corporations, mainly the manufacturing firms, to widen their resources and capability enhancement from internal environmental practices to greater heights. Attention is increasingly shifting towards external collaboration and networking outside the boundaries of the organisation (Danese, Romano & Formentini, 2013; Saeidi & Sofian, 2015). This requirement became essential in order to be competitive locally and across the border (Lambert & Cooper, 2000; Christopher & Ryals, 2014). As to achieve this, organisation needs to have strong supply chain practices and inter-organisation integration of its elaborate network of business relationships.

Therefore, there is an approaching need for value chain management practices in all sectors across each value chain entity. In striving towards a high-income nation status by 2020, the Malaysia's manufacturing sector remains a core sector for sustainable growth under the 11th Malaysia Plan. The manufacturing sector has played a vital role in the economic transformation in Malaysia. Thus, value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) are the particular factor that used in this study and measure its effect towards supply chain performance in manufacturing firms in Malaysia also address the above research gap and seeks to provide empirical evidence on this relationship.

Consequently, this research study has discovered a set of new combination of value chain management practices component (variables) which derived from the value chain model of Michael Porter (1985) consists of the support activities which includes human resource management, firm infrastructure, information and communication technology also procurement. The model simply suggests that depth and breadth of these new sets of VCM practices components adopted is a function of downstream practices. This new model is measured by considering supply chain management practices from within the whole system (upstream, downstream, internal process, across supply chain and system orientation).

The new model developed in this study integrates and expands upon insights from prior research, addressing the limitations of earlier, more narrowly focused approaches. For instance, Chong, Chan, Ooi and Sim (2011) emphasize the importance of specific operational efficiencies, while Pettit, Croxton and Fiksel (2013) explore resilience within supply chains.

Mukhsin, Moh and Najmuddin (2020) further contribute by focusing on adaptability within evolving market dynamics. By synthesizing these varied perspectives, the new model offers a holistic framework that captures a broader spectrum of factors influencing supply chain performance.

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Table 1.1
Summarization of Research Gap of This Study

Areas	Statement	Author
Value chain management practices	Far limited and scant scholarly investigation has been undertaken to present a theoretical viewpoint.	Manchidi (2024)
	An understanding of value chain management and the execution of its practices emerge to be of much greater importance to a company to obtain a sustainable competitive advantage in comparison to its competitors.	Barratt (2011); Kim, Choi & Dooley (2011); John et al., (2019); Gartner (2023)
Supply chain	Some business organisations who are clueless and do not know precisely what are the sets of supply chain management practices to be implemented to improve the performance.	Khajavi, Partanen & Holmstrom (2014); Calignano & Mercurio (2023)

1.4 Research Objectives

The objectives of this study are:

1.4.1 To identify the level of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology), supply chain performance and supply chain integration among firms in manufacturing industry.

1.4.2 To determine the influence of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) on supply chain performance among firms in manufacturing industry.

1.4.3 To determine the influence of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) on supply chain integration among firms in manufacturing industry.

1.4.4 To investigate the mediating effect of supply chain integration on the relationship between value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) and supply chain performance among firms in manufacturing industry.

1.5 Research Question

The research questions used in this study are:

1.5.1 What is the level of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology), supply chain performance and supply chain integration among firms in manufacturing industry?

1.5.2 What is the extent of the influence of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) on supply chain performance among firms in manufacturing industry?

1.5.3 What is the extent of the influence of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) on supply chain integration among firms in manufacturing industry?

1.5.4 How does supply chain integration mediate the relationship between value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) and supply chain performance among firms in manufacturing industry?

1.6 Justification of Current Research

The justification of research in this chapter highlights the reasons for why certain area are given importance in this research. It can be justified on three grounds:

1.6.1 Justification for The Selection of Malaysia as The Country of Study

Malaysia is a developing economy country which has experienced vast economic evolution. In the early 1970's, Malaysia was popularly known as a resource-rich country and began to adopt industrial evolution to be a manufacturing export structured economy (Rasiah & Shari, 2020). In 2003, Malaysia achieved the status of one of the most sophisticated export structured economy among developing countries, well above the level predicted, based on its income. Subsequently, Malaysia has shown both rising income and increasing manufacturing sophistication. Hassan and Moini (2021) note that this is particularly interesting because it is a rare instance of successful industrialization in a resource-rich country.

Currently, Malaysia has revealed the possibility of expanding industrial production in a resource-exporting economy (Wong & Kadir, 2020). Nevertheless, the success of the above effort depends whether manufacturing industry in Malaysia could be internationally competitive. This also depends not just on the manufacturing capabilities, which becomes less competitive as a result of the birth of new emerging economies (like China and Vietnam). It depends on the availability of sustainable competitive advantages gained from organisational collaboration through supply chain management. The Malaysian government has been strongly been engaged in planning, designing and implementing policies that concern supply chain. The basis of evident of Malaysian government policies that affect the supply chain can be seen in the New Economic Model (NEM) (NEAC, 2010).

In conclusion based on the above phenomenon, Malaysia, has successfully survived the transformational economy from resources export dependent to manufacturing export dependent which is indeed a rare case. Kamal and Ali (2021) mentioned that as a consequence, Malaysia has proved to increase income growth and manufacturing sophistication. This is particularly interesting because it is a rare instance of successful industrialization in a resource-rich country. Owing to the above uniqueness, Malaysia offers an interesting case for a middle-income economy.

1.6.2 Justification for The Selection of The Manufacturing Sector

Manufacturing or production operations are regarded as leading strategic and tactical functions of any business organisation (Heizer, Render & Munson, 2020). Apparently, this strategic function can be further synergized to realize its full potential if it is managed effectively and efficiently, throughout the total business process (Slack, Chamber & Johnston, 2021). In addition, recently, the ever changing and demanding customer requirements has forced manufacturers to adopt new manufacturing capabilities such as flexibility, adaptability, responsiveness and innovativeness (Bessant & Tidd, 2020). Tseng and Chiu (2020) highlight that compounding to it, globalization with a borderless competitive structure has required manufacturers to be more objective in terms of quality, cost, delivery, and flexibility.

As a consequence, upon reaching independence in 1957, Malaysia formulated a robust industrial policy with primarily targeting to promote industrial development, particularly with foreign direct investment (FDI) performing an essential role. Accordingly, foreign direct investment inflow to manufacturing will be the gateway for Malaysia to obtain new technology, capital and expertise as well as access to overseas market. Hence, Industrial Master Plan was executed in the mid-1980, which in principle aims to enhance the process of achieving a sustainable and competitive growth in the manufacturing base. Budhwar et al. (2019) argue that this means setting a strong foundation for a diversified approach through industrial strategy shifted from an inward-looking approach to an outward-looking, export-oriented one.

The above phenomenon and scenario provide adequate evidence of Malaysia investing heavy trust on manufacturing sector for the purpose of developing the economy. Hence, the manufacturing industry in Malaysia has set an example of a developing country that has successfully harnessed resource exports for export-oriented manufactures. Owing to the above importance of manufacturing sector, this study aims to identify the right practices for manufacturing firms' performance enhancement.

Recently due to the outbreak of Covid-19, the movement control order (MCO) is having an impact on manufacturers as not all are classified as essential. The uncertainty over the immediate health and future of manufacturing is a source of concern. The Star (April 2020) reports that the consensus to restart the manufacturing sector, along with other segments of the economy, is now picking up speed.

1.6.3 Justification for The Selection of Supply Chain as Research Area

Supply Chain Management (SCM) is a multifaceted concept with various definitions. From a business process perspective, a supply chain (SC) typically extends globally, encompassing production, trade, and logistics organization across different countries (Handfield & Melnyk, 2021). Kochak and Sharma (2015) together with Li and Liu (2019) explain that from a business function perspective, supply chain management involves coordinating and managing three key flows: the product flow from suppliers to end customers, the financial flow of money from customers to suppliers, and the information flow that links suppliers and customers.

From the perspective of a business entity, the supply chain encompasses not only the products but also the entire network of organizations, people, resources, and services involved (Stefanovic & Stefanovic, 2009; Stefanovic & Stefanovic, 2017; Coyle et al., 2020). To reach this level of sophistication, SCM solutions are typically designed to streamline all major flows among various functions, both within and between different enterprise organizations.

There are numerous research studies (Shepherd & Gunter, 2010; Hassini, Surti & Searcy, 2012; Govindan, Kaliyan, Kannan & Haq, 2014; Tehseen & Ramayah, 2015; Wang, Gunasekaran, Ngai & Papadopoulus, 2016; Sarkis & Talluri, 2021) that generally indicate supply chain management as a sustainable growing management network of supply chain members which strategically drives improvement to financial and non-financial (or operational) performance. Past research studies (Jin, Vonderembse, Ragu-Nathan & Smith, 2014; Zheng, Yildiz & Talluri, 2015; Jasti & Kodali, 2015; Swarnakar & Vinodh, 2016; Ayoub, Abdallah & Suifan, 2017; Kumar & Raut, 2022), have found the focus of supply chain management for most companies has shifted from cost reduction to the overall business impact and shareholder value.

Considering the above importance of the supply chain management, the Malaysian government has intensified the responsibility of the Federation of Malaysian Manufacturers (FMM) to bring changes to the local industry by enhancing their competitiveness and aligning their supply chain (Retrieved from FMM, 2021). Tan and Zainuddin (2022) explain that accordingly, FMM has engaged in the automation of local industry supply chain management (SCM) processes with the strategic purpose of preparing local industries to compete globally.

Although it is the key role of supply chain management practices in the SCM phenomenon, limited empirical research studies and investigation has been carried out to justify on, how supply chain management practices could yield total supply chain performance (Sundram, Ibrahim & Govindaraju, 2011; Hong, Zhang & Shi, 2018; Caniato et al., 2021). Therefore, new supply chain management practices models are required for continual improvement of supply chain performance.

1.7 Significance of the Study

The study's contribution is for the interest of scholars in VCMP, integration, and manufacturing sector, as well as to participating managers in the manufacturing firms. Studies on professional human resource, firm infrastructure, procurement and ICT are core areas of research in the field of value chain, to which this study would be significant. Moreover, the result of this study would give an excellent viewpoint on how to overcome the problem of maintaining the supply chain performance through VCM practices and supply chain integration. It is important to make the manufacturing firms in Malaysia realize the benefits of adopting value chain practice and integration into their supply chain.

1.7.1 Practical Implication and Contribution

An additional information on professional human resource, firm infrastructure, information and communication technology and procurement can be gained by the leaders in the organizations. It could be useful for the leaders to improve or raise the factors mentioned above that can give advantages to the culture in the organization in the future such as enhancing open communication and fostering a culture of innovation could help the organization become more adaptive and responsive to changes in the market, ultimately leading to greater long-term success.

The outcomes of this study can be used by the management in organizations for the progression of business practices to produce better employees. For example, by implementing training programs based on the study's findings, managers can improve employee skillsets and motivation, leading to enhanced performance and job satisfaction across the organization. This study also might be helpful and support for the organizations in increasing their supply chain performance.

For instance, by applying the study's recommendations on optimizing inventory management and improving supplier relationships, organizations could streamline operations, reduce costs, and enhance overall supply chain efficiency. Other than that, from this study, it can also help the organization as a guideline to improve the professional human resource, firm infrastructure, information and communication technology and procurement among employees of the organization in the future. For example, by using the study's insights, the organization could invest in employee training programs to enhance professional skills, upgrade technology systems for better communication, and streamline procurement processes to improve efficiency and reduce costs.

It also gives an idea to the management on how important the supply chain performance that affected by the employees' practices. For the organization, they can propose implementing an employee recognition program to ensure that the employees are satisfied with their job and can maximize their effort in ensuring better supply chain performance for the organization. This could include offering incentives for high performance, providing opportunities for career development, and creating a supportive work environment that encourages collaboration and innovation in supply chain processes.

1.7.2 Theoretical Implication and Contribution

This study contributes to the existing body of knowledge by examining the relationships between extended supply chain management practices, supply chain integration and the performance of supply chain management in the manufacturing industry in Malaysia. This contribution is derived from the attempt to test the impact of value chain management practices on supply chain performance through supply chain integration. Previous studies (Jin, Vonderembse, Ragu-Nathan & Smith, 2014; Chin, Tat & Sulaiman, 2015; Nkrumah, Apam & Boadu, 2020), have investigated direct link between supply chain practices and performance. Caridi et al. (2010) and Khan and Junaid (2022) suggest that, by examining whether or not value chain management practices have an impact on supply chain performance in the context of manufacturing industries, this study contribute to the resource-based view [RBV] literature.

In addition, by combining the extended variables of supply chain management practices and testing them in a single setting, this would allow the study to generate a comprehensive framework of the relationships between the variables. Further, this study analyses the relationship between supply chain management practices, supply chain integration and supply chain performance in the electronics manufacturing industry. Besides, the study establishes both theoretical and empirical argument not only to justify that this relationship exists, but also identified the mediating role played by supply chain integration.

In terms of theoretical contribution, this study also extends previous research conducted in Western countries (Aloini et al, 2012; Mathiyazhagan et al., 2013; Pereira, Christopher & Silva, 2014; García, Gonzalez & Prado, 2014; Zhang & Kuo, 2021) and advances our understanding of the relationship between supply chain management practices and supply chain performance in a developing and Asian economy. Past studies on similar supply chain management practices within the manufacturing context in Asian countries have largely focused on nations such as Singapore (Teo, Lin & Lai, 2009; Zangoueinezhad, Azar & Kazazi, 2011), Thailand (Vanichchinchai & Igel, 2011), and China (Zhao et al., 2007; Yang et al., 2020). These studies highlight key practices and challenges in each of these countries, providing valuable insights into how supply chain strategies are implemented and the factors influencing their success in different Asian contexts.

1.7.3 Policy Implication and Contribution

Through the understanding of these relationships, it provides important insights to all practitioners, academician, researchers, policy makers and government administrators in terms of identifying strategies that would enhance the utilization of value chain management practices within and across their organizations in Malaysia and globally. For organisations that are currently implementing such initiatives, this study sheds some light on the necessary measures to be undertaken to ensure successful value chain management practices implementation. Such proactive actions are deemed important as they help to recuperate the supply chain performance of manufacturing firms as well as the firm's performance concerned.

This section puts forward suggestions on issues related to the promotion and development of the value chain management practices. These suggestions need to be inspected thoroughly by various stakeholders in the manufacturing sector of Malaysia including the central government through the Ministry of International Trade and Industry (MITI); Ministry of Finance (MOF), Industrial promotion bodies through the Malaysia Investment Development Authority (MIDA), international bodies through United Nation Bodies (UNIDO), and the Malaysian industrialists.

The policy Industry 4WRD is Malaysia's response to Industry 4.0 and beyond, that calls for transformation of manufacturing sector and its related services to be smarter and stronger, driven by people, process and technology. This policy would enable the manufacturing sector to move into Industry 4.0 and along the way contribute to fulfilling Malaysia's commitment to the United Nation's Sustainable Development Goals (SDGs).

Meanwhile, there are few policy implications that may help decision makers in achieving the above efforts, such as embracing the awareness of value chain management practices, promoting infrastructure development, promoting information, communication and technology, incentives to promote value chain activities, establishment of non-governmental organisation in the field of supply chain, supply chain practitioners creative initiatives, support and commitment from top level, and provide training on value chain management skills. Some of these actions have already been suggested and employed by Malaysian Association of Productivity in order to improve the productivity of manufacturing firm mainly the Small and Medium Industries (SMI) in Malaysia.

1.8 Scope of the Study

In the current study, it has made significant contribution from both a theoretical and managerial point of view. Apart from that, there are also some limitations that beyond the area of control. The scope of supply chain is very wide. The research questions posed earlier can be answered most effectively by examining the value chain management practices of organizations' supply chain which contribute in manufacturing supply chain performance.

However, this study would specifically investigate on the 'value chain' practices that can be added compatibly with supply chain management in the manufacturing sector with supply chain integration as the mediator. Nonetheless, the study only focuses on the manufacturing firms in Malaysia. The study focuses on manufacturing firms in Johor, Klang Valley, and Pulau Pinang, these regions represent major industrial hubs in Malaysia, providing a reasonably representative sample of the broader manufacturing sector. However, findings may not fully generalize to smaller clusters or niche subsectors.

Next, the study is using cross-sectional study which requires the data to be collected within the stipulated time. As this study covers certain period, the design affects this study as it does not consider other factors such as employees vacation time and others. However, this study has taken precautions to ensure that the selected respondents represent the population. For example, the characteristics of the sample resembles the characteristic of the population.

Primary data method is used for this study. Hence, the need for distribution of questionnaires is required in order to get the needed information first-hand and to fill the gap of unattainable data. This is because, among all the variables there are a few facts that can really relate with the study's main objective, but they are limited. This is due to some of the related source are private and needed access permission or payment before it can be obtained.

Respondent cooperation can also be a challenge in terms of obtaining valid answered questionnaires. It is because, this study's questionnaires gathered from both top management and support staff in manufacturing firms to ensure a comprehensive understanding of value chain management practices and supply chain performance. While top management provides strategic perspectives on policy, planning, and organizational direction, support staff contribute essential insights into the day-to-day implementation and operational challenges of supply chain activities. Including both groups enhances the validity of findings by reflecting both strategic decision-making and operational execution, which is particularly important in supply chain research where practical execution influences performance outcomes.

An additional problem would be the lateness in obtaining back the mailed questionnaires, as it can either be from sending to the wrong address or respondent late in mailing the survey itself. Therefore, a strategy of "keep in contact" or "follow ups" for updates must be made in order to minimize the challenges.

1.9 Definition of Terms

The following definitions were used as the basis for the terms in this study:

Table 1.2
Definition of Terms

Terms	Description
Supply Chain Management	SCM is a loop where it starts with customer and ends with customer. Through the loop flow all materials, finished goods, information, and transactions. It requires looking at business as one continuous, seamless process. This process absorbs distinct functions such as forecasting, purchasing, manufacturing, distribution, sales, and marketing into a continuous business transaction (Govinda, Mangla & Luthra, 2017).
Value Chain Model	A linear map showing how value is added through a process from raw materials to finished products (Awino, Machuki & Ogaga, 2017).
Value Chain Management Practices	The strategic activities, processes, and methods that organizations use to manage and optimize the various stages of their value chain including activities categorized into primary and secondary activities (Gupta & Ramachandran, 2021).
Professional Human Resource	One of the four cluster element strategy resources proposed by Michael Porter, as being an element of the competitiveness of an industrial cluster. Hsu, Lai and Lin (2014) emphasized that professional human resources are an essential factor of forming industrial clusters and improving competitiveness.
Firm Infrastructure	Serves the company's needs and ties its various parts together and consists of functions or departments (Roberts & G, 2012).
Procurement	The process through which a project team comes to conclude one or several contracts for the supply of goods, works or services that are part of the deliverables of a project (Sarfo and Mintah, 2013).
Information and Communication Technology (ICT)	A firm’s ability to acquire, deploy, combine and reconfigure IT resources in support and enhancement of business strategies and work processes (Lu, Misra, Jain and Ramamurthy, 2011).
Supply Chain Performance	The benefits derived from supply chain cooperation, including efficiency improvement, cost reduction, and enhancement in cycle time (Ryoo & Kim, 2015) and it evaluates the performance of various activities, processes, and entities involved in the movement of goods, services, and information from suppliers to customers (Croom & Carter, 2020).
Supply Chain Integration	The strategic integration of both internal and external organisational processes (Flynn, Koufteros &Lu, 2016) and gauges the extent to which supply chain partners work collaboratively together to gain mutual beneficial outcomes (Zhu, 2015).

1.10 Organization of Chapters

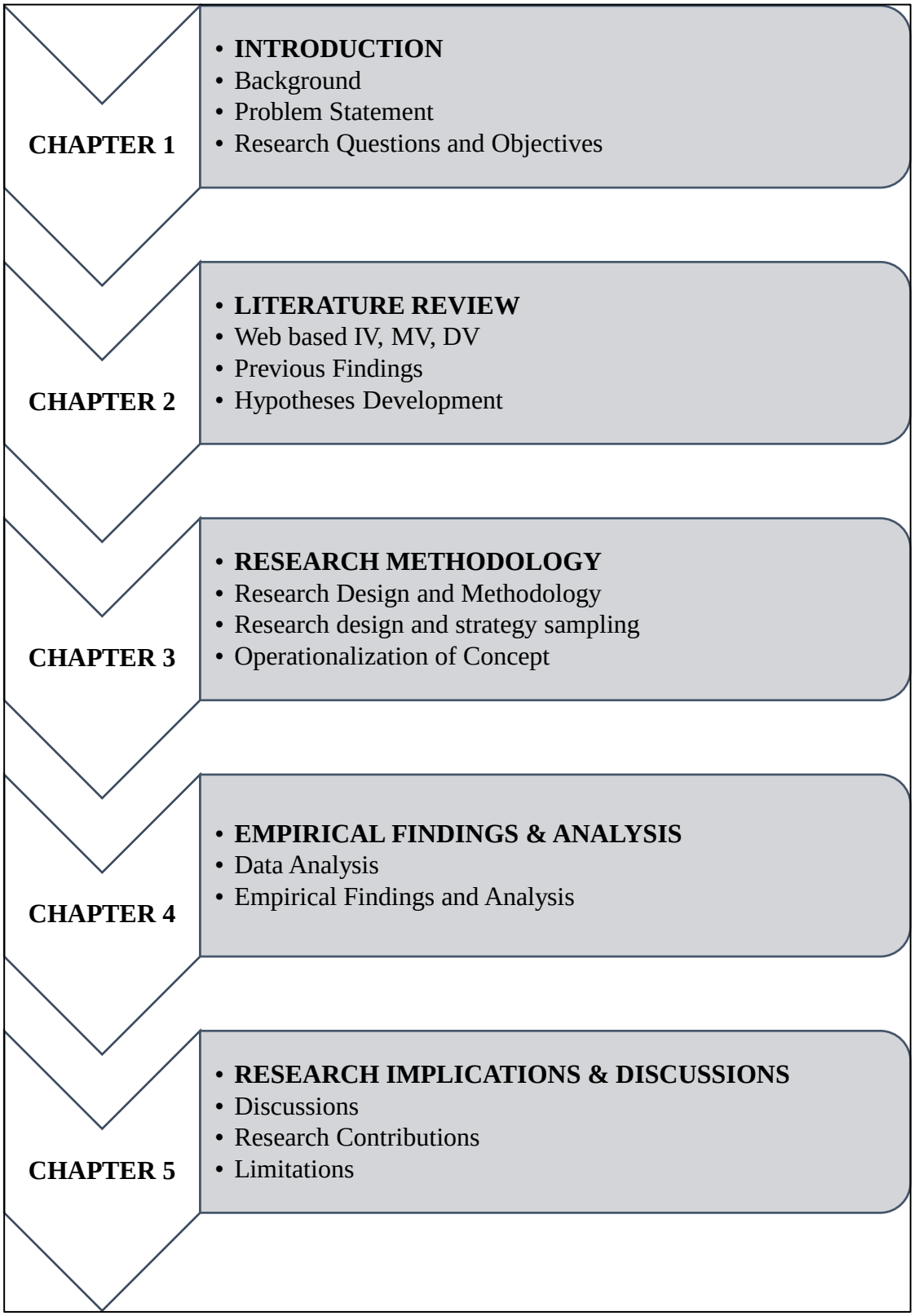

Figure 1.1 Outline of thesis

Figure 1.1 illustrates the structure of this research based on the content of the individual chapters. The arrows in Figure 1.1 indicate how the chapters are linked to each other. This research is divided into five (5) chapters and these chapters basically discusses about five different matters.

In **Chapter 1**, a brief background of research was presented. Followed by the problem statement. Besides that, the research objectives and research questions have been stated in order to give direction to what was achieved by this study. The justification of research highlights the reasons why the selection of research area was made. Moreover, the limitation of the study and the significance of this study also been explained so that it gave some insight to the readers. Finally, the study also explained the definition of every dimension used in this study in order to make future researchers or readers understand why this study was actually conducted.

The next chapter is **Chapter 2** about the literature review. It will discuss (i) the conceptualization and evolution of supply chain performance (ii) professional human resource (iii) firm infrastructure (iv) procurement (v) information and communication technology (vi) the concept of supply chain integration as the mediator of this study (vii) the relationship between supply chain performance and professional human resource (viii) the relationship between supply chain performance with firm infrastructure (ix) the relationship between supply chain performance and procurement (x) the relationship between supply chain performance and information and communication technology, and (xx) the relationship between supply chain performance and supply chain integration. Followed by the theories involved in this study, conceptual and theoretical framework also hypotheses development.

Meanwhile, **Chapter 3** Research Methodology will discuss the research methodology implied in this study. This chapter includes research design, research population, research sampling, research instruments and data analysis approach. Furthermore, this chapter also provide brief information on the data analyses based on the results of the pilot study, namely reliability and correlation analysis. It also includes the detailed measurement for variables, hypotheses statement, data collection method and the description on all the samples to be used.

Chapter 4 Research Findings showcases the result of the data analyses. The data will be analysed using SPSS 24 and PLS-SEM. This chapter summarized as follows. First, the profile of respondents of this study is presented. Secondly, the goodness of measure and general assumptions employed in this study are discussed.

These include several analyses namely normality tests, factor analysis, reliability analysis, the descriptive statistics and correlation analysis. Lastly, the results of the regression analyses to test the hypotheses are discussed and the result of the hypotheses testing are summarized.

Chapter 5 Conclusion and Recommendations discusses the main outcomes of the hypotheses testing of this study. The main outcome of the hypothetical tests is concerned on the direct relationship between value chain management practices variables and supply chain performance. These results are supported with previous empirical evidence and possible underlying assumptions or phenomenon. In addition, research implications are discussed in terms of how this study can be beneficial for the academicians (theoretical contribution) and industry practitioners (managerial contribution). Furthermore, the limitations of this research are explained. Prior to the end of this study, the sub-chapter recommendations for future study are discussed to provide potential theoretical avenues for future researchers to discover especially in the field of branding and marketing.

1.11 Chapter Summary

This chapter basically discuss about seven different matters. In the first point, a brief background of research was presented. Followed by the problem statement. Besides that, the research objectives and research questions have been stated in order to give direction to what was achieved by this study. Next, the justification of research, the scope and limitation of study also the significance of this study (practical implication and contribution, theoretical implication and contribution, and policy implication and contribution) also been explained so that it gave some insight to the readers. Finally, the study also explained the definition of every dimension used in this study in order to make future researchers or readers understand why this study was actually conducted. The next chapter is about the literature review. It discusses on the literature review of professional human resource, firm infrastructure, ICT, procurement, supply chain integration, and supply chain performance. Followed by the theoretical background, conceptual and theoretical framework and also hypotheses development.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

In this chapter, literature review discusses the variables involved in this study. This study focuses on the general overview of relationships between the value chain management practices, supply chain integration and supply chain performance. It also portrays on the relationships and a few determinants in order to give a clear view about what this research definitions and motives. Independent variables involved in this study are Professional Human Resource, Firm Infrastructure, Procurement and also Information and Communication Technology. The dependent variable of this study is Supply Chain Performance while the mediating variable for this study is Supply Chain Integration. This chapter also discusses on the relationship between professional human resource, firm infrastructure, procurement and information communication technology on supply chain performance. Last part of this chapter discusses on the underpinning theory and model adapted for this study which are value chain model, contingency theory and resource-based view theory, past literature review, the theoretical and conceptual framework of this study and also the hypothesis development.

2.2 Overview of Manufacturing Industry in Malaysia

The manufacturing sector is pivotal to Malaysia's economy, driving industrialization and economic expansion. It encompasses a diverse array of industries such as electronics, automotive, chemicals, food processing, and machinery, all crucial for the country's growth (Mohamad & Ismail, 2020). Therefore, Malaysia's manufacturing process is underscored by its robust export orientation, attracting numerous multinational corporations that capitalize on its strategic location and skilled labor force. Numerous government policies have promoting industrial development, infrastructure investments, and efforts to attract foreign direct investment (FDI) are key drivers of Malaysia's manufacturing success. Kaliannan and Baskaran (2018) stated that the nation benefits from a well-established supply chain network, a conducive business environment, and regional market access facilitated by free trade agreements.

Despite these strengths, the sector faces challenges such as the imperative to enhance productivity and innovation, address workforce skill gaps, and navigate global economic uncertainties and technological changes. Nonetheless, according to ERIA Economic Research Institute for ASEAN and East Asia (2020), Malaysia remains committed to positioning itself as a competitive manufacturing centre in Southeast Asia, contributing significantly to its economic diversification and developmental objectives.

The manufacturing sector is a cornerstone of Malaysia's economy, contributing significantly to its Gross Domestic Product (GDP) and providing employment opportunities to millions of Malaysians. As of recent statistics from Ministry of International Trade and Industry Malaysia (2023), manufacturing constitutes a substantial portion of Malaysia's GDP, reflecting its importance in driving economic growth and development. The manufacturing industry in Malaysia makes a substantial economic contribution, playing a big role in the country's overall economic landscape.

Furthermore, the manufacturing industry in Malaysia is pivotal in driving value-added activities and technological advancements. Through continuous innovation, adoption of advanced manufacturing processes, and investment in research and development (R&D), Malaysia strives to enhance productivity, efficiency, and competitiveness on the global stage. As believed by Zawawi, Ismail and Tan (2020), government supports including policies that promote investment, infrastructure development, and skills enhancement, further fortifies the sector's growth trajectory and economic impact. Azman, Law and Mahmood (2014) emphasize that the manufacturing industry in Malaysia embodies a dynamic force that propels economic growth, fosters industrial diversification, and positions the nation as a formidable player in the global economy.

Malaysia's manufacturing activities are primarily export-oriented, playing a crucial role in the country's economic landscape by significantly contributing to its export revenue. Key products manufactured in Malaysia include electronics, automotive parts, chemicals, and machinery, among others. These goods are exported to global markets, thereby generating substantial foreign exchange earnings and strengthening Malaysia's trade balance (Koh & Ismail, 2020). Malaysia's manufacturing sector has established a strong global presence, leveraging strategic trade agreements and geographical advantages to enhance its competitiveness in international markets. Ismail and King (2017) said this reputation enhances the competitiveness of Malaysian goods in global markets, fostering trust among international buyers and partners.

Malaysia is moving forward to be an industrialized economy. The importance of the manufacturing sector to a country's economy is increasingly undermined as the services sector contributes a larger share of gross domestic product (Ghani & Kharas, 2021). It can be seen when Malaysia moved from material production to manufacturing. Ahmad and Seed (2021) stated that in a developing country like Malaysia, small and medium enterprises (SMEs) in the manufacturing sector contribute significantly to the economic growth.

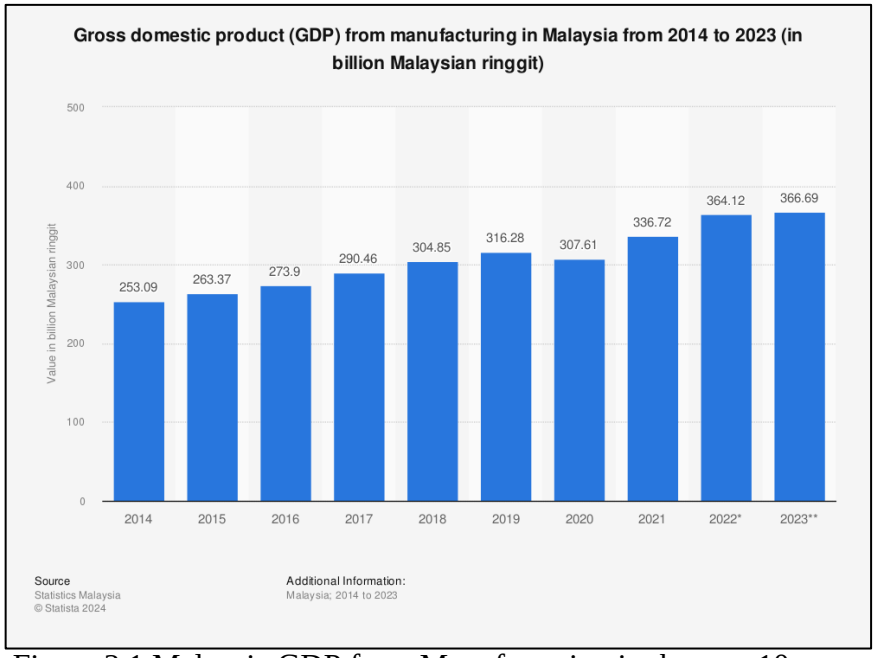

Figure 2.1 Malaysia GDP from Manufacturing in the past 10 years

Note/Source: The grid chart shows the Malaysia GDP from Manufacturing in the past 10 years from the year 2014. The information was retrieved from TradingEconomics .Com based on statistics information in the Department of Statistics Malaysia, 2024

Figure 2.1 above shows manufacturing GDP has increase 30 MYR Billion in the last three years. In 2023, the gross domestic product (GDP) from the manufacturing sector in Malaysia reached around 366.69 billion Malaysian ringgits, an increase from around 364.12 billion Malaysian ringgits in the previous year. The GDP from manufacturing in the country has been increasing in the last decade. The gross domestic product (GDP) from the services industry in Malaysia was the highest for 2023 compared to the other sectors, at around 928 billion Malaysian Ringgit. The services sector includes utilities, retail and trade, and food industry. Meanwhile the manufacturing sector was the second highest with a GDP contribution of more than 366 billion Malaysian ringgit in the same year.

2.2.1 Supply Chain Performance in Manufacturing Sector

The manufacturing sector is one of the most important sectors in Malaysia besides agriculture. This is because foreigner considers Malaysia's industry as one of the top countries to invest on thus, it deems as a high yield investment opportunity. According to Gunasekaran and Ngai (2021), supply chain performance in manufacturing is a multifaceted discipline that requires continuous improvement, innovation, and adaptation to meet evolving market demands and competitive pressures. Therefore Kamble, Gunasekaran and Sharma (2020) argue that by optimizing efficiency, managing costs, enhancing quality, and fostering collaborative relationships across the supply chain network, manufacturing companies can achieve sustainable growth and resilience in today's global marketplace.

Most previous research from Chen and Zhang (2024) relates manufacturing performance with the standard financial and non-financial performance. The performance measurement process usually emphasizes the financial indicators, such as profits and investment. Yet, critics argued that focusing only on financial indicators could encourage organizational short-term thinking (Ittner & Larcker, 2021). However, Schroeder and Goldstein (2020) state that there are four widely accepted manufacturing performance indicators: cost, quality, delivery, and flexibility.

2.2.2 Issues and Challenges of Manufacturing Industry

In navigating global economic uncertainties, supply chain disruptions, and environmental sustainability challenges, Malaysian manufacturers adopt resilient strategies to safeguard operations, ensure continuity, and sustain long-term competitiveness. By diversifying suppliers, enhancing risk management practices, adopting sustainable initiatives, and leveraging technology, manufacturers can build agile and adaptive supply chains capable of thriving amidst adversity. These strategies not only mitigate risks but also position manufacturers to capitalize on opportunities in a dynamic global marketplace. Through supply chain strategies, robust risk management frameworks are crucial in order to enhance the risk management practices. Manufacturers conduct risk assessments, develop contingency plans, and establish supply chain visibility through technologies like real-time tracking and data analytics. Proactive risk management helps anticipate and mitigates potential disruptions.

2.3 Supply Chain Performance

In the following paragraphs, the key elements of supply chain performance are outlined and reviewed. Review of supply chain performance is further synthesized by focusing on the relevant definition and literature review of supply chain performance. Furthermore, the review discussion will also focus on the importance of supply chain performance.

2.3.1 Definition of Supply Chain Performance

Measuring performance, often viewed as managing for results, can be described in various ways depending on the methods used and the objectives behind the measurement. Different organizations might proritize different aspects of performance based on their strategic objectives and goals (Koufteros, Verghese, & Lucianetti, 2014). Thus, it may mean setting performance expectations, comparing actual performance with benchmarking data and continuously improving the processes. As such, Wood, Reiners, and Srivastava (2017) describe performance measurement as a process of assessing a single task or several activities effectively and efficiently.

A supply chain is a network between a company and its suppliers to produce and distribute a specific product to the final buyer. The supply chain also represents the steps it takes to get the product or service from its original state to the customer. A supply chain is comprised of all the businesses and individual contributors involved in creating a product, from raw materials to finished merchandise. Examples of supply chain activities include farming, refining, design, manufacturing, packaging, and transportation. A supply chain starts with the delivery of raw materials from a supplier to a manufacturer and ends with the delivery of the finished product or service to the end consumer. SCM oversees each touch point of a company's product or service, from initial creation to the final sale.

More specifically, measuring performance means interpreting the performance outcome into communicated and reported information that can be useful for the purpose of further improvement (Bahcall, Pinsonneault & Basu, 2001; Trkman, et al., 2010; Sardi, Sorano & Garengo, 2020). According to Das and Hassan (2021), supply chain performance encompasses how well the supply chain meets customer requirements, which includes ensuring product availability and timely delivery.

Owing to its importance to current competitiveness in the business environment, even supply chains need monitoring mechanisms for their performance, the same way as individual firms (Estampe, Lamouri, Paris & Brahim-Djelloul, 2013). For a performance measurement system to be dynamic, it should possess properties that match the dynamic environment (Kim, Kumar, & Kumar, 2010). Nudurupati, Bititci, Kumar and Chan (2011) identify such properties as to be sensitive to changes in the external and internal environment of an organization. Additionally, Al-Hakim and Lu (2017) refer supply chain performance as a process of quantifying the performance of the total supply chain operations of an organization in terms of cost efficiency, capital utilization, and customer service.

Besides, supply chain performance projects a set of metrics reflecting activities or tasks pertaining to customer service, corrective actions and preventive action (Hassini, Surti & Searcy, 2012). The objectives of developing an effective customer service in a supply chain can be achieved through corrective action (production overtime and emergency or rush order). Meanwhile, preventive action (safety stock and plant extra capacity) is related to supply chain cost operation and capital management. Together, both these corrective and preventive action could deliver excellent customer service.

2.3.2 Literature Review of Supply Chain Performance

The concept of the supply chain has roots stretching far back in history, paralleling the very existence of products throughout time. This intricate network plays a pivotal role in ensuring goods are efficiently sourced, manufactured, and delivered to meet consumer demand across global markets. Typically, the goals for the supply chain extend beyond mere fulfillment of customer demand to encompass enhancing responsiveness, fostering collaboration, and establishing a robust network among diverse stakeholders (Govindan et. al., 2022). The overarching objectives include optimizing operational efficiency, minimizing costs, maximizing profitability, ensuring product quality, promoting sustainability practices, and adapting swiftly to market fluctuations and customer preferences (Bigliardi et. al., 2022). By achieving these goals, organizations can cultivate competitive advantages, strengthen relationships with suppliers and distributors, and ultimately enhance customer satisfaction and loyalty on a global scale.

Studies on supply chain performance can be classified under two major areas. The first category of research is about how to measure supply chain performance (Chaabane, Ramudhin & Paquet, 2012; Aguezzoul, 2014). Green et al. (2014), and Jermsittiparsert, Wattanapongphasuk, and Phonwattana (2019) collectively highlight several predictor factors that can explain variations in supply chain performance. These studies explore elements such as supply chain collaboration, technological adoption, resource optimization, and strategic alignment, providing a comprehensive understanding of why some supply chains outperform others in different contexts.

Supply chain management has a complex network of business entities with greater number of echelons in the chain and the number of facilities in each echelon (Barratt, Choi & Li, 2011; Foersti et al., 2015). As such, Candak, Kumar and Dalpati (2019) emphasize that identifying effective indicators for supply chain performance is critical due to the complexity of context, scope, the number of organizations involved, product lines, and the challenges in developing appropriate measures.

Rezaei, Çelik, and Baalousha (2011), give the general performance measurement framework as one having the following fundamental system requirements: Accountability, Data system, Feedback, Recognition, and Training. Meanwhile, the concept and framework of a supply chain performance measure will definitely vary in relation to the different level of management hierarchy in an organization and its objectives (Shepherd & Gunter, 2010). Askarany, Yazdifar, and Askary (2010) state that supply chain performance measures can significantly influence the decision-making process at various management levels within an organization.

As a result, there is a need for different sets of performance measure for different level of management hierarchy (strategic level, tactical level and operational level). Unfortunately, there is difficulty in integrating performance measure across all three level of management hierarchy in an organization. Finally, characteristics found in effective performance measurement systems, as identified by Flynn, Huo and Zhao (2010), includes universality, measurability and consistency that can be used in analysing the effectiveness of supply chain performance measurement systems as well. Supply chain performance is one of the substances of competitive strategy to boost organizational productivity and profitability (Shabbir et al., 2018; Saudi et al., 2019). In today's dynamic business landscape, supply chain management, analysis, and enhancement are gaining significant prominence.

However, there remains a notable gap that must be addressed to optimize supply chain performance, particularly among companies based in Malaysia. Managers in manufacturing organizations predominantly prioritize supply chain performance due to its critical role in effective cost management and enhancing the overall profitability and competitiveness of the company.

Hence, because of the extensive use of gross domestic product (GDP) on supply chain, it is important to work on Malaysia based supply chain companies and to reveal various factors to enhance supply chain performance. The firm supply chain performance is merging as the main agenda behind achieving the economies of scale. For example, top retail and manufacturing firms in five hundred well-known companies have achieved remarkable success by incorporating firm supply success factors such as cross-doc strategy. Figure 2.2 below shows the benefits and impacts of cross-docking on Walmarts supply chain.

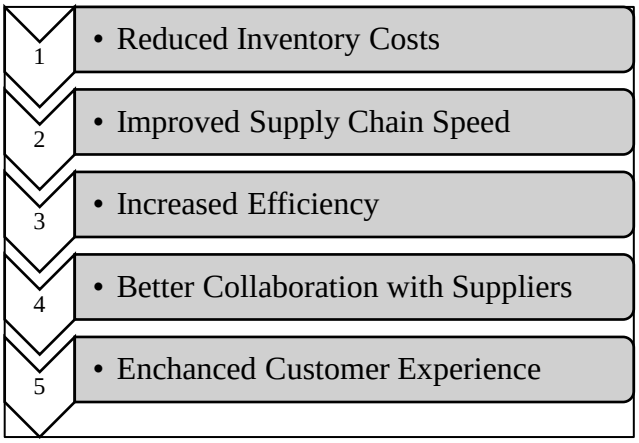

Figure 2.2 Benefits and Impacts of Cross-Docking on Walmarts Supply Chain

Source: Jabbouri et. al. (2023)

Organizational and market performance is often heavily influenced by the effectiveness of supply chain performance strategies and execution (Candak et al., 2019). According to Kamble, Gunasekaran and Sharma (2020), studies on supply chain performance can generally be classified into two major areas of focus and the first category of research is about how to measure supply chain performance. Meanwhile, the second group of studies focus on several predictor factors that could be used in explaining why some supply chains perform better than others.

2.4 Value Chain Management Practices

In the following paragraphs, key value chain management practices are outlined and reviewed. The discussion covers the impact of each activity on the management of value chains. Review of supply chain management practices could be further synthesized by focusing on the relevant definition and literature review of the value chain management practices.

2.4.1 Definition of Value Chain Management Practices

According to Christopher and Peck (2020), value chain management practices refer to the strategic activities and processes that organizations undertake to optimize the flow of goods, services, information, and finances from suppliers through to customers. These practices aim to enhance efficiency, reduce costs, improve quality, and ultimately create value for customers and stakeholders. As introduced by Porter (2024), value chain management practices are the support/secondary activities that derived from the Porter's Value Chain Model. Support activities in this value chain model are firm infrastructure, human resource management, technology development and procurement. These activities enhance the efficiency and effectiveness of the value chain, contributing to the overall competitive advantage and the support activities also assist the firm as a whole by providing infrastructure that allows the primary activities to function.

The support activities include firm's infrastructure, human resources, information and technology and procurements. The value chain encompasses all internal activities within a company aimed at delivering a valuable product or service to the market. Each stage in the value chain contributes additional value by transforming inputs into more refined products or services, which ultimately enhances the offering to the customer. It serves as a framework for visualizing a company's productivity by identifying numerous specific activities involved. According Kaplinsky and Morris (2021), value chain refers to the operational activities of a business that enhance its offering to customers. A company must leverage these activities to generate and capture value such as car manufacturer companies receiving raw materials from supplier (Hitt, Ireland &Hoskisson, 2023). The overall value created by these interconnected activities should surpass the sum of the values contributed by each individual activity.

Meanwhile the Value Chain Model is a business framework introduced by Michael Porter in his 1985 book Competitive Advantage. It helps companies understand how each part of their business activities contributes to creating value for customers. The goal is to identify the specific processes that give the company a competitive advantage by efficiently producing goods or services and minimizing costs.

Moreover, value-chain analysis is a key approach for improving production efficiency by optimizing each stage of the process to deliver maximum value while minimizing costs (Johnson, Scholes & Whittington, 2022). It involves breaking down a business into its primary activities, which span from the initial creation of a product to its final consumption and beyond. This breakdown helps identify potential competitive advantages at each stage of the chain (Fernandez & Gereffi, 2019). Both perspectives emphasize the importance of strategically managing and enhancing individual activities within the value chain to achieve sustainable business performance and competitive differentiation.

In this case, the term "value chain" refers to the sequence of activities that businesses perform to create a product or service, from its inception to its consumption (Porter, 1985). These activities include inbound logistics, operations, outbound logistics, marketing, and service, each contributing to the creation of value for the customer. On the other hand, "value chain management practices" focus on how these activities are managed and optimized to enhance performance and competitive advantage. This includes aligning resources, improving processes, leveraging technology, and ensuring that each activity is executed efficiently and effectively to maximize value (Johnson, Scholes & Whittington, 2022; Fernandez & Gereffi, 2019). Essentially, while the value chain outlines “what” activities are performed, value chain management practices focus on “how” these activities are strategically managed to achieve business objectives.

It is crucial to understand the role of procurement, HR, and IT in enhancing the overall supply chain performance when interact with the primary activities in the value chain. Procurement directly impacts inbound logistics by ensuring the timely sourcing of materials and services, thus supporting operations and reducing costs (Porter, 1985). HR plays a vital role by managing the workforce needed in operations, marketing, and after-sales services, ensuring that employees are skilled and motivated to contribute effectively to the value chain (Johnson, Scholes & Whittington, 2022).

Meanwhile IT enables the integration and optimization of these primary activities through systems like ERP, enhancing communication and real-time data sharing across procurement, operations, and customer service functions (Kamble, Gunasekaran & Sharma, 2020). Therefore, a comprehensive understanding of how these functions collaborate with primary value chain activities is critical to improving overall business performance.

As concluded by Christopher (2022), value chain describes the full sequence of activities involved in creating a product or service while value chain management practices refer to the methods and techniques used to manage, optimize, and improve the value chain effectively. In short, value chain refers to the activities, while value chain management practices refer to how those activities are managed and improved for better performance.

In this case, according to Schroeder and Goldstein (2022), firm infrastructure, procurement, human resources (HR), and information technology (IT) under "technology development" are considered support activities in Michael Porter's Value Chain Model. Although they are not directly involved in the production or delivery of goods and services (the focus of primary activities), they provide essential resources and services that enable primary activities to function efficiently.

The interaction of these activities with primary activities in value chain model are as follows where firm infrastructure provides the framework for effective management and decision-making, influencing all primary activities while procurement ensures the right inputs for production and distribution, affecting primary activities like inbound logistics and operations. Meanwhile human resource manages the workforce that performs the tasks in operations, marketing, and customer service and information technology provides technology solutions that improve production efficiency, distribution, marketing, and customer service processes (Heizer & Munson, 2023).

2.4.2 Literature Review of Value Chain Management Practices

According to Kano, Tsang, and Yeung (2020), The primary objective of a value chain is to create products with added value for a market, achieved through the transformation of resources and utilization of infrastructure within the firm's operational context.

Developing a commodity's value chain involves identifying constraints related to market access at local, regional, and national levels, market orientation, available resources, and various institutional frameworks (regulatory, cognitive, and normative). Value chain management involves assessing internal activities to understand their contribution to a firm's competitive advantage. The ultimate objective of value chain management is to pinpoint the practices and processes that set a firm apart from its competitors (Ong, Goh & Yong, 2022). Value chain management serves multiple objectives. Its core aim is to diagnose inefficiencies within the chain and pinpoint opportunities for enhancing performance, leveraging both qualitative and quantitative data. Additionally, Durand (2020) stated that it enhances comprehension of competitive hurdles, facilitates the identification of relationships and coordination methods, and sheds light on power dynamics among chain actors and their governance structures.

Anandajayasekeram and Berhanu (2019) concluded that Agricultural value chain analysis is a responsive method that studies how markets and industries adapt to fluctuations in domestic and global demand and supply of commodities. Value chain management enables companies to make informed decisions, deliver optimal solutions to meet customer requirements, and enhance members' comprehension of the organization's objectives. According to Keulan and Kirchherr (2021), a value chain encompasses the internal activities of a company aimed at delivering valuable products or services to the market. Each stage in the value chain contributes incremental value.

This framework allows firms to assess productivity by identifying numerous specific activities. Businesses must leverage these activities to generate and capture value. The combined value of these interconnected activities should exceed the sum of their individual contributions. Value-chain analysis aims to enhance production efficiency, enabling companies to maximize value while minimizing costs. Value chain management supports firms in making informed decisions, offering superior customer solutions, and enhancing members' alignment with organizational goals.

The absence of value management within an organization can lead to erroneous decisions, limited adoption of technology, dissatisfaction among consumers, inferior products, and a loss of market share due to the firm's inability to compete effectively (Muthoka & Ogutu, 2018). According to Chege (2017), efficient and effective management of the business value chain aims to maximize value for both the customer and the end-user of the customer. It concentrates on creating competitive advantages and enhancing all strategically significant corporate activities.

Value chains operate at both the business and industry levels. Achieving value at the industry level requires organizations to connect and engage key stakeholders, develop appropriate strategies, adopt a systemic perspective, cultivate partnerships, assess and expand the value chain, and institutionalize successful practices. It is worthwhile to investigate each of these activities to ascertain how each affects the integration and performance level of supply chains. Previous literature reveals that value chain management practices have various dimensions and perspectives which ultimately enhance the performance within and across organization. In total, the literature captured several important dimensions of value chain management practices which include the secondary activities of value chain model.

Although all these dimensions are captured and investigated successfully, they are all tested separately and not in a single setting. As such, the result of previous study will not reveal the actual standing of the total impact of supply chain management practices toward organizational performance and supply chain performance. The present study, therefore, proposes VCM practices as a multi-dimensional concept. In the following paragraphs, the study has identified and defined the four constructs of value chain management practices.

2.4.3 Construct of Value Chain Management Practices

Value chain management practices is the support/secondary activities that derived from the Porter's Value Chain Model. The support activities assist the firm as a whole by providing infrastructure or inputs that allows the primary activities to function. These includes firm's infrastructure, human resources, technology and procurements. This theory was propounded by Porter in 1985. Porter's value chain consists of a sequence of operations involved in the development, manufacturing, marketing, and distribution of a product.

Within the core value chain, Porter distinguishes between primary and secondary activities. Primary activities such as logistics, production, sales and marketing, and service directly contribute to value creation. Supporting activities, including procurement, research and development, human resource management, and infrastructure, facilitate the value creation process of products (Mathias, 2010). Nweke (2017) emphasizes that the success of company operations is tied to its ability to achieve growth in a challenging operating environment.

Porter's Value Chain Model has been widely used to analyse how firms create value through a series of interrelated primary and support activities. In the manufacturing context, primary activities such as inbound logistics, operations, outbound logistics, marketing and sales, and service are central to transforming inputs into finished products, while support activities including human resource management, technology development, procurement, and firm infrastructure enable efficiency and coordination across the value chain (Porter, 1985).

However, recent studies argue that merely identifying value chain activities is insufficient to explain firm performance in today's manufacturing environment. Contemporary manufacturing firms operate in increasingly complex and competitive settings, where value creation depends not only on operational efficiency but also on strategic integration of human capital, technology, and inter-firm collaboration (Ketchen et al., 2021; Gereffi, 2022). For instance, human resource management is no longer viewed as a supporting function alone but as a strategic driver influencing productivity, innovation, and employee retention across the value chain.

Moreover, recent literature highlights that value chain activities are dynamic rather than linear. Manufacturing firms increasingly adopt digital technologies and flexible work practices, which reshape traditional value chain configurations and require firms to continuously adapt their activities to sustain competitiveness (Ivanov & Dolgui, 2020; Frank et al., 2023). This suggests that the effectiveness of value chain activities depends on how well firms align internal resources, particularly talent, with operational and strategic objectives.

In relation to this study, the value chain framework provides a useful lens for understanding how manufacturing firms manage and integrate activities that influence organisational outcomes. By linking value chain activities with talent acquisition and retention practices, this study extends existing literature by examining how human capital contributes to value creation within manufacturing firms.

Understanding the interactions within a value chain is crucial for identifying the factors influencing its performance. Every company contributes to the creation of value in its products, although some firms play more significant roles in the value chain compared to others, such as marketers and intermediaries (Kothandaraman & Wilson, 2001). Meanwhile, McKinsey (2023) mentioned that a successful value strategy enables a business to pinpoint the critical competencies needed to compete, create and meet customer value expectations, and oversee the process of value addition.

While Porter's Value Chain Model provides a foundational understanding of value creation, its linear structure may not fully capture the complexity of modern manufacturing firms operating in a digital and knowledge-driven environment. Contemporary manufacturing increasingly relies on digital technologies, data analytics, and human capital integration, which are not explicitly reflected in the original model (Frank et al., 2023; Ketchen et al., 2021). In this context, talent acquisition and retention play a critical role in enabling value chain activities, suggesting that the model requires adaptation to remain relevant in explaining organisational performance.

Beyond the limitations of Porter's Value Chain Model, recent literature suggests that value creation in manufacturing has evolved towards more interconnected and network-based perspectives. Alternative frameworks such as global value chains and value networks emphasise inter-firm collaboration, digital integration, and knowledge flows, reflecting a shift away from a purely linear and firm-centric view of value creation (Ketchen et al., 2021; Gereffi, 2022). This evolution highlights the need to view value chain activities as adaptive and relational, particularly in contemporary manufacturing environments shaped by digitalisation and human capital integration (Frank et al., 2023).

2.4.3.1 Professional Human Resource

Human resources are vital to the sustainability of an enterprise. Hsu, Tian and Xu (2014) advocated that industrial clusters are most conducive to industrial innovation. Today's human resource (HR) is a unique approach to employment management that aims to attain competitive advantage through the strategic improvement of well dedicated and competent workers by means of an incorporated collection of cultural, structural and human resources techniques. According to Saks and Gruman (2021), an effective PHR in the organization enable employees to contribute effectively and fruitfully to the achievement of the organization's goals and objectives.

It makes employees to be committed to their work and generate positive behavior that will increase the organization's effectiveness. PHR is expected to add value to the strategic utilization of workforce. The study of human resource has gained importance in the literature for the last few years (Brewster, 2023) and most importantly its impact on organizational performance (OP), effectiveness and employees' commitment.

However, there is little in the literature that describes the relationship between human resource and supply chain performance. This omission may perhaps be due to the previously noted initial research emphasis on hard supply chain topics. Further, there is a notable lack of studies that evaluate the soft variables and their alignment with supply chain strategies. From an applied perspective, Prajogo and Olhager (2022) suggest that human resource must be proactively applied to the emerging supply chain. Therefore, Davenport (2023) identify new rules for human resource, including permeable boundaries and virtual enterprises. Similarly, Swart and Kinnie (2014) describe the direct and indirect effect that give changes in supply chain performance.

Professional human resources and firm's performance are positively correlated (Boxall & Purcell, 2011). When the flow of information and human resources is faster, it can help to promote the industrial knowledge spill over effects and strengthen the advantage of industrial innovation. Yang (2020) advocated professional human resources, as one of the four cluster element strategy resources proposed by Michael Porter, as being an element of the competitiveness of an industrial cluster. Hsu, Lai and Lin (2014) emphasized that professional human resources are an essential factor of forming industrial clusters and improving competitiveness.

Porter (1998) found that geographic region and the environment of the industry play extremely important roles in determining a cluster's competitive advantage, such as human resources, natural resources, knowledge resources, capital resources and infrastructure. Hence, it can be seen that human resources play a key role in the determination of the competitive advantage of an enterprise. Boxall and Purcell (2011) found that human resources are the most important asset of an enterprise. Becker (2022) pointed out that human capital is never outdated and has a value that can transit with changing environments.

This study integrated theories proposed by Porter (1990), Bahraml and Evans (1995) and Yang (2020) used human resources as the basis for the research dimension to further explore and verify the correlation between human resources and firm's performance. The success of supply chain management (SCM) depends on the actions of individuals within the firms that form part of the supply chain (SC). Some authors propose that HRM plays a key role as a support and as a mechanism for operationalizing responsibilities and relationships within the SC (Jackson, Schuler & Jiang, 2014).

In this sense, Garcia and Ayala (2021) identified that specific professional human resource, including flexible job descriptions, team organisation, training in teamwork and the use of performance indicators, are significantly related to the performance of the SC. Boxall and Macky (2022) indicated that HR generated better performance only when three conditions were met: when employees possessed well-developed skills, when employees were motivated to apply their skills and when platforms were provided for employees to contribute their efforts. These conditions are known as high-involvement HRM practices and have been confirmed to greatly improve individual (Liu & Batt, 2010), operational (MacDuffie, 1995), firm (Huselid, 1995) and supply chain (Fu et al., 2014) performance.

Lepak and Gowan (2022) explicitly pointed out that high-involvement HRM systems included a set of HRM practices that aimed at advancing employee skills, enhancing employee incentives and improving employee participation. Moreover, Collins and Hans (2021) said through selective hiring, talents and potential talents are placed into companies and serve as fundamental resources for companies to compete. In addition to selective hiring, companies must initiate a series of training programs to develop firm-specific human capital and increase the depth of employee skill.

As mentioned by Brewster, Chung and Sparrow (2022), depth of skill means that employees acquire skills through training that are above the industrial level and allow them to perform their tasks efficiently while breadth of skill means that employees acquire skills through training that make them capable of performing different tasks if necessary. According to Kirkpatrick (2021), together they provide skilled workforces to companies and emphasize continual learning.

Employee incentives are designed to motivate employees to apply their knowledge and skills to specific tasks and achieve company goals. There are many kinds of incentive strategies, such as performance- (Hypko, Tilebein & Gleich, 2010), process- (Quentier, 2012) and goal-based (Linan & Chen, 2009; Nguyen, 2020) incentives. The rapidly changing environment and integrated manufacturing strategies such as SCI require employees to remain flexible and discover creative ways to confront unexpected and complex situations (Tatikonda & Montoya, 2023), making it difficult to evaluate employees' working processes and performance. In addition, Gomez and Balkin (2023) stated that process and performance-based incentives are implemented at the individual level, and have arguably inhibited cooperation and teamwork.

2.4.3.2 Firm Infrastructure

Firm infrastructure is a critical element of Michael Porter's Value Chain Model, providing the necessary framework for an organization's overall strategy and operations. It encompasses various support systems, including management structures, financial planning, and quality control, that ensure the effective functioning of primary activities such as operations, marketing, and logistics. According to Porter (1985), firm infrastructure is essential for creating a competitive advantage, as it directly impacts how efficiently an organization can execute its primary functions.

By aligning resources with strategic goals, a robust infrastructure enables firms to respond swiftly to market changes and customer demands. Research indicates that a well-designed firm infrastructure enhances decision-making processes within organizations. For instance, Breu and Hemingway (2019) emphasize the importance of a decentralized management structure that allows for more agile responses to emerging challenges. This flexibility is vital in today's fast-paced business environment, where rapid decision-making can significantly influence a company's performance.

Additionally, effective planning systems within the infrastructure facilitate better resource allocation, ensuring that critical areas such as production and marketing are adequately supported (Gonzalez et al., 2020). This alignment between infrastructure and primary activities is crucial for optimizing overall operational efficiency. Furthermore, the role of firm infrastructure in fostering compliance with regulatory standards cannot be overstated. Compliance mechanisms are integral to mitigating risks and enhancing organizational reputation (Brewster et al., 2023). A strong infrastructure supports the establishment of quality control systems that ensure products meet industry standards, thus reinforcing customer trust and loyalty.

In conclusion, firm infrastructure serves as the backbone of the value chain, integrating various organizational elements to enhance performance and competitive advantage. The interplay between firm infrastructure and primary activities is essential for achieving operational excellence and responsiveness to market dynamics. Prajogo and Olhager (2022) highlights that as organizations continue to navigate complex business landscapes, the significance of a well-structured firm infrastructure will likely grow, highlighting the need for ongoing research and innovation in this area.

2.4.3.3 Procurement

Procurement refers to the function of purchasing inputs used in the firm's value chain, not to the purchased inputs themselves. Purchased inputs include raw materials, supplies, and other consumable items as well as assets such as machinery, laboratory equipment, office equipment, and buildings. Ceasing to be a secondary business function, procurement has played a fundamental role in organisation's management by being responsible for purchasing specific resources from the external part of the enterprise required by internal operations.

In the literature, procurement and purchasing are sometimes discussed as interchangeable terms; however, there are authors (Chen & Paulraj, 2004; Pereira, Christopher & Silva, 2014; Abbasi & Mohamadi, 2020) who distinguish procurement as an evolution of purchasing which was fundamentally focused on cost-reduction in the past. Consequently, procurement is no longer considered a simple business function accountable for planning, implementing, evaluating and controlling purchase decisions (Kumar & Arora, 2021).

Internally, procurement managers provide information (such as suppliers' capacity, logistics data, pricing and discounts and new products information) to other functions and internal customers taking responsibility to supply procurement with their needs (Roh, Pong & Min, 2014). Thus, Caniato et al (2022) believe that cross-functional integration between procurement and other functions is fundamental to increase visibility of the flows and allow for more reliable decision-making from managers.

In this regard, Leenders and Fearon (2022) point out, in one of their study's propositions, the importance of developing a cross-functional team in purchasing and supply management. In summary, procurement has become widely recognised as an important function, responsible for increasing competitiveness within an unstable environment (Prajogo & Olhager, 2022), influencing positively the organisation profitability (Van, 2023) and contributing as much as other functions to business continuity (Gonzalez and Mena, 2021). It is, therefore, evident that procurement plays a fundamental role in any organisation. By doing so, this function is capable of managing relevant internal and external organisational issues which may help create supply chain resilience.

2.4.3.4 Information and Communication Technology (ICT)

Technological developments play an important role in retail operations, in terms of streamlining the flow of goods, services and information. Integrated and coordinated information systems are important to supply chain alignment (Davis, 2022). Organizational managers are ultimately held accountable for organizational performance (Hallyburton, 2013; Drucker, 2020). 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, Kalivan, Kannan & Haq, 2014). Information sharing results in benefits for all of the supply chain partners. Moreover, Feng and Wang (2021) stated that information and knowledge sharing can help spread the risks, costs, and gains for supply chain partners. Organizational success first depends upon the performance of the supply chains in which the organization functions as a partner (Christopher, 2022).

Information flow involves the exchange of information from suppliers to customers and vice versa, operating in both directions within the supply chain. Information is a critical resource known to enhance organizational efficiency and enable businesses to effectively meet customer expectations. Modern enterprises seek to share information with suppliers that is timely and beneficial for ordering and replenishment processes, thereby enhancing manufacturing performance. Therefore, Stevenson and Spring (2017) emphasize that the accurate and real-time flow of information in logistics is crucial for the efficient movement of materials. Patrucco et al. (2018) indicate that both the buyer and supplier must establish a mutually beneficial relationship to generate and exchange value. A robust supplier relationship can result in favorable outcomes.

However, there are risks involved, particularly when companies request price concessions from their suppliers, which can strain the relationship. Sharing information among supply chain participants enhances organizational and logistical planning, thereby optimizing performance. It ensures that all participants are well-informed about their roles in meeting market demands effectively (Mentzer & Moon, 2021). Although information sharing among supply chain participants is crucial, many remain reluctant to share information due to the belief that their competitive advantage in the market is tied to the information they possess. This reluctance stems from the perception that information can confer significant market power.

Supply chain actors often hesitate to share information with their business partners due to perceived risks, costs, and complexities involved. This reluctance turns information sharing into a trade-off between the responsiveness of information resources and overall efficiency (Zhao et al., 2021). Information within the supply chain often remains restricted or altered, hindering the availability of essential data necessary for informed decision-making, despite its potential benefits. Successful information flow depends heavily on the adoption of information technology. IT enables firms to access and monitor private data within a collaborative system, tracking product development across every stage of the supply chain. Health-care supply chain firms rely heavily on firm-specific IT infrastructure, as they help in driving operational and patient-related information from one department to the other, for example, in hospitals (Vähätalo and Kallio, 2015; Lindh and Nordman, 2017). With such information sharing between departments, trust among the units are also enhanced that aids in coordination (Kumar & Sethi, 2022).

So inside-out IT capability, although internally oriented, yet has a pivotal role in hospital operations through timely information exchange across critical units. Spanning IT capability mainly tries to unify the individual effectiveness of inside-out and outside-in IT capabilities (Zhang & Tansuhaj, 2023). Such synchronisation helps in achieving effective routine and strategic performance (Petitgout, 2018). IT resources aid prominently in the enhancement of operational and competitive performance in collaborative supply chains (Fawcett et al., 2019). Several research opportunities in IT and SC interfaces were identified by Gunasekaran and Ngai (2021) in their conceptual research where they argued that the IT and SC management jointly created the digitally enabled SCs. Complex SCs can be efficiently coordinated when both focal units and their allied partners are equipped with IT infrastructure at the same level (Khalid & Helo, 2022). Sheffield (2019) argued that assimilation of IT resources in supply chain management has its benefits but at a cost.

2.5 Supply Chain Integration

In the following paragraphs, key elements of supply chain integration are outlined and reviewed. The discussion covers the impact of supply chain integration towards the performance of supply chain. Review of supply chain integration could be further synthesized by focusing on the relevant definition and relevant literature review of supply chain integration.

2.5.1 Definition of Supply Chain Integration

Supply chain integration refers to the alignment and interconnection of key supply chain processes across different functions, departments, or organizations to improve collaboration, efficiency, and responsiveness. This integration involves the seamless flow of information, materials, and services between suppliers, manufacturers, and customers, with the goal of optimizing the entire supply chain's performance (Simchi-Levi et al., 2020; Kamble et al., 2020). When supply chain integration is effectively implemented, it enhances supply chain performance by reducing costs, improving lead times, and boosting overall operational efficiency. By ensuring smooth coordination between different stages of production and distribution, integrated supply chains are better positioned to meet customer demands, improve quality, and increase flexibility, which are key performance indicators (Schroeder & Goldstein, 2020).

Additionally, value chain management practices are integral to achieving supply chain integration. These practices involve managing and optimizing activities across the value chain to create competitive advantages (Porter, 1985). Proper integration of procurement, HR, IT, and other support functions with primary activities such as inbound logistics, operations, and customer service enhances the value chain's ability to generate maximum value with minimal costs, while ensuring that all elements of the supply chain contribute to the strategic goals of the organization (Fernandez & Gereffi, 2019). Briefly, supply chain integration (SCI) is a strategic approach that emphasizes the coordination and collaboration of various functions and stakeholders within the supply chain to enhance efficiency, responsiveness, and overall performance.

It involves aligning processes, information systems, and relationships among suppliers, manufacturers, distributors, and customers to create a seamless flow of goods, services, and information. As noted by Mena, Pascual and Van (2021), effective supply chain integration facilitates the sharing of critical information, reduces redundancies, and enhances the collective capability of all partners involved, ultimately leading to improved customer satisfaction and competitive advantage. One of the key benefits of supply chain integration is the ability to respond swiftly to market changes and customer demands. A study by Ralston et al. (2020) highlights that organizations with well-integrated supply chains can adapt more rapidly to disruptions and fluctuations in demand. This agility is crucial in today's fast-paced business environment, where consumer preferences can shift quickly.

By fostering collaborative relationships and leveraging integrated information systems, companies can achieve a higher level of operational efficiency and innovation, enabling them to deliver products to market more effectively. Moreover, supply chain integration plays a critical role in achieving cost efficiencies. According to Lee and Billington (2021), organizations that adopt integrated supply chain practices can optimize their inventory management, reduce lead times, and minimize operational costs. By synchronizing production schedules and inventory levels across the supply chain, businesses can better match supply with demand, thereby reducing excess inventory and associated carrying costs.

This alignment not only improves financial performance but also enhances the overall resilience of the supply chain. In conclusion, the importance of supply chain integration cannot be overstated in the context of modern business practices. By creating cohesive and collaborative networks among supply chain partners, organizations can improve responsiveness, reduce costs, and enhance customer satisfaction. As businesses continue to navigate complex global markets, effective supply chain integration will remain a critical component of their strategic objectives.

2.5.2 Literature Review of Supply Chain Integration

Supply chain integration (SCI) is the strategic integration of both intra- and inter-organisational processes (Zhou & Benton, 2021) and gauges the extent to which supply chain partners work collaboratively together to gain reciprocally beneficial outcomes (Kumar & Singh, 2022). SCI has become a major topic amongst organisations which seek to exploit the potential of the supply chain to build sustainable value (Kannan and Tan, 2010). Harrison and Van (2021) highlight that the ultimate aim of supply chain integration is to achieve the effective and efficient movement of products, services, information, cash, and decisions.

This is accomplished through coordinated efforts and the exchange of information, ensuring that value is delivered to the customer at low cost and without delay. Integration refers to combining one entity with another to form a complete system aimed at achieving a specific goal. In the context of supply chain management, the literature defines Supply Chain Integration (SCI) as the degree to which a firm is interconnected and aligned with its supply chain partners (Yu et al., 2019).

Zhou and Benton (2021) further defined SCI as a strategic collaboration of activities within organizations and among supply chain participants involves coordination and information sharing. While scholars define Supply Chain Integration (SCI) from various perspectives, the core elements of SCI are 'collaboration' and 'coordination,' often used interchangeably. To achieve effective integration, firms must collaborate and coordinate on agreed-upon processes and activities to optimize their supply chain efficiently and effectively. It has been proposed that formation and management of collaborative relationships among supply chain partners lead to improved levels of integration and performance. For example, Uvet and Celik (2020) found that positive outcomes of collaboration included enhancements to efficiency, effectiveness and market position. However, it appears that the link between integration and performance is not fully established. Thus, more research on how to achieve integration is called for, as a response to ambivalent results on the impact of supply chain integration on performance (Frohlich & Westbrook, 2022).

The above observations give a motivation to expand the earlier research on the relationship between supply chain integration and performance (Tsanos, Zografos & Harrison, 2014) by developing a conceptual model that considers professional human resources, infrastructure also ICT and their influence on supply chain performance. To understand how SCI translates into real-world benefits, scholars have identified several key areas of impact, particularly when collaboration is implemented at the strategic level to yield both operational and strategic benefits (Flynn et al. 2010; Mackelprang et al. 2014; Cox & Chicksand, 2021). When companies strategically collaborate on their activities, they can distinguish themselves from competitors and gain a competitive advantage. This collaboration not only helps in differentiation but also enhances operational performance in areas such as speed, quality, dependability, and flexibility.

Wiengarten et al. (2019) highlight that researchers have emphasized the importance of using Supply Chain Integration (SCI) to achieve improvements across various performance measures. Examples include improvement in quality and cost (Schoenherr and Swink 2012), where companies can reduce product or service defects and better understand customer needs to tailor their offerings precisely to customer demands. The cost reduction performance is also seen in forms such as an increase in productivity due to fewer defects and product redundancy; flexibility (Wong et al. 2011) through adequate/accurate information sharing which facilitates quick access to demand to enable service and product fulfilment; and delivery (Wiengarten et al. 2019) where

through adequate and timely information sharing, companies are able to achieve reliable, quick and timely product and service delivery. Therefore, Roh and Yoon (2023) concerned that lack of SCI causes serious problems such as increased inventory cost, delayed procurement, lowered product quality and inaccurate product forecasts, which may jeopardise both a focal organisation and all of its supply chain partners, by worsening customer satisfaction.

The SCI construct comprises three dimensions including internal, supplier and customer integration to capture multidimensionality. Internal integration refers to the extent to which a manufacturer re-engineers its own organisational strategies and processes into synchronised processes to satisfy its customers' demands (Gonzalez & Sweeney, 2022). The expansion of cross-functional teams that tend to focus on their process requires a seamless flow of resources and relevant information in supply chains and removal or minimisation of barriers between functional boundaries to surmount the shortcomings of specialisation (Sgro, Palazzi & Gelsomini, 2020). Internal integration facilitates cooperation amongst internal functions (Lee & Billington, 2022). It focuses on functions within the manufacturers via an integrated process across them.

An absence of internal integration and heterogeneity of each team's aim may cause redundant work and waste resources, which undermine quality and cost performance (Ketokivi & Choi, 2014). In addition, internal integration fosters relevant knowledge and information sharing (Zhao, Huo & Selen, 2023). By sharing knowledge pertaining to value-adding activities across cross-functional teams, they can facilitate modern supply chains, which in turn promote greater integration of suppliers and customers (Fawcett & Waller, 2010). External integration comprises supplier and customer integration (Parida, Westerberg & Frishammar, 2012). According to Liu et al (2020), a multitude of activities between a focal firm and suppliers underpin supplier integration, including information sharing and collaboration in planning and joint production development in dealing with inter-organisational boundaries.

Kahn and Mentze (2021) define coordination 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".

2.6 Relationship of Professional Human Resource and Supply Chain Performance

Professional Human resources (PHR) and the supply chain (SC) as fields of study have traditionally been treated separately, despite their being "intimately linked" in almost all business environments (Harrison & Van, 2023). In fact, Becker and Huselid (2021) propose the importance of human resource management (HRM) related to the area of operations as a new research theme. To ensure the success of their supply chain performance (SCP), firms need to commit themselves fully to promoting this human dimension. Many firms focus their attention on improving and investing in technology and in infrastructure, but they need to dedicate the same attention to the people that manage and operate the supply chain (SC).

For Dyer and Singh (2022) an adequate HR system is a key element in the implementation of a SC and, consequently, for greater customer satisfaction (CS) and an improved operational performance. Therefore Decha, Khlungsaeng and Pulphon (2020) agreed that the evidence indicates that SCP research has focussed on the study of the integration of manufacturing and marketing processes, concerning itself above all with the performance measurement of supply chain management SCM practices, above all with regard to a firm's operational systems, including resource efficiency and cost reduction, and marketing questions, such as customer service.

Furthermore, according to the literature (Marin, Alfalla & Medina, 2014), SCM studies have targeted the structural or hard areas (technology, information or measurement systems, JIT and IT purchasing, among others) at the expense of the so-called non-structural or soft areas (HR, cultural organisation and trust, among others).

In this sense, few empirical studies have measured the causal relationships between human resource HR practices, supply chain management SCM performance and a firm's success (Vanichchinchai & Igel, 2011; Fu et al., 2017; Nguyen & Doan, 2020), although there are clear indications that HR practices improves the performance of supply chain.

There is little in the literature that describes the relationship between human resource activities or organization variables and supply chain success. This omission may perhaps be due to the previously noted initial research emphasis on hard supply chain topics. Further, there is a notable lack of studies that evaluate the soft variables and their alignment with supply chain strategies, using high confidence methods.

For that reason, this paper includes general research in just-in- time (JIT; earlier described as the internal and dyadic steps in supply chain development). As with supply chains, JIT has been shown to have a hard and a soft component (Ezzahra, Ahmed & Said, 2018). Additionally, this study considers cross-national cultural studies relating to products, processes, and systems. Specifically, Hofstede and Minkov (2022) offers a relevant cross-national cultural perspective on differences in process implementation. Similarly, Johanson and Vahlne (2021) define a "country psychic distance profile", which measures cultural differences among countries. Unfortunately, this sort of profile is not available for companies, though the work of Johanson and Vahlne (2021) may be applicable to globally integrated firms. From an applied perspective, Al-Wahshi (2016) suggest that human resource management practices must be proactively applied to the emerging supply chain.

Toward this end, Cascio and Montealegre (2021) identify new rules for human resource practices, including permeable boundaries and virtual enterprises. Other than that, Simba and Thai (2019) describe the direct and indirect effects that changes in supply chain management have on human resource activities. For example, direct efforts may include customer inquiries about human resource practices which lead to the establishment of a wide- ranging auditing system, while indirect efforts include customer performance demands of suppliers. Meanwhile, Jabbour and Sousa (2016) characterize a transaction-relationship continuum for logistics and human resource management strategies and emphasize the necessity for fit between logistics and human resources strategies. These efforts, however, fall well short of providing propositions and a model of the general structure of the soft variables and their relationship and fit with supply chain integration and performance.

The importance of fit, variously called alignment, concordance, and congruence, cannot be overstated (Sorge, 1991; Wong, 2001; Sparkman, 2015; Meyer & Smith, 2020). The basic notion of fit suggests that any deviation from a complete co-alignment incurs inefficiencies or transaction costs. Meyer and Smith (2020) identifies how organizations fit institutionalized patterns with the market requirements of specific niches to achieve comparative advantages. Sparkman (2015), following Meyer and Smith (2020), argues that an organization must choose between cooperative, competitive, and independent strategies. They find that the cooperative strategy leads to greater quality contributions from supply chain partners.

From another perspective, Meyer and Smith (2020) conclude that organizations must assure that recruitment and selection processes are congruent with the firm's practices. Again, however, these efforts fall well short of identifying the critical dimensions of soft human resource activities and organization variables that should support, and be aligned with, the hard components of supply chain integration and performance. The industrial cluster effect results in the high concentration of suppliers of the same industry or relevant industries to form a complete supply chain system and create value-added effects among relevant industries (Porter, 2022). In addition to cost reduction and efficiency improvement, it can also contribute to innovation (Edquist, 2021). Enterprises in the cluster can more apparently perceive competitive pressure and market opportunities, as they are geographically close to each other.

When the flow of information and human resources is relatively fast, it can help to promote the spill over effects of industrial knowledge and strengthen the advantage of industrial innovation. Hsu, Lai and Lin (2014) emphasized that professional human resources are an essential factor in the formation of industrial clusters and improving competitiveness. Morrison and Dunning (2023) pointed out that the industrial clustering relationships can enhance the industrial competitive advantage through positive vertical and horizontal connections. Bergman and Feser (2020) argued that industrial clusters are the reuse of the industrial clustering phenomenon.

Clusters represent a group of associated industries that reduce costs, gain advantages and improve the firm's performance of relevant companies through clustering. Meyer et al., (2011) and Keeble and Wilkinson (2017) mentioned that manufacturers in a cluster can easily gain access to benefits, such as professional talents, knowledge and technology, to reduce production and transaction costs and thus improve the firm's performance of the enterprises.

From the viewpoint of employment clusters, it was found that regional economic infrastructure requires international competitiveness, educational and research institutes, a proper resource supply, etc. These depend on the input of talents or professional human resources. In particular, clustering regions with advanced knowledge and technology can better attract new manufacturers and strengthen the local industrial power and knowledge bases (Le-Masson & Hatchuel, 2010; Inman et al., 2011; Florida & Kenney, 2022).

Chesbrough and Rosenbloom (2023) emphasize that research and development networks with innovation as the goal are like a flexible organization that can promote innovation through knowledge and information exchanges in between members. A research and development network have a large flow of knowledge and information. Manufacturers share the development cost and risk of innovative technology and strengthen the technologically innovative performance via network teaching (Nambisan & Sawhney, 2022). Human resources are the key to the sustainability of enterprises of clusters (Good, 2017).

When discussing the competitiveness of industrial clusters, Yang (2020) pointed out the four clustering element strategy resources proposed by Michael Porter: high-quality human resources; a technology infrastructure; knowledge resources, and capital resources. All of which have a causal relationship with a continuous route; therefore, high-quality human resources are one of the important factors. Becker and Huselid (2023) suggested that the strengthening of human capital is significantly positively correlated to the firm's performance of enterprises. Meanwhile Wheeler et al. (2010) found that an innovative working system has a positive impact on a firm's performance as compared with the traditional human resource systems.

Porter (2022) argued that, based on the characteristics of specific industries and the development process of manufacturers, regional industrial clusters with spatial close relationships can be formed. The geographic proximity demonstrates that the need for knowledge drives the continuous occurrence of knowledge user derivation and the flow of technology talents, resulting in a significant impact on innovative activities. Kalubanga (2018) advocated that industrial clusters are the connection of a group of manufacturers in terms of individual efficiency and competitiveness and that they have close relationships.

Glaeser and Gottlieb (2021) stated that business competitiveness depends on productivity rather than easily accessible production elements and the size of individual enterprises. The determining condition of business environment is generally related to the industrial cluster. Awad (2017) advocated that because enterprises in industrial clusters can produce relationships with fierce competition and close cooperation in the region, the process will produce innovative practices. Clustering can promote cooperation to overcome common problems and share input resources that individual companies do not have access to.

Hence, the clustering relationships of enterprises in an industrial cluster can produce innovative advantages for the need of new services and enhance the firm's performance of a company. Supply Chain Management involves the expansion, development, implementation, and monitoring of supply chain processes, efficiently utilizing information and technology (Khudhair et al., 2020). Supply Chain Management (SCM) includes all operations from raw material procurement, storage, work-in-process inventories, to finished products, spanning from the point of origin to the point of consumption.

It ensures organizational productivity while meeting customer demands and ensuring customer satisfaction (Manogaran et al., 2020). Violations of human resources ethics can result in numerous legal issues, both civil and criminal, for the company and its employees. Regulatory agencies like the BBB and the Equal Employment Opportunity Commission receive more complaints from victims of HR ethics violations than from other departments, such as product development or accounting. Companies with comprehensive ethics programs can prevent discrimination and hostile work environment issues, leading to lower litigation and settlement costs.

Simultaneously, due to increasing globalization, competition, privatization, liberalization, commoditization, and technological advancements, supply chains have become highly complex (Malik et al., 2020). Despite the recognition that effective Supply Chain Management can provide a significant competitive advantage, there seems to be a lack of acknowledgment that this factor hinges on the performance of human capital within the supply chain (Kumar et al., 2020). Human capital refers to the value derived from a worker's experience and skills. It encompasses assets such as education, training, intelligence, skills, and health, which are intangible qualities not typically listed on a company's balance sheet.

Enhanced productivity and profitability are directly connected to human capital. The more a company invests in developing its employees, the greater its likelihood of achieving success and maintaining productivity. Effective and strategic human resource management can establish a strong foundation for competitive advantage, yet little of this knowledge has been applied to team management, training, and development within the supply chain (Ramprasad & Amudha, 2014). Purposefully managing human resources in the supply chain requires HR configurations and ongoing HR development that align with the broader corporate strategy (Öztürk & Yildizba¸si, 2020).

The company's commitment to HR development is essential to improve employee performance and ensure employee comfort and job satisfaction (Amudha, 2021). Effective Human Resource Management (HRM) and its established practices like job design, recruitment, selection and orientation, performance management, compensation, training, and development can foster a culture of efficiency and success in work management (Gheisari et al., 2021). The data triangle forms the basis of the concept of quality within organizational settings.

In strategic HR management, the HR department plays a crucial role and exerts a lasting influence on strategic decisions at the managerial level. Human resource management at the micro level, involving HR practices and policies, is vital but insufficient for companies to achieve sustainable competitive advantage (Billah et al., 2021). To remain competitive, businesses must embrace a strategic approach to human resource management. Supply chain management encompasses everything involved in creating a product, from raw materials to finished goods. Raut et al (2020) stated that enhancing customer value and achieving a competitive advantage in the market requires optimizing a company's supply-side operations while the success or failure of a company is not solely determined by its strategic HRM practices, these practices are likely to play a crucial role.

2.7 Relationship of Firm Infrastructure and Supply Chain Performance

The transaction cost perspective suggests that supplier idiosyncratic investment leaves a supplier open to opportunism by their customer without the presence of contracts or hostage exchanges. Relational exchange theory (RET) suggests opportunism may be suppressed through relational norms, the expectation of relational continuity (Dwyer, Schurr and Oh, 2022), and joint value creation (Geyskens, Steenkamp & Kumar., 2021). With potential for joint value creation, the negative impact of opportunism on expected future exchanges often dominates the inclination to act opportunistically.

RET asserts that integrative exchange entails emphasis on structure and process planning to facilitate joint value creation in anticipation of future exchange (Kumar & Helgeson, 2022). The structure and process approach to measuring integration is widely supported in the literature, highlighting that interaction (structure) antecedes effective and efficient collaboration (process) (Mai, 2016).

Two studies exploring integration across supply chains focus on the role of information technology on integration (Schryen, 2013). In both studies, integration was conceptualized as a two-dimensional model in which the first-dimension integrated technology infrastructure facilitates the second-dimension integrated supply chain activities. Nguyen, Ha and Doan (2020) follow the structure-conduct-performance approach to integration, in which supplier investment in relationship-specific infrastructure results in increased integration of supply chain processes.

2.8 Relationship of Procurement and Supply Chain Performance

Having the right components parts and process resources at the right time at the right prices is very important for firm performance in terms of cost, quality, delivery and innovativeness. These are essential activities in procurement. A core function of procurement is thus to quickly secure such critical resources at low costs that meet the firm's needs. As such, it stands to reason that higher levels of procurement performance (capability) will support the overall performance of the firm (Pearcy and Dobrzykowski, 2012). It is widely held that firms that achieve better lead time and lower costs tend to improved firm performance (Matopoulus, 2014). Huang and Mak (2021) emphasized that lead time will support a firm's goals with regard to responding quickly to customers thus improving sales, while lower costs influence the overall profitability of the firm.

Increasing numbers of firms use procurement in an attempt to enhance these key business outcomes. This comes as no surprise, given one of the key competitive priorities for the 21st century is the maximization of technologies such as procurement (Hacket, 2024). Among other things, technologies assist supply chain management professionals in the sometimes-arduous task of linking supply chain members, which is a necessity in increasing the speed of information transfer and reducing non-value adding processes. Van and Rozemeijer (2022) mentioned that supply chain management professionals are faced with the challenge of selecting and implementing the most appropriate procurement to meet the needs of their firms.

While these and other forms of procurement can prove to be beneficial, the supply chain management professional's decision-making process can be complicated by the fact that these tools vary in many respects, including their ability to facilitate supply chain integration within and across firms. Monczka et al. (2022) voiced out that some procurement tools involve applications within a single function (e.g., electronic requisitions), while some facilitate integration across multiple functions within a single

firm (e.g., Enterprise Resource Planning [ERP] systems); others provide integration across organizations (e.g., Electronic Data Interchange [EDI]). The purpose of the procurement process in supply chains is to ensure that organizations have the supplies required to meet the demand (Holm, Rudis & Wilson, 2015).

Mauliddina (2020) describes different features that help characterize the procurement process in supply chains. The author explains that goods and services enter the supply chain through different sources. Goods can be acquired in different ways such as in bulk or stored at the vendor until needed (Falasca & Zobel, 2011; Mauliddina, 2020), and the procurement of goods can be done using local or global suppliers (Blecken, 2010). Local procurement, whenever possible, has the advantages of faster delivery times and lower transportation costs (Cohen & Lee, 2021). Local procurement can also help in the recovery of the affected region by stimulating the local economy. However, Cohen and Lee (2021) believe that local suppliers may not be able to provide the level of quality needed as local procurement can generate competition between organizations and result in shortages.

2.9 Relationship of ICT and Supply Chain Performance

Recently with development of IT, the concepts of supply chain design and management have become a popular operations paradigm. The complexity of SCM 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. This illustrates an evolution in supply chain towards online business communities. According to Mentzer, Moon and Estampe (2022), supply chain management emphasizes the long-term benefit of all parties on the chain through cooperation and information sharing. This confirms the importance of IT in SC which is largely caused by variability of ordering. There have been an increasing number of studies of IT's effect on supply chain and interorganizational relationships.

A popular belief is that IT can increases the information processing capabilities of suppliers, thereby enabling or supporting greater relationship in addition to reducing uncertainty. IT decreases transaction costs between buyers and suppliers and creates a more relational/cooperative governance structure, leads to closer buyer-supplier relationships, may decrease trust-based interorganizational partnerships and removes a human element in buyer-supplier interaction, while trust is built on human interaction.

IT increases the effectiveness of organizational decision making and learning, and thus indirectly enhances firm performance (Liu, Wei & Hua, 2013). Some researchers argue that IT investments have mixed results because they are often applied ineffectively, hurting the organization's communication infrastructure (Zhang & Van, 2016; Zhang & Tansuhaj, 2023). Liu and Zhang (2022) mentioned that IT integration sets a stage where a firm can generate a series of interaction patterns with its customers.

In accordance with the structuration perspective, it is not the IT itself which promotes an understanding of customer firms, but it is the duality of structure, namely the actual human integration of the IT, which provides a desired strategic outcome (Chunha, 2013; Orlikowski, 2020). Collaborated IT can eliminate problems in communication and thus set the stage for a clearer understanding (Kelleher & O'Connor, 2021). With the assistance of IT integration that results in more interactions and better access to customer information, the firm can easily assign meanings to its customers' behaviors and preferences (Citroen, 2011). Recent research from Chae (2022) also shows that as a result of IT integration that helps firms better anticipate the needs of customers, lead time is reduced.

2.10 Relationship of Supply Chain Integration and Supply Chain Performance

Supply chain performance is an important driver of organizational and market performance (Gunasekaran & Ngai, 2021). It is defined as "the benefits derived from supply chain cooperation, including efficiency improvement, cost reduction, and enhancement in cycle time" (Yul and Kyu, 2015). Previous research has shown that an efficient and effective supply chain delivers quality products on time and in the right quantities (Prajogo and Olhager, 2022), reduces order cycle time (Mishra & Singh, 2023) and provides mutual benefits for supply chain partners (Cao & Zhang, 2021).

Several studies suggest that improving supply chain integration can positively impact supply chain performance, as it fosters better coordination and smoother flows of materials, information, and decisions across the supply chain (Salamah, Alzubi, & Yinal, 2023). This integration is seen as a key driver for enhancing operational efficiency, reducing costs, and improving responsiveness to customer needs. However, the results of existing research on the relationship between integration and performance remain inconsistent.

Some studies, such as Flynn et al. (2010), highlight positive effects, while others, like Kumar et al. (2017) and Li & Lin (2022), suggest that the impact may vary depending on factors such as organizational context, industry, and specific integration strategies used. Therefore, while the potential benefits of supply chain integration are generally recognized, its effectiveness in improving performance may depend on various contextual factors that require further exploration. RBV scholars have argued that integration offers companies resources that are valuable and hard to imitate (Barney & Clark, 2021), enabling OEMs to become more market responsive (Teece, 2020). Kamal and Irani (2014) find increasing overall supply chain performance is a key motivation for the supply chain integration while Zhao, Huo and Flynn (2021) identified that companies in the supply chain with the highest level of customer and supplier integration achieve the highest level of performance in the context of service quality, delivery, productivity, market share and profitability.

There is limited explicit research on integration in the automotive supply chain (Othman et al., 2016), but reasonable optimism has been identified in studies to suggest a positive relationship between supply chain integration and performance. Integrating Tier-1 suppliers within early-phase design activities has a positive impact on the success and project performance of vehicle manufacturers in terms of costs, quality and time-to-market (Wong & Boon-Itt, 2011; Liker & Morgan, 2020). Similarly, customer integration supports enhanced product quality (Danese & Romano, 2011) and the achievement of customer-focused production (Lotfi et al., 2015). Furthermore, integration within supply chains positively contributes to cost-containment performance (Rao & Goldsby, 2021), reliability (Zhang & Huo, 2020) and customer-oriented performance (Chen & Paulraj, 2022).

Given the lack of consensus in the literature over the relationship between supply chain integration and performance, but the encouraging emphasis found in automotive research, it is necessary to explore this relationship further in the current study. This research predicts a positive relationship between supply chain integration and supply chain performance in the manufacturing industry, which is additionally reinforced by Additive Manufacturing adoption. Increasing the level of integration and sharing of information between the members of a supply chain has become a requirement in improving supply chain performance. Such cooperative activities by firms provide easy access to the information needed, more attention to customer needs and faster response times than competitors.

Past studies reveal positive relationships between supply chain integration and performance levels (e.g., Schryen, 2013; Wang, Gunasekaran & Ngai, 2020). Lee (2015) also mentioned that by reducing costs and increasing market share, well-integrated supply chains create value for shareholders. Ambivalence on the impact of supply chain integration on performance calls for more research. In particular, there is a need to examine how individual dimensions of integration are related to different dimensions of performance (Lin, Zhou & Dai, 2021) and how the integration of manufacturing and marketing/sales decisions affects organisational performance (Wang, Li & Shi, 2021). It is argued that there is a need to further explore linkages between dimensions of supply chain integration and supply chain performance. According to Christopher (2020), supply chain refers to all different processes and activities that produce value in the hands of the ultimate customer.

2.11 The Mediating Effect of Supply Chain Integration

Increasing the level of integration and sharing of information between the members of a supply chain has become a prerequisite for improving supply chain performance. Such organizational cooperative behaviours provide quick access to the information required, more concentration to customer needs, and faster time to market than competitors. Past studies showed positive relationships between the level of supply chain integration and performance (e.g., Kim, 2006; Zailani and Rajagopal, 2015; Flynn, Koufteros & Lu, 2021). By reducing costs and increasing market share, well-integrated supply chains create value for shareholders (Lee, 2010; Zhang, Liu & Wang, 2020). According to Tan, Wei and Waring (2021), companies that have effectively integrated their supply chains have less inventories, shorter cash flow processing times, decreased transportation and material procurement costs, increased productivity in the workplace and enhanced customer responsiveness.

Similarly, it has been shown that receiving customer demand information reduces inventory costs in a supply chain (e.g., Lee et al., 2013; Cheng & Lu, 2021). Under the visibility and continuous communication capabilities provided by advanced technologies and information systems, inventories can now be resupplied promptly and rapidly (Shapiro et al., 2013). Wang, Zhang and Li (2022) showed that sharing information on supply and demand with the supply chain helped to reduce inventory costs and shorten order cycle times.

Chen and Lin (2021) stated that coordination and information sharing are also suggested to increase the ability of supply chains to react to sudden changes in volatile demand environments. There are several other studies that show cooperative sharing of knowledge among supply chain partners improves the competitiveness and effectiveness of supply chains (Zhao et al., 2012; Zhou, Wang & Zhao, 2023). Managers in manufacturing industries often seek to manage supply chains by adopting new techniques such as total quality management, just-in-time (JIT), enterprise resource planning and lean production (Gunasekaran et al., 2014). Customer integration enhances market expectations and opportunities, leading to more precise and rapid responses to customer needs (Swink et al., 2017). External integration underlines the importance of building close and interactive relationships with suppliers and customers (Kumar & Saini, 2022). All three types of integration are essential to ensure enhanced value in supply chains.

2.12 Underpinning Theory

The mechanisms governing the formation of exchanges between business partners can be studied from several theoretical vantage points differentiating in terms of their focus on specific aspects of the exchanges (e.g. transaction costs, resources, relational elements, etc). Smith and Jones (2021) stated that selecting the appropriate theoretical approach should depend on the study's research objectives and the researchers' appraisal of the capability of alternative theories to explain the actual manifestations of the phenomena under examination. Based on the classification of transactions in terms of their distinguishing characteristics (Ring and van de Ven, 2012), supply chain relationships exhibit the majority of characteristics of relational contracting transactions (Tsanos et al., 2014) and can therefore be viewed as continuous, long-term relationships.

This study examines if the collaborative behaviour of value chain partners involved in relational exchanges leads to greater integration and performance. According to Zhao, Wang and Li (2022), the examined behavioural characteristics suggest that the driving force behind the formation of these relationships is the partners' belief that higher performance benefits for the supply chain can be achieved through collaboration. Therefore, a theoretical approach that addresses the association among relational constructs and integration is appropriate.

In addition, as the value chain management practices is derived from the secondary activities in Value Chain Model, the value chain activities will also be explained further. Kim and Choi (2021) mentioned that theories concerning value chain management are presented to formulate an understanding of the framework that firms in supply chain are able to learn to leverage their internal resources to build up the value chain. The practices and implementation of value chain management practices, supply chain integration and supply chain performance can be viewed through various theories. Theories such as the contingency theory provide a strong background for addressing this relational perspective. The contingency theory highlights the need for managers to recognize the implications of a changing environment and to use firm resources (in this case resources in the supply chain) to respond effectively (Sousa & Rocha, 2021).

Kayakutlu (2010), Stonebraker and Afifi (2014), and Kharub and Sharma (2020) emphasize that contingency theory focuses on the challenge's organization face due to a dynamic environment. These challenges arise from factors such as shifting customer demands, technological advancements, and external environmental changes. The theory suggests that effective utilization of firm resources is crucial for organizations to adapt and respond to these evolving conditions. By aligning resources with external pressures and internal capabilities, firms can navigate complexities and maintain competitive advantage in the face of constant change.

In addition to contingency theory, elements from other theoretical approaches are used. The use of other interorganisational theories in supply chain, complementarily to the predominant theoretical underpinnings, provides a more comprehensive view of the SC phenomena under examination and is encouraged (Halldorsson et al., 2017). The resource-based view (RBV) theory (Barney, 1991) justifies the relationship between information exchange and supply chain performance improvement. It is argued that the formation of relational exchanges between supply chain partners can create a sustained competitive advantage for the supply chain because it opens access to resources in the forms of information sharing and decision coordination.

These resources demonstrate attributes that can lead to competitive advantage (Barney, 1991): they are valuable, rare among the supply chain's competitors, imperfectly imitable and non-substitutable. Among the partners in supply chain, the information access may lead to the increased information integration also coordination of operational decisions, thus creating a sustained competitive advantage that can be translated into a higher supply chain performance.

2.12.1 Value Chain Model

Firms throughout the world face slower growth as well as domestic and global competitors. It is important to categorize the business system into a series of value-generating activities, called the value chain, to better understand the activities by which a firm develops competitive advantage and produces shareholder value (Porter, 2020). Marketing involves satisfying consumer's needs and wants. The task of any business is to deliver customer value at a profit. In a hypercompetitive economy with increasingly rational buyers faced with abundant choices, a company can win only by fine-tuning the value delivery process and choosing, providing, and communicating superior value (Kotler & Keller, 2016).

Porter's Value Chain is a model used to analyse the actions undertaken by an organization during development of a product or service. Such activities add value and cost to product and service development processes. The activities can be categorized as primary or secondary, relying on whether they are the company's main business or rather its auxiliary functions (Porter, 2021). The aim of these activities is to deliver a level of value to the consumer that exceeds the expense of the activities, resulting in a profit margin. The value chain was a concept developed by and made public by Harvard strategy guru Michael Porter.

The value chain also known as value chain analysis, is a concept from business management that was first described and popularized by Michael Porter in his 1985 best seller, *Competitive Advantage: Creating and Sustaining Superior Performance.* The value chain categorizes the generic value-adding activities of an organization as the "Primary activities" and these include: inbound logistics, production, outbound logistics, sales and marketing and maintenance.

The 'support activities' include: administrative infrastructure management, human resources management, technology development and procurement. The costs and value drivers are identified for each value activity. The value chain framework quickly made its way to the forefront of management thought as a powerful analysis tool for formal strategic planning. Its ultimate goal is to maximize value creation while minimizing costs (Johnson, Scholes and Whittington, 2015). In his book Competitive Advantage, Porter (1985) introduced a generic value chain model that comprises a sequence of activities found to be common to a wide range of firms. Porter identified primary and support activities as shown in the following diagram:

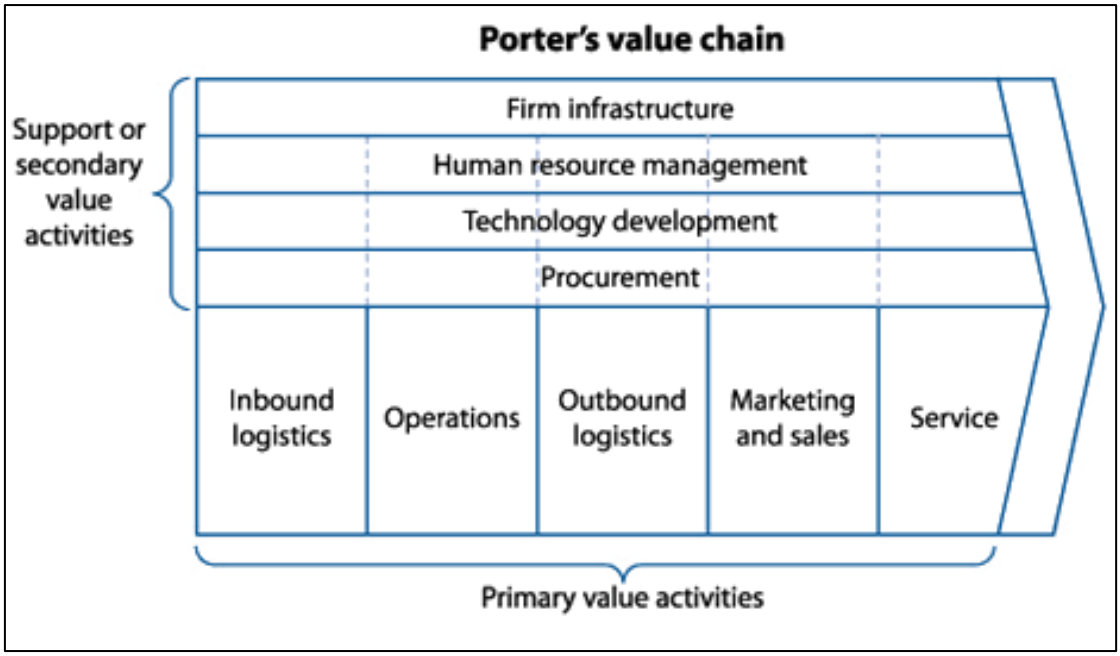

Figure 2.3 Porter M.E (2004) Porter's Value Chain

Identifying the value chain activities is very important. These should be activities that are "technologically and strategically distinct" Porter (1985). In a firm, there are primary activities and support activities. These primary and support activities can be direct, indirect or be quality assurance activities. Clear and succinct definition of these activities is the first step for a firm that intends to use the value chain to gain competitive advantage. To use the value chain as a tool of gaining competitive advantage, a firm in an industry has to properly define its value chain. According to Porter (2021), the discrete value activities identified should have three key features.

Firstly, they should have different economics, secondly, they should have a high potential impact of differentiation and thirdly they should represent a significant or growing proportion of cost. Grant (2023) exclaimed that successive desegregation of activities can expose differences that are important to competitive advantage. According to Porter (2022), firms have gained competitive advantage by redefining the roles of traditional activities. He further argues that everything that a firm does must be captured as a primary or secondary activity. Value activities should be assigned to categories that best represent their contribution to a firm's competitive advantage. Therefore, the clear and proper definition of the value chain is very important in using the value chain to gain competitive advantage.

2.12.2 The Value Chain activities

Porter (1985) Primary activities are directly concerned with the creation or delivery of a product or service and can be grouped into five main areas. These are; inbound logistics, operations, outbound logistics, marketing and sales and service. Inbound logistics are the activities concerned with receiving, storing and distributing the inputs to the product or service. They include materials handling, stock control, and transport. Operations transform these various inputs into final product or service: machining, packaging, assembly, and testing. Outbound logistics collect, store and distribute the product to customers. For tangible products this would be warehousing, materials handling, distribution, etc. In the case of services, they may be more concerned with arrangements for bringing customers to the service if it is a fixed location (Hill & Jones, 2022). Marketing and sales provide the means whereby consumers/users are made aware of the product or service and are able to purchase it. This would include sales administration, advertising, selling and so on.

In public services, communication networks which help users access a particular service are often important. The last primary activity is Service. This includes all activities which enhance or maintain the value of a product or service, such as installation, repair, training and provision of spare parts. The primary activities are linked to support activities. Barney and Hesterly (2021) stated that support activities help to improve the effectiveness or efficiency of primary activities and they can be divided into four areas; firm's infrastructure, human resource management, technology development and procurement. Procurement refers to the processes for acquiring the various resource inputs to the primary activities. Technology development refers to all value activities that have a technology, even if it is just know-how. The key technologies may be concerned directly with the product or with processes or with a particular resource. This area is fundamental to the innovative capacity of the organisation.

According to Porter (2021), human resource management, which transcends all primary activities, is concerned with those activities involved in recruiting, managing, training, developing and rewarding people within the organisation. Infrastructure refers to the systems of planning, finance, quality control, information management, etc. important to an organisation's performance in its primary activities. Infrastructure also consists of the structures and routines of the organisation which are part of its culture.

2.12.3 Porter's Secondary Activities

Support value activities can be divided into four generic categories as shown in Figure 2.3. These activities help to improve the effectiveness or efficiency of primary activities to which they are actually linked to (Johnson, Scholes & Whittington, 2017). Support activities (sometimes called staff or overhead functions) assist the firm as whole by providing infrastructure or inputs that allow the primary activities to take place on an ongoing basis (Pearce & Robinson, 2015).

These activities include; Firstly, Procurement which includes all activities involved in acquiring resource inputs to the primary activities, including the purchase of fuel, energy, raw materials, components, assets such as machinery, soft and hard wares, office equipment and consumable items from external vendors. Indeed, Calniels and Gelderman (2021) affirms that procurement tends to spread throughout the organization and generally has a significant impact on the firm's overall cost and differentiation thus it does underpin excellence in creating best value in products.

Secondly, Technology development activities relating to product design and improvement of production processes and resource utilization, including research and development, process design improvement, computer software, computer-aided design and engineering and development of computerized support systems. Technology development will describe innovative capacity of an organization. Key technologies are mainly specific to a product, process or particular resource and this is fundamental to the innovative capacity of the organization (Johnson et al., 2015).

Technology is key in creating competitive advantage. However, Gonzalez et al (2021) argued that investment in technology requires two critical shifts that is a shared vision and a proactive mindset in order to realize return on investment where an organization must first share its vision of where it is going with all levels of staff. The vision then answer the question why are organization investing in this and what does it mean to the client and the firm. The organization will then establish some standards work processes that ultimately will improve utilization & cross training of staff members. Further, the Information & Communication Technology (ICT) department must have a proactive mindset rather than reactive to issues. Chong, Zhang and Yeo (2022) stated that ICT must have the perspective that technology is a means to leverage their business initiatives and to manage their critical assets, time, and people & money.

Further, Odero (2016) stated that they must appreciate the need to drive the process as a means of controlling overhead costs, leveraging resources and providing quantifiable return on investment.

Thirdly is Human Resource management which includes all the activities involved in recruiting, hiring, training, developing and compensating the people in an organization. According to Smith and Jones (2021), human resource formulates the organizations character which entrenches the perspective influencing the way an organization develops new ideas, considers and weighs options and responds to its environment. Human resource management affects the competitive advantage in any firm through its role in determining the skills and motivation of employees and the cost of hiring and training. According to Johnson and Lee (2022) the benefit an organization realizes from human capital investment is directly proportional to the quality of its human resource, strategy, processes and overall management. The outcomes of an organization's human resource processes are critical capabilities like enhanced leadership, managerial competency, employee efficiency and proficiency and workforce collaboration. Therefore, Smith and Patel (2021) concluded that an efficient human resource organization empowers employees, managers, suppliers and partners and leverages technology to accomplish strategic business goals.

Lastly, is the Firm's infrastructure or general administration, including activities, costs and assets relating to general management safety and security, finance, accounting, legal affairs, research & corporate planning, management information systems and the formation of strategic alliances. Infrastructure unlike other support activities which usually supports the entire chain and not individualized activities. Firm infrastructure is sometimes viewed only as 'overhead" but can be a powerful source of competitive advantage (Johnson & Lee, 2022). According to the Porter's value chain model, the word margin on the right side indicates that the firm obtains a profit margin that is more than the cost of each of the individual activities or subsystems that comprise the value chain. He argued that the end customer is more willing to pay more for a product or service than the total cost of all the value chain activities or subsystems.

In another hand, linkages are the means by which the interdependent parts of the value chain both internal and external are joined together. Such linkages take place when one clement affects the cost effectiveness of another element in the value chain. Linkages thus require coordination, ensuring that products are delivered on time.

Indeed, Wilkins (1989) reinforces this view and points out that without internal alignment there cannot be external alignment. Internal alignment involves having aligned resources- both human and non-human, systems, goals and objectives to enable the organization maximize its output while external alignment involves the capability of fulfilling the consumer needs and the other stakeholders' expectations like shareholders, the government among others (Smith & Brown, 2023). Revang et al (2018) emphasize that the core of strategy is the ability to build and maintain relationships to the best people for maximum value creation, both ‘internally’ to the firm's representatives and ‘externally’ to the customers.

2.12.4 Contingency Theory

The contingency theory highlights the need for managers to recognize the implications of a changing environment and to use firm resources (in this case resources in the value chain) to respond effectively. Kayakutlu and Buyukozkan (2010), Stonebraker and Afifi (2014), and Johnson and Lee (2021) highlight that contingency theory emphasizes the challenges organizations face due to a dynamic environment. These challenges stem from factors such as shifting customer requirements, technological innovations, and changes in the external environment. The theory suggests that organizations must effectively utilize their resources to adapt to these changes. By aligning resources with the demands of the environment, firms can better navigate uncertainties and enhance their competitive positioning.

The contingency theory mainly argues that the impact of an adopted practice on performance is dependent on the context in which the practices are applied (Sousa & Rocha, 2021). That is why there needs to be a fit between a firm’s internal structure and its external environment (Smith & Thomas, 2022). This argument mainly came into effect after some studies realised that in some cases, what is generally known as “best practices” tend to yield no significant influence on performance. This is evident in the SCI literature where some scholars identified a positive (Yu et al., 2013; Donkor et al., 2021), negative (Flynn et al. 2010) and no significant (Donkor et al., 2021) relationship between SCI and performance. This places a high need to properly understand the different contexts in which SCI influences SCP positively.

From a scientific perspective, predictability is a main concern, which occurs not only when researchers identify causal mechanisms that tie action to results, but also when circumstances are described (Christensen & Raynor, 2013). Whereby Johnson and Lee (2023) stated that contingency theory attempts to describe these circumstances, suggesting that no universal set of strategic choices applies to every business situation. Smith and Brown (2022) agreed that early advocates have indicated that organizations are continuously under pressure for sustaining in the market. This thinking is in line with contingency theory, which explains how external conditions correlate with organization's internal structure to form an organizational fit that determines their performance (Burns and Stalker, 1994; Tangpong et al., 2019). The origins of this theory can be traced back to the works of prominent scholars such as Donaldson (1987), Drazin and Van de Ven (1985), Thompson (1967), and Venkatraman (1989). Therefore, Johnson and Lee (2021) believed that theory upholds the belief that there is ''no one best way'' of managing or organizing but it depends on the ''fit'' between the organization and the environment.

In the context of this study, external pressures in the form of social relationship, global awareness, and technological dynamic correlate with a decentralized structure to form the organizational fit that determines the effectiveness of environmental management (McAdam et al., 2019). Furthermore, it was pointed out that contingency theory can be used for improving the performance of the firm (Johnson & Lee, 2022). Thus, typical frameworks in the contingency research tradition would focus on the relationships between the contextual factors and the performance (Schoonhoven, 2013; Smith & Jones, 2022). Empirical evidence from Scholten, Stevenson and Van Donk (2019) address that contingency theory is fairly recent in the SCM literature.

2.12.5 Resource-based View Theory

Another underpinning theory for the research framework is the Resource-based view (RBVs) of firm. RBV emphasizes the role of the firms' internal and external resources for performance (Barney, 1991). Firm resources include assets, capabilities, organizational processes, firm attributes, information, and knowledge (Barney, 1991). According to this theory, the competitiveness of any organization is based on the resources it masters to develop core competencies.

In the context of supply chains, this means that companies must leverage their distinctive capabilities, such as specialized technology, skilled human resources, and effective processes, to optimize performance outcomes. For example, integrating advanced technologies can enhance data accuracy and streamline operations, leading to improved efficiency and responsiveness to market demands (Mitra et al., 2023). Meanwhile Sezen (2018) mentioned increasing the level of integration and information sharing, communication, and relationship management among the members of a supply chain has become a necessity for improving the effectiveness of supply chains.

Furthermore, RBV emphasizes the importance of collaboration and resource sharing among supply chain partners. By fostering strong relationships and trust, firms can enhance their collective resource base, which in turn boosts supply chain performance. Research from Singh et al (2021) indicate that companies that successfully integrate their resources with those of their suppliers and customers often experience higher levels of innovation and adaptability, resulting in better overall performance metrics, such as cost reduction and service quality improvement.

This collaborative approach not only strengthens individual firms but also enhances the resilience and responsiveness of the entire supply chain network. Moreover, the RBV underscores the necessity of aligning supply chain strategies with a firm's core competencies. Effective resource allocation and capability development are crucial for achieving strategic objectives and enhancing performance. For instance, organizations that prioritize the development of human capital—through training and knowledge sharing—tend to achieve superior supply chain outcomes. According to Kumar et al (2022), this alignment of resources with strategic goals enables firms to respond effectively to external challenges, such as changing customer preferences and market dynamics.

In conclusion, the Resource-Based View provides a comprehensive lens through which to examine supply chain performance. By focusing on the unique resources and capabilities that firms possess, as well as the importance of collaborative relationships with partners, organizations can develop strategies that enhance both operational efficiency and competitive advantage. Future research should continue to explore how various dimensions of the RBV can be leveraged to further improve supply chain performance in an increasingly complex and dynamic business environment.

2.13 Research Framework

The entire research is built upon the research framework. This framework provides the conceptual foundation necessary for advancing the research. Since a research framework involves identifying the network of relationships among the variables deemed important for studying a particular problem, it is crucial to understand what each variable signifies in this study (Sekaran & Bougie, 2016). The theoretical framework provides the theoretical foundation, drawing from established theories to explain expected relationships, while the conceptual framework maps out the key variables and their potential interactions, offering a visual or structural guide to the study (Jiang et al., 2019; Li & Lin, 2022). Thus, this framework in Figure 2.4 below provides the theoretical foundation for advancing the research.

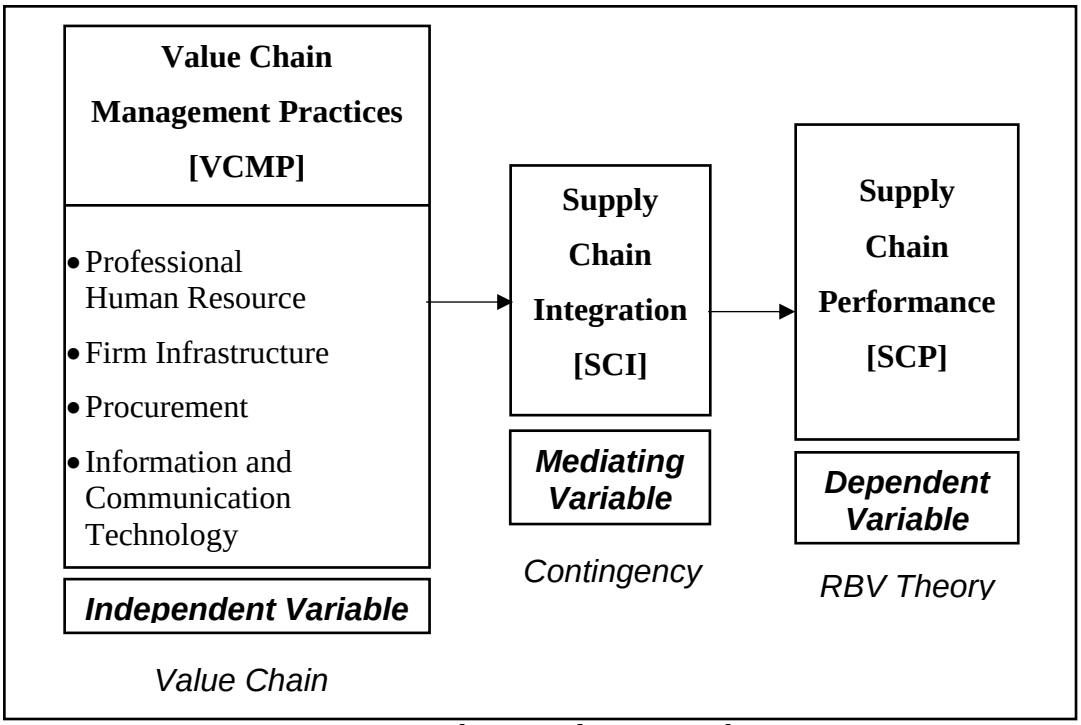

Figure 2.4 Theoretical Framework

Source: Generated by this study

Figure 2.4 presents the proposed theoretical framework. The framework for this research results from relationships deduced from the review of literature, observing that different authors use varying approaches to study similar sets of variables, and vice versa. The framework for this research proposes that value chain management practices (VCMP) have an impact on the supply chain integration and in turn influence supply chain performance (SCP).

This theoretical framework delineates relationship between three main variables with several dimensions in two categories: (1) direct relationship (see Figure 2.3) and (2) indirect relationship (see Table 2.3).

2.13.1 Conceptual Framework

The conceptual framework provides a guide in obtaining a better understanding of the Impact of Value Chain Management Practices on Supply Chain Performance and the Supply Chain Integration of manufacturing industry in Malaysia. Value chain management practices is conceptualized in a four-dimensional construct. The four dimensions being professional human resource, firm infrastructure, procurement and information and communication technology.

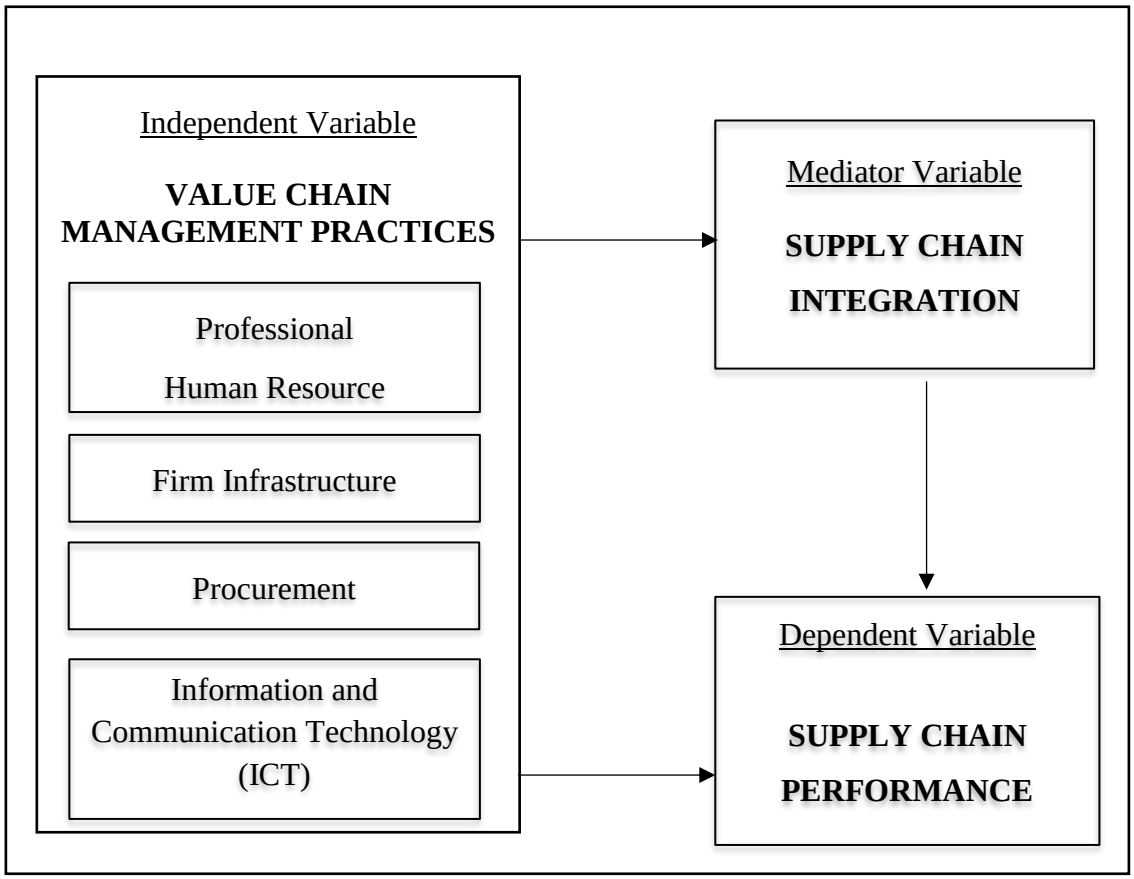

Figure 2.5 Conceptual Framework of Value Chain Management Practices (Professional Human Resource, Firm Infrastructure, Procurement and ICT) Towards Supply Chain Performance with Supply Chain Integration as The Mediator.

Sources: Michael E. Porter (2008), Paul Eric (2009), Smith Doerflein (2011), Shikumo (2012), Cristos (2016), Emmanuel (2017), and Waseem (2018).

Based on the proposed framework in Figure 2.5 above, it basically illustrates manufacturing firms that adopt VCMP practices would achieve great supply chain performance. This is because of the influence of value chain management practices, which collaborate together with the suppliers and customers.

2.14 Research Gaps

In the rapidly evolving landscape of global business, value chain management practices have emerged as critical components for achieving competitive advantage (Porter, 1985). Despite extensive research in this area, significant gaps remain that warrant further exploration. One notable gap is the limited understanding of how specific value chain practices can be effectively tailored to different industries. While existing literature has focused on generic frameworks, empirical studies examining the unique challenges and opportunities faced by companies in various sectors, such as manufacturing, retail, and technology, are lacking (Koufteros et al., 2014). This variation in industry dynamics suggests that a one-size-fits-all approach to value chain management may not yield optimal results. However, in spite of the key role of value chain management practices in the SC phenomenon, far limited and scant scholarly investigation has been undertaken to present a theoretical viewpoint, supported by empirical evidence (Pati, Chandran & Bhatti, 2016), on how value chain management practices to yield performance gains at firm level and total supply chain performance.

As such, an understanding of value chain management and the execution of its practices emerge to be of much greater importance to a company to obtain a sustainable competitive advantage in comparison to its competitors (Sezen, 2008; Barratt, 2011; John et al., 2019). All these point to the need for studies that are predicated on value chain management practices and their models. Hence, this study ascertains the need of mediating variable between value chain management practices and supply chain performance. There are limited studies on using supply chain integration as a mediating role between value chain and supply chain. In summary, addressing these research gaps contribute to a deeper understanding of value chain management practices and their impact on organizational performance. By focusing on industry-specific adaptations, the integration of technology, and the role of human resources, future research can provide actionable insights for practitioners aiming to optimize their value chains in a dynamic business landscape.

2.15 Hypothesis Development

This section formulates and develops the relevant hypotheses for the research. Specifically, the hypotheses postulated to answer the research questions in the study. These hypotheses are classified based on the direct and indirect relationship between three main variables such as the independent variable [four value chain management practices dimension], mediating variable [supply chain integration] and dependent variables [supply chain performance]. There are four main relationships to be tested:

i.] Value Chain Management Practices and Supply Chain Performance.
ii.] Value Chain Management Practices and Supply Chain Integration.
iii.] Supply Chain Integration and Supply Chain Performance.
iv.] Value Chain Management Practices and Supply Chain Performance, mediated by Supply Chain Integration.

In this study, the value chain management practices have four (4) dimensions – professional human resource, firm infrastructure, procurement and information & communication technology. All these practices considered as initiatives, effort and resources of an organisation. Hence, this current study uses findings relevant to these variables to examine the link between value chain management practices, supply chain integration and supply chain performance.

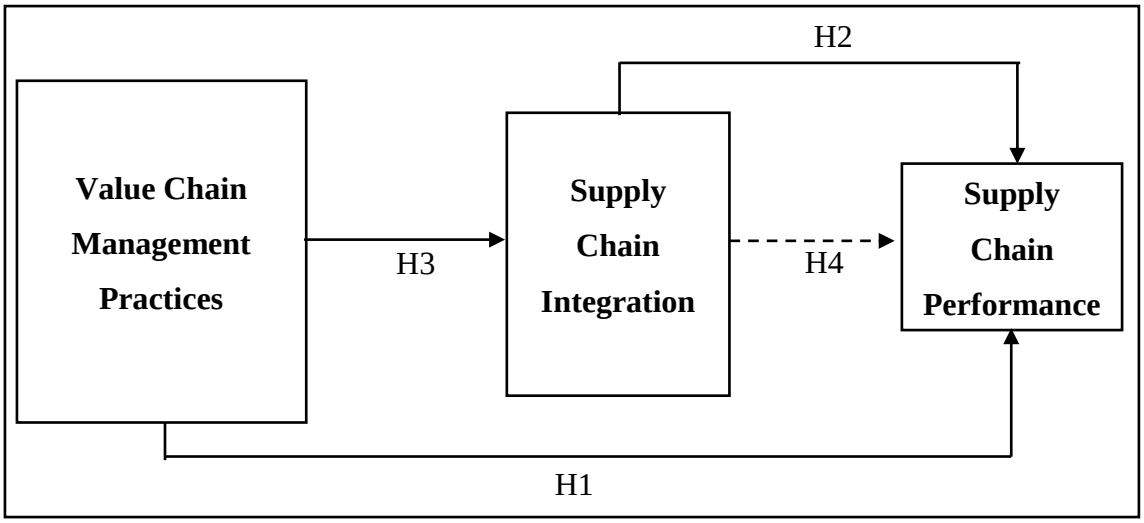

Figure 2.6 The Hypothesized Research Model

Source: Generated by this study

Note:

Direct effect:

——► *Represents direct effects: Value Chain Management Practices on Supply Chain Performance, Value Chain Management Practices on Supply Chain Performance*

- - - - - - ► *Represents mediating effect: Value Chain Management Practices on Supply Chain Performance through Supply Chain Integration (analysis using hierarchical regression considering supply chain integration as mediating variable)*

Figure 2.6 presents the proposed structural framework. The structural framework identifies the direct relationship and the indirect relationship among the three variables which is value chain management practices (Independent variable), supply chain integration (mediating variable) and supply chain performance (dependent variable). As such the structural framework highlighted the four main hypotheses which are relevant to this study.

The framework for this research proposes that value chain management practices (VCMP) have an impact on the supply chain integration and in turn influence supply chain performance (SCP). The framework also proposes that value chain management practices, supply chain integration (SCI) and supply chain performance are closely associated. This structural framework delineates relationship between three main variables and sixteen dimensions in two categories: (1) direct relationship (see Tables 2.1, 2.2 and 2.3) and (2) indirect relationship (see Tables 2.4).

Table 2.1
Direct Relationship – Hypothesis 1

Hypothesis	Direct Relation
Main Hypothesis [H1]	**The relationship between VCMP and Supply Chain Performance (SCP)**
H1a	*The relationship between PHR and supply chain performance*
H1b	*The relationship between FI and supply chain performance*
H1c	*The relationship between PSS and supply chain performance*
H1d	*The relationship between ICT and supply chain performance*

Table 2.1 depicts the direct relationship between the four dimensions of value chain management practices (independent variable) and supply chain performance (dependent variable).

Table 2.2
Direct Relationship – Hypothesis 2

Hypothesis	Direct Relation
Main Hypothesis [H2]	**The relationship between SCI and Supply Chain Performance (SCP)**

Table 2.2 depicts the direct relationship between supply chain integration (mediating variable) and supply chain performance (dependent variable).

Table 2.3
Direct Relationship – Hypothesis 3

Hypothesis	Direct Relation
Main Hypothesis [H3]	**The relationship between VCMP and Supply Chain Integration (SCI)**
H3a	*The relationship between PHR and supply chain integration*
H3b	*The relationship between FI and supply chain integration*
H3c	*The relationship between PSS and supply chain integration*
H3d	*The relationship between ICT and supply chain integration*

Table 2.3 depicts the direct relationship between the four dimensions of value chain management practices (independent variable) and supply chain integration (mediating variable).

Table 2.4
Indirect Relationship – Hypothesis 4

Hypothesis	Indirect Relation
Main Hypothesis [H4]	**The relationship between VCMP and Supply Chain Performance (SCP)**
H4a	*SCI mediates the relationship between PHR and SCP*
H4b	*SCI mediates the relationship between FI and SCP*
H4c	*SCI mediates the relationship between PSS and SCP*
H4d	*SCI mediates the relationship between ICT and SCP*

Table 2.4 depicts the indirect relationship between the four dimensions of value chain management practices (independent variable) and supply chain performance (dependent variable). The above indirect relationship proposes that supply chain integration mediates the relationship between the dimensions of value chain management practices and supply chain performance.

The proposed hypotheses are:

H1: Value chain management practices has a positive effect on supply chain performance.

$H1_a$: Professional human resource has a positive effect on supply chain performance.

$H1_b$: Firm infrastructure has a positive effect on supply chain performance.

$H1_c$: Procurement has a positive effect on supply chain performance.

$H1_d$: Information and communication technology has a positive effect on supply chain performance.

H2: Supply chain integration has a positive effect on supply chain performance.

H3: Value chain management practices has a positive effect on supply chain integration.

$H3_a$: Professional human resource has a positive effect on supply chain integration.

$H3_b$: Firm infrastructure has a positive effect on supply chain integration.

$H3_c$: Procurement has a positive effect on supply chain integration.

$H3_d$: Information and communication technology has a positive effect on supply chain integration.

H4: Supply chain integration positively mediates the relationship between value chain management practices and supply chain performance

$H4_{a:}$ Supply chain integration positively mediates the relationship between professional human resource and supply chain performance.

$H4_{b:}$ Supply chain integration positively mediates the relationship between firm infrastructure and supply chain performance.

$H4_{c:}$ Supply chain integration positively mediates the relationship between procurement and supply chain performance.

$H4_{d:}$ Supply chain integration positively mediates the relationship between information and communication technology with supply chain performance.

2.16 Chapter Summary

The aim of this chapter was to discuss the literature on what are the comprehensive sets of value chain practices and factors which promote the overall supply chain performance. It also examined the relevant literature review relating to the professional human resource, firm infrastructure, procurement, information and communication technology, supply chain integration and supply chain performance also the relationship between the variables. Further, the review has been highlighted by considering contingency theory and resource-based view theory, both of which has brought about compounding strength to overall supply chain model.

This study also examined the mediating variable of supply chain integration on the value chain management practices and supply chain performance. The concept and implementation of value chain management practices can be further investigated through professional human resource, firm infrastructure, ICT and procurement in manufacturing firms. Hence, conceptual framework and hypotheses of this study has been established and well developed. Research methodology of this research will be discussed in the next chapter.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains in detail about the methodology used in conducting this research. It elaborates the procedures of obtained and analysed the data in the hope of significant results. This chapter discusses the items such as research design, research population, research sampling technique, sample size, unit of analysis, data collection procedure, research instruments including likert scale used, questionnaires, distribution of questionnaire, validity of instrument, pilot study and data analysis technique.

3.2 Research Design

This research used correlation type of research to analyze the relationship between three variables, namely the independent, dependent and mediating variables. The independent variables for this study are professional human resource, firm infrastructure, procurement and information and communication technology, the dependent variable is supply chain performance and the mediating variable is supply chain integration. Correlation type of research helps to identify the variables that can contribute towards supply chain performance. According to Sekaran and Bougie (2013) research design was a blueprint used for the collection, measurement, and analysis of data, based on the research questions of the study.

In this research, data collection, measurement and analysis of data are key stages in data-driven decision-making processes, research and various forms of investigation on supply chain performance. It describes the details of the procedure that was required for obtaining the information linked to the supply chain performance research problem. This research aimed at finding out the relationship between professional human resource, procurement, firm infrastructure, information and communication technology, and supply chain integration towards supply chain performance. This study focuses on descriptive-correlational research design and it involves cross-sectional studies. This research is more to descriptive approach than experimental and it was conducted in cross-sectional as the data gathered at one point in a period of time.

Descriptive research design is used to describe characteristics of a population or phenomenon being studied. It addresses the "what" question which is what are the characteristics of the population or situation being studied. In order to describe the current state of value chain management practices situation, descriptive research would be the best approach. It's useful for gathering detailed, observable information without manipulating variables or establishing causal relationships (Siedlecki, 2021). In cross-sectional studies, variables of interest in a sample of subjects are examined once and the relationships between them are determined. Therefore Setia (2020) agreed that a cross-sectional design allows data to be collected efficiently, provides a snapshot of the population at a specific point, and is well-suited for exploring relationships between variables without the need for long-term follow-ups.

Meanwhile, correlational study was carried out to determine the relationship between two variables and there is relationship between the variable, to what degree the relationship occurs and examine variable (Curtis, Windsor & Soubelet, 2020). In this study, understanding how various factors, such as value chain management practices and supply chain performance, interact in real-world settings was a primary objective. Zhang and Chen (2022) believed that by utilizing a correlational method, existing data and patterns that reflect these relationships could be analyzed and identified.

3.3 Research Population

According to Denise and Bernadette (1999), population was referred as an aggregate or totality of all the objects, subjects or measures that certain to a set of specialisations. The target population for this study were an assorted set of manufacturing companies in Malaysia that produce Food, Beverages & Tobacco, Textile, Wearing Apparel, Leather & Footwear, Wood, Furniture, Paper Products & Printing, Petroleum, Chemical, Rubber & Plastic, Non-Metallic Mineral Products, Basic Metal & Fabricated Metal Products, Electrical & Electronics Products and Transport Equipment & Manufacturers. An assorted set of manufacturing companies chosen as the target population for this study to fulfill the need to capture a broad and representative sample of the industry's diversity. This approach allows the research to account for different business sizes, operational models, and levels of supply chain integration, which provide insights into the variability of performance across sectors.

The target respondents are covered in Peninsular Malaysia, specifically focusing on Penang, Klang Valley, and Johor. These states were selected because they represent Malaysia's key industrial hubs, with a high concentration of manufacturing firms and skilled labour, making them suitable for examining talent acquisition and retention practices. They are home to numerous manufacturing firms, ranging from small to large-scale operations across various industries such as electronics, automotive, and consumer goods. This concentration allows researchers to gather a rich sample of firms that are representative of the diverse manufacturing landscape in Malaysia (Tan & Zainuddin, 2022).

According to the Statistical Department of Malaysia, there are 63,050 manufacturing companies in Malaysia as at 2024 and categorized into 24 sub-sector of manufacturing industry. The respondents for this study are from manufacturing firms in peninsular Malaysia in Penang, Klang Valley and Johor and the total number of respondents to answer the questionnaire are 379 respondents. The estimation of respondents was based on the calculation using rule of thumb Krejcie and Morgan.

3.4 Research Sampling Technique

According to Rahman (2023), sampling techniques is a subset of the subjects that represent the whole population. By using this technique, researcher can complete this survey systematically. To conduct this study, researcher was using stratified sampling with simple random sampling technique. Stratified sampling is most common for large populations thus it complements the needs to cover the total sample in this study. In this method, the entire heterogeneous population is divided into a number of homogeneous groups, usually known as Strata, each of these groups is homogeneous within itself, and then units are sampled at random from each of these stratums.

The sample size in each stratum varies according to the relative importance of the stratum in the population. Strata or Subgroup are chosen because evidence is available that they are related to outcome. The selection of strata varies by area and local conditions. The advantage is it assures representation of all groups in the population needed. The characteristics of each stratum can be estimate and comparisons can be made. Each stratum is then sampled as an independent sub- population, out of which individual elements can be randomly selected. It also reduces variability from systematic sampling.

The study used stratified sampling across Penang, Klang Valley, and Johor to ensure regional representativeness. Within each region, respondents from top management and support staff were included to capture both strategic and operational perspectives. The consistency of using this sample lead to an increasing response rate. Therefore, this research used stratified sampling as the types of manufacturing firms acts as the strata in this case.

Companies were selected based on their active participation in manufacturing and supply chain activities within Penang, Klang Valley, and Johor. Micro and small industries were included to capture diverse organizational sizes and capabilities, providing insights into how value chain management practices and supply chain integration affect performance across different scales of manufacturing operations.

3.5 Sample Size

Sample is defined as subset of population. The purpose is to enable the researcher to simplify the characteristic of the larger population (N). The sample selected are from the population. According to Krejcie and Morgan rule of thumb, there are minimum of 379 respondents for this study which all of the respondents come from manufacturing companies in peninsular Malaysia mainly focus on Penang, Klang Valley and Johor. Krejcie and Morgan's (1970) formula provides a reliable and systematic approach to calculate sample sizes based on the total population size.

As the population is 27,495 for the three states chosen, the rule of thumb needs to refer the total of population number to get the estimate sample size. Based on Krejcie and Morgan (1970) rule of thumb, if the population is 27,495 then the suitable sample size for this study is 379 as researcher only accept one respondent from each manufacturing firm. To support the sample size of this study, Malhotra, Kim and Patil (2006) mentioned that the appropriate sample size is larger than 30 and less than 500 because larger sample size can generate more accurate data. Therefore, sample size of 379 is very ideal in order to get accurate and reliable data for this study.

3.6 Unit of Analysis

The unit of analysis employed in this study is organization or firm, which primarily refers to the local firm of the supply chain. The firm refers specifically to a business entity that engages in commercial, industrial, or professional activities meanwhile organization is a broader term that refers to a structured group of people working together to achieve common goals or purposes. Other than that, local firm refers to a business entity that operates primarily within a specific geographic area or community, typically focusing on serving local customers or clients.

In supply chain performance studies, the unit of analysis typically includes individual firms, supply chain partners, or entire supply chains. Past studies have used various units of analysis depending on the research focus. For example, Mackelprang et al (2014) analyzed the relationship between supply chain integration and performance at the level of individual firms, while Flynn et al. (2010) focused on the supply chain as a whole, examining how the integration of multiple organizations within a supply chain impacts overall performance.

In unit of analysis, using multiple responses can be problematic because it leads to ambiguity and inconsistent interpretations. This is particularly the case when aggregating data from various levels or types of respondents, which may distort the clarity and accuracy of the analysis. It can make it difficult to draw precise conclusions or to evaluate the impact of a specific variable in a study (Kumar et al., 2019). Clear, singular responses are essential for robust statistical analysis and reliable conclusions in research.

Target respondents for this study consists of both top management and support staff to accurately reflect how supply chain practices are both decided and enacted within firms. Including respondents from different levels allows the research to capture strategic insights from leaders and operational insights from personnel directly involved in supply chain activities, which improves the interpretation of organizational behaviour and performance outcomes. This approach is supported in recent empirical research that uses multi-level respondents to obtain a broader range of viewpoints and deeper understanding of how organizational practices translate into performance, particularly in supply chain and sustainability studies where both strategic and operational perspectives influence results (Jum'a et al., 2025). Their perspectives help ensure that the data collected is both relevant and reliable.

3.7 Data Collection Procedure

Data collection is a process that allows participants involved in the study to help answer the overarching research question and achieve the objectives of the research (Dlodlo & Hamunyela, 2017). Method that was used in this study to collect the data was by using questionnaire as it is the most suitable instrument for collecting data. In studies related to supply chain management, a questionnaire is ideal for reaching out to multiple respondents, such as managers, who can efficiently provide insights into organizational processes (Creswell, 2014). This method is cost-effective and time-efficient for large-scale data collection. The questionnaires were distributed using online methods to all of the respondents as the distribution of questionnaires was done in Malaysian Movement Control Order due to the spreading of Corona Virus. Online methods provided a practical solution to reach respondents, especially when physical meetings or paper-based surveys were not feasible.

It also allowed for quicker responses, greater reach, and the ability to gather data remotely, which was essential during the restrictions imposed by the MCO (Kumar et al., 2020). The questionnaire includes with short explanation about the study and instructions was given as a guideline for the respondents to answer the questionnaire. The 40 items questionnaires were distributed to 379 employees and it consists of closed-ended questions which is multiple-choice questions (MCQ) and Likert scale.

The MCQ strictly for the demographic questions as the question provides multiple answers and it simplify data entry which allow for consistency in responses, reducing variability. The Likert scale enables the measurement of attitudes, opinions, or perceptions across a range, offering nuanced insights into respondent views on specific issues. This combination ensures efficient data collection while maintaining reliability and validity in the measurement of variables (Dillman et al., 2014).

During data collection, ethical considerations were strictly observed, including informed consent, voluntary participation, and confidentiality of respondents. Sampling procedures ensured that participants were fully aware of the study's purpose and their rights, maintaining research integrity. Additionally, sustainability principles were considered by selecting firms and respondents that reflects long-term operational practices and responsible resource management within manufacturing operations. This approach ensures that the sampling strategy not only provides representative data but also adheres to ethical standards and supports the study's sustainability focus.

3.8 Research Instruments

In this research, questionnaire was used as an instrument to collect the data. Questionnaire was also known as a pre-formulated written set of questions to which respondents recorded their answers, within closed and defined alternatives. This research use questionnaires to collect the data in order to achieve the objective of this study. A questionnaire is a research instrument consisting of a series of questions and prompts for the purpose of gathering information from respondents regarding the professional human resource, firm infrastructure, procurement and information and communication technology, supply chain integration and supply chain performance.

The research instrument was developed based on a thorough review of existing literature on value chain management practices, supply chain integration, and supply chain performance. Items were adapted from validated scales used in prior studies to ensure content validity, while modifications were made to suit the Malaysian manufacturing context. A pilot test was conducted with a small group of respondents to assess clarity, relevance, and reliability, and adjustments were made based on feedback. This approach ensures that the instrument accurately measures the constructs of interest and is appropriate for the study population.

The questions regarding professional human resources, which is the independent variable, were adopted from Porter (2008), firm infrastructure was adopted from Shikumo (2012), procurement from Emmanuel (2017), information & communication technology from Doerflin (2011), the questions regarding supply chain integration, which is the mediator variable, were adopted from Sezen (2008). The questions related to supply chain performance, the dependent variable, were adopted from Waseem (2018). This questionnaire was designed according to the research objectives and divided into four sections. The statistical methods used to analyze the data include factor analysis, reliability testing, validity testing, demographic analysis, descriptive analysis, normality testing, and correlation analysis.

1. **Section A**

   Section A consists of the respondents' demographic background which is including gender, age, education level, working experience and job level.

2. **Section B, C and D**

   Section B consists of the 8 items of professional human resource questions, section C consists of 5 items of firm's infrastructure questions, section D consists of 5 items of procurement questions, section E consists of 6 items of information & communication technology questions, section F consists of 5 items of supply chain integration questions and section G consists of 6 items of supply chain performance questions. The author for dimensions in Section B is Porter (2008), Section C is Shikumo (2012), Section D is Emmanuel (2017), Section E is Doerflin (2011), while the author for dimensions in Section F is Sezen (2008) and Section G is Waseem (2018).

3.8.1 Likert Scale Used

The scale that was used in this questionnaire is Likert-scale as shown in Table 3.1. There are two types of likert scale was used to identify the relevant answers for the questions in the questionnaire whether respondents are strongly agreed or strongly disagreed or extremely satisfied or extremely dissatisfied with the statement in the question. Two kinds of likert scales used in order to fit different types of questions asked in the questionnaires. Using two different Likert scales allows researchers to capture multiple dimensions of a construct, such as measuring both agreement and frequency of behavior. This approach enhances the precision of the measurement, helping to address different facets of a variable. For example, one scale might assess how strongly participants agree with a statement, while another might gauge how often they engage in a specific behavior.

This combination ensures a more robust understanding of the underlying factors being studied (Queiroz & Wamba, 2019). For likert scale i, 6 stands for extremely satisfied, 5 for very satisfied, 4 for somewhat satisfied, 3 for somewhat dissatisfied, 2 for very dissatisfied and 1 for extremely dissatisfied. The questions that used likert scale i to answer are the questions in Section B professional human resource, Section C firm infrastructure, Section D information and technology and Section G supply chain performance. Meanwhile for likert scale ii, 6 stands for strongly agree, 5 stands for agree, 4 stands for somewhat agree, 3 for somewhat disagree, 2 for disagree and 1 for strongly disagree. The questions that used likert scale i to answer are the questions in Section E procurement and F supply chain integration.

Table 3.1
Likert Scale

Likert scale i	Likert scale ii
6: Extremely satisfied	6: Strongly agree
5: Very satisfied	5: Agree
4: Somewhat satisfied	4: Somewhat agree
3: Somewhat dissatisfied	3: Somewhat disagree
2: Very dissatisfied	2: Disagree
1: Extremely dissatisfied	1: Strongly disagree

3.8.2 Questions for Questionnaire Section B

Table 3.2 below shows the questions for Section B Professional Human Resource. Section B focuses on professional human resource as one of the Value Chain Management Practices also as the independent variable that related to the respondents. Professional human resource is measured with 6 scale items with 8 questions adapted from Michael E. Porter (2008) study. Respondents were asked to rate based on the Likert scale i in Table 3.1 which allocates 6 as extremely satisfied, 5 as very satisfied, 4 as somewhat satisfied, 3 as somewhat dissatisfied, 2 as very dissatisfied and 1 extremely dissatisfied.

Table 3.2
Questions for Questionnaire – Section B

Section B – Professional Human Resource [Michael E. Porter, 2008]	
PHR1	It is relatively easy for the firm to have employees with educational levels above college.
PHR2	It is relatively easy for the firm to find R&D talents with educational level of master or doctor.
PHR3	It is relatively easy for the firm to find technological personnel of sufficient experience.
PHR4	It is relatively easy for the firm to find talents with innovative capabilities.
PHR5	It is relatively easy for the firm to find professional labor of various levels.
PHR6	The firm can obtain human resources from government, universities, and research institutes.
PHR7	It is relatively easy for the firm to obtain core technological talents.
PHR8	It is relatively easy for the firm to retain professional technological talents.

3.8.3 Questions for Questionnaire Section C

Table 3.3 below shows the questions for Section C Firm Infrastructure. Section B focuses on firm infrastructure as one of the Value Chain Management Practices also as the independent variable that related to the respondents. Firm infrastructure is measured with 6 scale items with 5 questions adapted from Edgar Shikumo (2012) study. Respondents were asked to rate based on the likert scale i in Table 3.1 which allocates 6 as extremely satisfied, 5 as very satisfied, 4 as somewhat satisfied, 3 as somewhat dissatisfied, 2 as very dissatisfied and 1 extremely dissatisfied.

Table 3.3
Questions for Questionnaire – Section C

Section C – Firm's Infrastructure [Edgar Shikumo, 2012]	
TI1	My firm is well organized/structured efficient delivery of its products.
TI2	My firm administration protects all the organization core business property, equipment and assets against any security alert.
TI3	My firms ensure all premises owned or related by the organization are in proper state and usable as office facility to store the goods.
TI4	My firm participates in the marketing efforts of its customer to maintain the desired level of excellence.
TI5	My firm ensure the quality management to follow the standard of supplier quality and performance metrics.

3.8.4 Questions for Questionnaire Section D

Table 3.4 below shows the questions for Section D Information and Communication Technology. Section B focuses on information and communication technology as one of the Value Chain Management Practices also as the independent variable that related to the respondents. Information and communication technology is measured with 6 scale items with 6 questions adapted from Emmanuel (2017) study. Respondents were asked to rate based on the likert scale i in Table 3.1 which allocates 6 as extremely satisfied, 5 as very satisfied, 4 as somewhat satisfied, 3 as somewhat dissatisfied, 2 as very dissatisfied and 1 extremely dissatisfied.

Table 3.4
Questions for Questionnaire – Section D

Section D – Information and Communication Technology [Emmanuel, 2017]	
ICT1	My firm provides systems and services which are cost-effective, timely, secure, and reusable.
ICT2	My firm explores and pursues opportunities of employing new techniques that meet the requirements and expectation of users.
ICT3	My firm continuously reengineers the business processes and modernizes its technology.
ICT4	My firm provides leadership in facilitating technology-driven improvements, and proactive technology management.
ICT5	My firm ensures quality checks on all the software before release to internal and external users.
ICT6	My firm regularly makes new enhancements/improvements to its existing services.

3.8.5 Questions for Questionnaire Section E

Table 3.5 below shows the questions for Section E Procurement and Supplies Services. Section E focuses on procurement as one of the Value Chain Management Practices also as the independent variable that related to the respondents. Procurement and supplies services are measured with 6 scale items with 5 questions adapted from Smith Doerflin (2011) study. Respondents were asked to rate based on the likert scale ii in Table 3.1 which allocates 6 as strongly agree, 5 as agree, 4 as somewhat agree, 3 as somewhat disagree, 2 as disagree and 1 strongly disagree.

Table 3.5
Questions for Questionnaire – Section E

Section E – Procurement & Supplies Services [Smith Doerflin, 2011]	
PSS1	My firm offers an effective plan by providing a framework to guide procurement officers in achievement of their tasks.
PSS2	My firm gives an effective plan to ensure compliances with regulatory policies.
PSS3	My firm ensure all the respondents affirmed the existence of a procurement committee as well as entity and evaluation committees.
PSS4	My firm planners can estimate the time required to complete the procurement process and award contract for each requirement.
PSS5	My firm ensures that stakeholders have the knowledge about procurement practices.

3.8.6 Questions for Questionnaire Section F

Table 3.6 below shows the questions for Section E Supply Chain Integration. Section F focuses on Supply Chain Integration as the Mediator Variable that related to the respondents. Supply Chain Integration is measured with 6 scale items with 5 questions adapted from Sezen (2008) study. Respondents were asked to rate based on the likert scale ii in Table 3.1 which allocates 6 as strongly agree, 5 as agree, 4 as somewhat agree, 3 as somewhat disagree, 2 as disagree and 1 strongly disagree.

Table 3.6
Questions for Questionnaire – Section F

Section F – Supply Chain Integration [Sezen, 2008]	
SCI1	Firms in our supply chain establish more frequent contact with each other.
SCI2	Firms in our supply chain create a compatible communication and information system.
SCI3	Our firm extends its supply chain beyond its customers/suppliers.
SCI4	Our firm participates in the marketing efforts of its customers.
SCI5	Our firm participates in the sourcing decisions of its suppliers.

3.8.7 Questions for Questionnaire Section G

Table 3.7 below shows the questions for Section G Supply Chain Performance. Section G focuses on Supply Chain Performance as the Dependent Variable that related to the respondents. Supply Chain Performance is measured with 6 scale items with 6 questions adapted from Waseem (2018) study. Respondents were asked to rate based on the likert scale i in Table 3.1 which allocates 6 as extremely satisfied, 5 as very satisfied, 4 as somewhat satisfied, 3 as somewhat dissatisfied, 2 as very dissatisfied and 1 extremely dissatisfied.

Table 3.7
Questions for Questionnaire – Section G

Section G – Supply Chain Performance [Waseem, 2018]	
SCP1	High customer satisfaction has been achieved through supply chain.
SCP2	With organized information, process transparency has increased.
SCP3	With organized information in supply chain, it reduces errors in work process in my organization.
SCP4	Good supply chain process reduces work redundancies.
SCP5	Good supply chain reduces administration cost.
SCP6	High return can be attributed through effective supply chain process.

3.9 Distribution of Questionnaire

For the purpose of this study, questionnaires were distributed to the targeted respondents by using stratified simple random sampling. From August 2020, 379 questionnaires were distributed to manufacturing companies in Peninsular Malaysia focuses on Klang Valley, Penang and Johor. Prior to the distribution of the questionnaire, official request letters were sent to companies listed. The final questionnaires were collected in few months after the distribution date. This is to make sure that there was enough time allocates for the respondents to complete the questionnaires and respondents have plenty of time to identify the most relevant answer for all of the questions.

3.10 Validity of Instrument

Validity was a combination of reliability, accuracy and goodness in a research. The validity of instrument was used to measure the questionnaires whether it was valid or not to be distributed to the respondents. According to Salkind (2009) validity of questionnaire could be measured with face validity and content validity. For this study, both face validity and content validity were applied. According to William (2007), face validity was known as simple form of validity where applied superficial, subjective assessment and content validity were matched to the test questions and the content of the questions were needed to be measured.

Face validity of questionnaire in this study was made by a top management in a manufacturing company. He reviewed the content of questionnaire and he agreed on the content of questionnaire without any objection. Meanwhile, the content validity was to ensure that the measure included an adequate and representative set of items that achieved the concept. For content validity in this research, it had been evaluated by experts. According to Kidder & Judd (1986), the test was designed to calculate the degree of speech impairment which could be measured by taking validity if it was evaluated by a group of expert judges.

3.11 Pilot Study

Valid research instruments are important for the collection of reliable data (Polit & Beck, 2011). In ensuring that the items were valid and reliable, a pilot study was conducted right after the instruments were approved and endorsed in terms of the content and face validity by the experts from the academic and industry. The pilot test also serves as a platform to identify any concerns and difficulties in comprehending the survey questions (Stangor, 2011).

The questionnaire of this study consisted of value chain management practices dimensions which are professional human resource which was derived from Michael E. Porter (2008), firm infrastructure from Edgar Shikumo (2012), ICT technology from Emmanuel (2017), and lastly, procurement from Smith Doerflein (2011). As for the mediating variable of this study which is supply chain integration, the questions were adapted from Sezen (2008). The questions for dependent variable which is supply chain performance were adapted from Waseem (2018).

A pilot study was conducted in order to determine the reliability of the questions and the questionnaire was distributed to 30 respondents. The sampling process for the pilot study was conducted using the quota sampling approach. Five (5) manufacturing firms was selected for the purpose of the pilot study, which researcher concentrated around Klang Valley area. The completed questionnaires must be returned within the stipulated time given which is three (3) weeks indicating 100% response rate. Based on this pilot study in table 3.8 below, all variables recorded strong reliability namely, professional human resource (α=.823), firm infrastructure (α=.879), procurement and supplies (α=.910), information and communication technology (α=.887), supply chain integration (α=.899), and lastly, supply chain performance (α=.924).

Table 3.8
Pilot Study

Variables	Score (∝)
Professional Human Resource	0.823
Firm's Infrastructure	0.879
Procurement & Supplies Services	0.910
Information and Communication Technology (ICT)	0.887
Supply Chain Integration	0.899
Supply Chain Performance	0.924

3.12 Data Analysis Technique

Data analysis helps to turn the raw data to become a meaningful data by using the application of rational and critical thinking. The data collected from the questionnaire survey and data measured and analyzed by using Statistical Package for the Social Science (SPSS) version 24.0 and PLS-SEM. Data analysis is the process where the researcher key in the data from raw material into a software in organized order. In this study, Statistical Package for the Social Science (SPSS) version 24 and PLS-SEM version 4 was used to analyze the raw data and for documentation purpose. The data analysis techniques that were used are confirmatory factor analysis, reliability analysis (Cronbach Alpha), descriptive analysis, normality testing analysis and multiple regression analysis and hierarchical multiple regression.

Table 3.9 describes the research objectives, concepts or construct used to operationalize the objectives, the research question(s) used to measure the construct, the measurement scale and the appropriate statistical tests to be used.

Table 3.9
Plan for Data Analysis

No	Research Objectives	Research Questions	Measurement	Statistic
1	To identify the level of value chain management practices (professional human resource, firm infrastructure, procurement & ICT), supply chain performance and supply chain integration among manufacturing industry employees.	What is the level of value chain management practices (professional human resource, firm infrastructure, procurement & ICT), supply chain performance and supply chain integration among manufacturing industry employees?	Interval	Mean / Standard Deviation
2	To determine the influence of value chain management practices (professional human resource, firm infrastructure, procurement & ICT) on supply chain performance among manufacturing industry employees.	What is the extent of the influence of value chain management practices (professional human resource, firm infrastructure, procurement & ICT) on supply chain performance among manufacturing industry employees?	Interval	Multiple Regression
3	To determine the influence of value chain management practices (professional human resource, firm infrastructure, procurement & ICT) on supply chain integration among manufacturing industry employees.	What is the extent of the influence of value chain management practices (professional human resource, firm infrastructure, procurement & ICT) on supply chain integration among manufacturing industry employees?	Interval	Multiple Regression
4	To investigate the mediating effect of supply chain integration on the relationship between value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) and supply chain performance among manufacturing industry employees.	How does supply chain integration mediates the relationship between value chain management practices (professional human resource, firm infrastructure, procurement & ICT) and supply chain performance among manufacturing industry employees?	Interval	Hierarchical Regression Analysis

3.13 Summary

To summarize, this research employs the quantitative method and stratified sampling technique was applied to select the samples of this study. Referring to Krejcie and Morgan, a sample size of 379 is required for the study in view of the manufacturing firms in Peninsular Malaysia focuses on Johor, Penang and Klang Valley. The instruments of this study were adapted from established measures that yield acceptable level of reliability indicator. The measures were developed by authors whom their papers were published in indexed journals.

CHAPTER 4
RESEARCH METHODOLOGY

4.1 Preamble

This chapter discusses the result of data analysis of the study. For the purpose of the data analysis, Statistical Package for Social Science (SPSS) version 22.0 and PLS-SEM was employed. The measure for independent variable of this study which is value chain management practices consist of 24 items which are divided into four (4) categories and the first one is professional human resource where there are all together eight (8) questions which were adapted from Michael E. Porter (2008). Secondly, firm infrastructure and there are all together five (5) questions which were adapted from Edgar Shikumo (2012). Thirdly, procurement and there are also five (5) questions which were adapted from Smith Doerfin (2011). Lastly, information communication technology and there are all together six (6) questions which were adapted from Emmanuel (2017). Meanwhile the dependent variable of this study which is supply chain performance consists of 6 items adapted from Waseem (2018). To further investigate the inconsistent relationship between the independent and dependent variable as found by previous studies, a mediator variable was introduced. The mediator of this study is supply chain integration. For this section, there were all together five (5) questions adapted from Sezen (2008). In order to validate the questionnaire, the content validity in terms of wordings, transparency, clarity and relevancy, all the items in the questionnaire were content validated by several academic experts in the areas of supply chain and manufacturing. Based on the content validity, some items from the variables were restructured and reworded to reflect manufacturers perspective.

4.2 Data Screening

Data screening is an important preliminary process before analyzing any data for the purpose of research. This is to ensure the data is clean from several elements, namely, missing data and outliers (Johnson & Wichern, 1998). Once the date of collection is reach, all the survey questionnaires that have been received back form respondent is evaluate. The data then be input into SPSS for screening and for an easier formatting such as into an Excel sheet or Comma Separated Value (CSV) file formats.

The data was screened by case and variables for the following: (a) checking for invalid data and making corrections, (b) checking for missing data (if any) and replacing them with missing data code, and (c) skewness and kurtosis and removing wild/outliers from the dataset (Gaskin, 2014).

4.2.1 Detection of Missing Data

Missing data were reduced as much as possible by checking all the questionnaires at the time of collection. When any questions were found unanswered it was either brought to attention of respondent by telephone or discarded. Since all the data entered into SPSS, before any tests were conducted using the data set, frequency distribution for each variable in the study as well as missing value analysis were run to ensure the data were clean. The result indicated that there was no missing data.

4.2.2 Data Cleaning

The data cleaning displayed Figure 4.3 is based on raw data for the preparation of the research analyses report in chapter 4 for the actual study with sample n = 360. Data cleaning was conducted through Multiple Imputation to confirm that all of the samples have answered all the items and whether all the evaluated variables have received a full response from the survey. Findings from data cleaning through Multiple Imputation have shown that all 54 items or variables (variables) have been cleaned (100.0 percent) and the missing value is 0 percent.

Likewise, in terms of cases or respondents as many as n = 360 respondents consisting of employees of manufacturing firms were randomly selected for the purpose of the research. All responses from the respondents have also answered all the items given. The Missing Value box also shows that there are 16,200 data entries that have been keyed into the SPSS column, Patterns and Missing Value Patterns have also shown the same meaning. In Figure 4.1 shows the overall summary of missing values and the blue colour in the three circles for variables, cases and values indicates that all data has been filled in and cleared (no red colour indicates data left to be filled). Based on figure 4.2 below, it has been shown that all the research sample n = 360 items have answered all the items and have been cleaned from any blank or missing data.

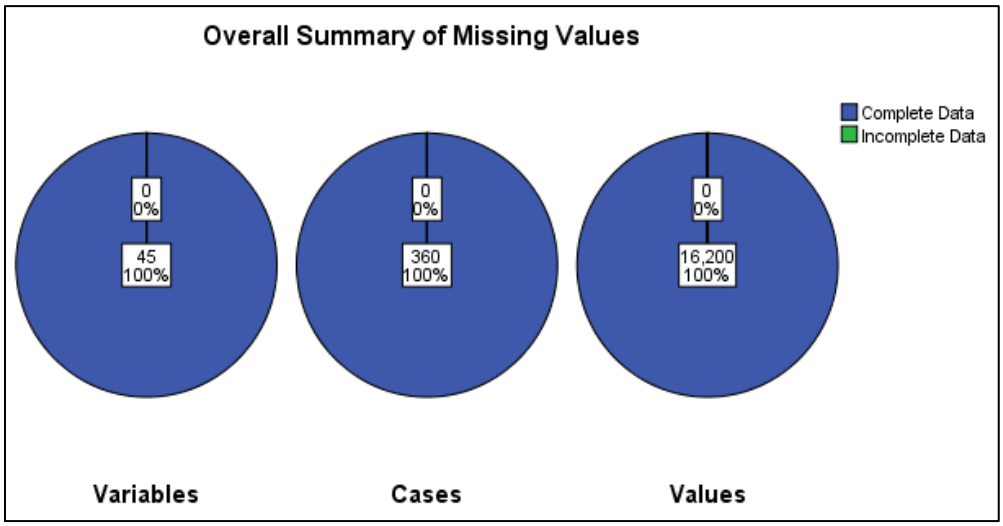

Figure 4.1 Overall Summary of Missing Values

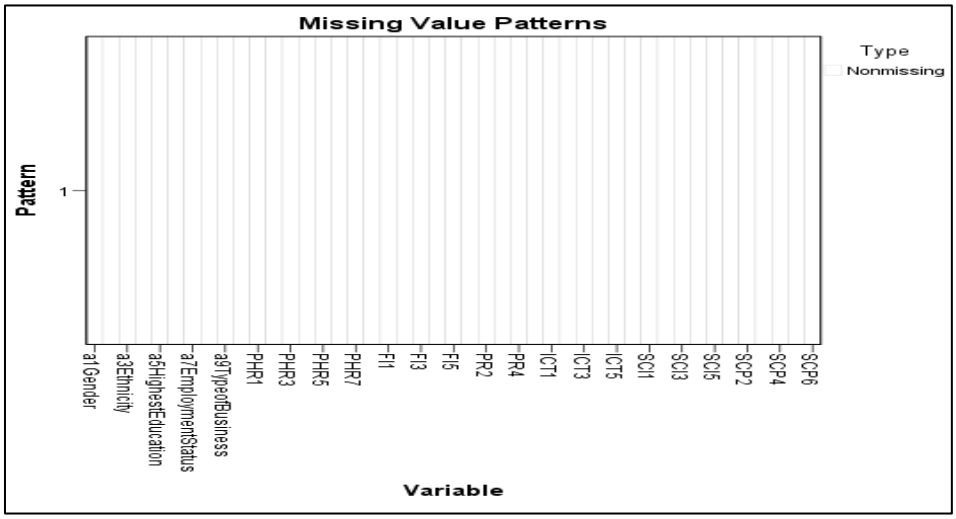

Figure 4.2 Missing Value Patterns

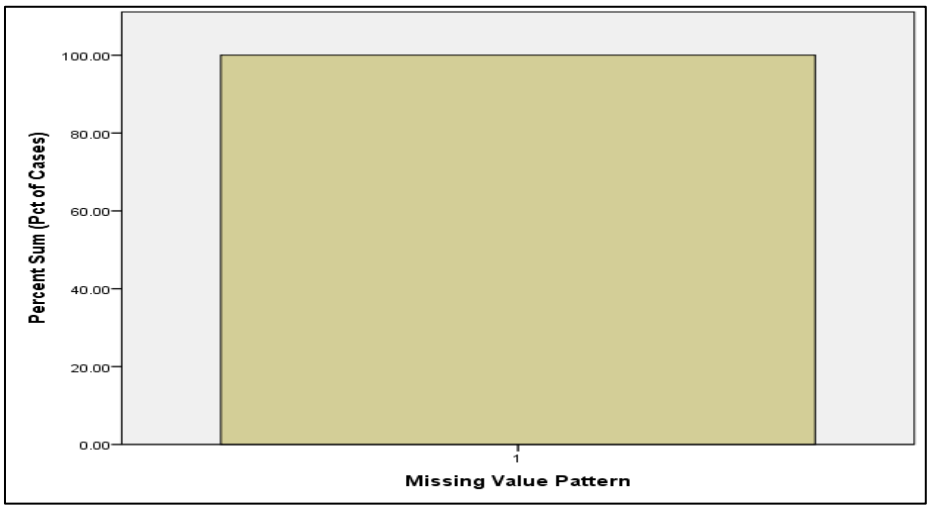

Figure 4.3 Data Cleaning through Multiple Imputation

4.2.3 Detection of Outliers

Outliers refer to data points or observations that deviate significantly from the majority of the data in a dataset. These observations are typically seen as unusual, unexpected, or distinct due to their extreme values or unique characteristics compared to other data points (Aggarwal, 2013). It is crucial to differentiate between outliers that should be removed and those that should be retained. Outliers that necessitate removal include instances of missing data, errors in data entry, unusual data points, and responses from individuals not belong to the intended population (Hair, et. al., 2014).

Hair, Black, Babin, Anderson and Tatham (2006) explained that outlier data is data that deviates too far from the other data in a data network, if the data outliers are not cleaned, they can have a bias effect (not reflecting the actual findings). Marginalized data or outliers also mean research samples that answer dishonestly, these samples or respondents need to be removed or removed from the real raw data (Ghazali Darusalam & Sufean Hussin, 2021). Pallant (2013) explains that data outliers can be found in the Boxlpot indicated by a small circle symbol (*) present with the case number.

Examining the marginalized data is very important because it involves deciding whether to discard the sample (case) or continue to maintain it. Marginal data that needs to be discarded is data that involves errors in entering data entry in addition to the recorded loss of real value and should be a value in the study (Tabachnick & Fidell 2007). For this study, maximum and minimum extreme values for all the study variables were produced using SPSS. A visual inspection of the data revealed that the data were free from outliers. The following Figure 4.4, 4.5, 4.6, 4.7, 4.8 and 4.9 shows the sampling of outliers or outliers for all variables where there are no case numbers or samples that are outside the Boxplot box for all of the variables.

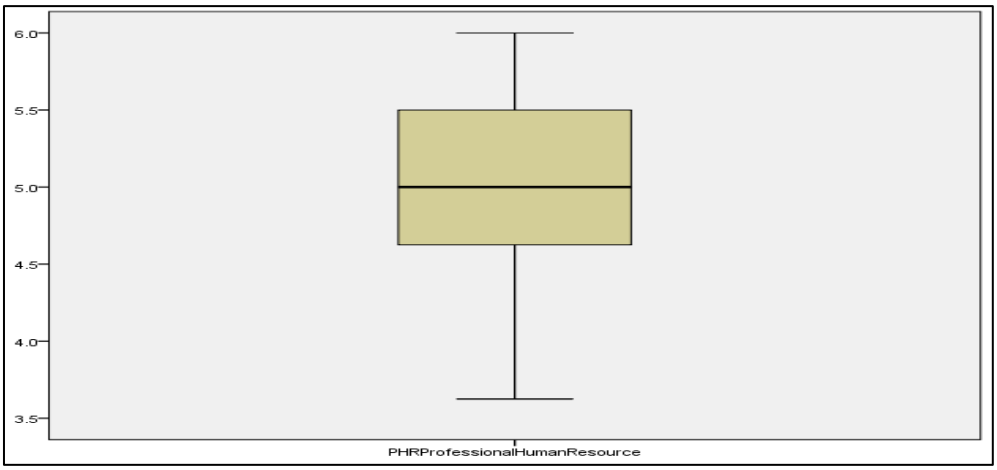

Figure 4.4 Outliers for Professional Human Resource

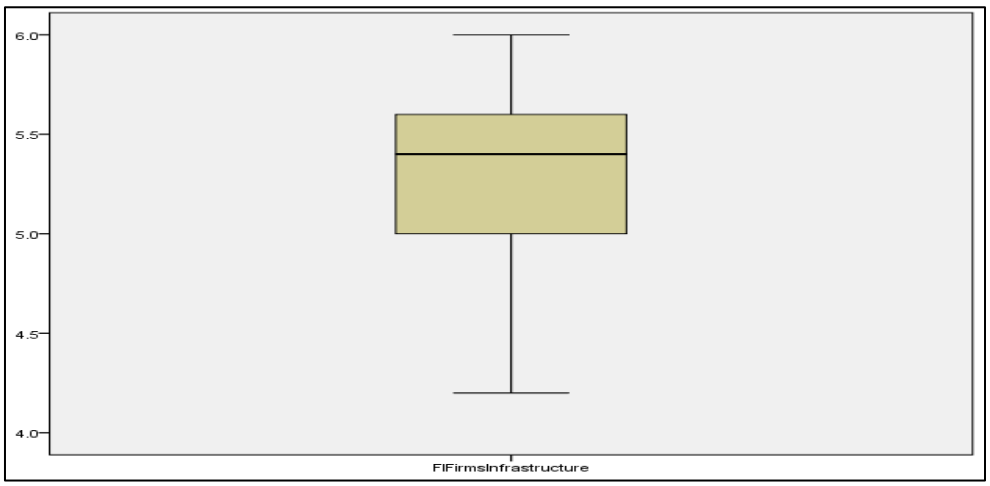

Figure 4.5 Outliers for Firm Infrastructure

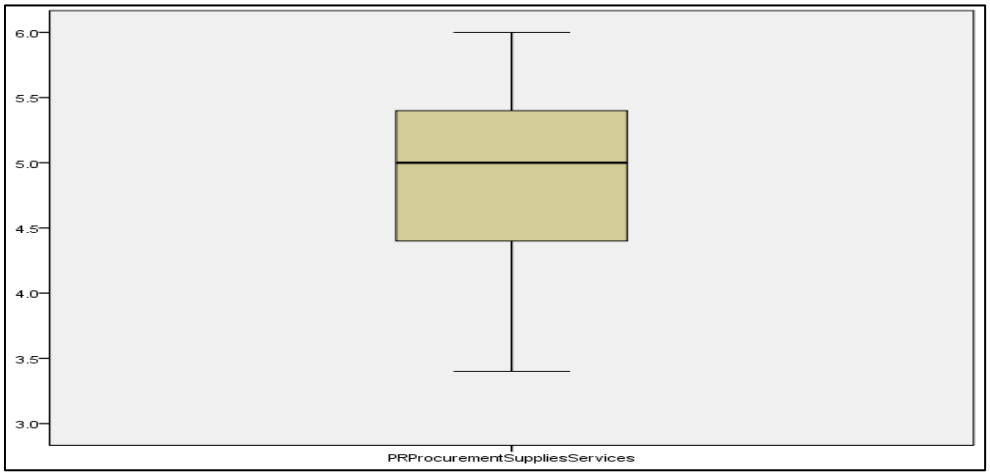

Figure 4.6 Outliers for Procurement Supplies Services

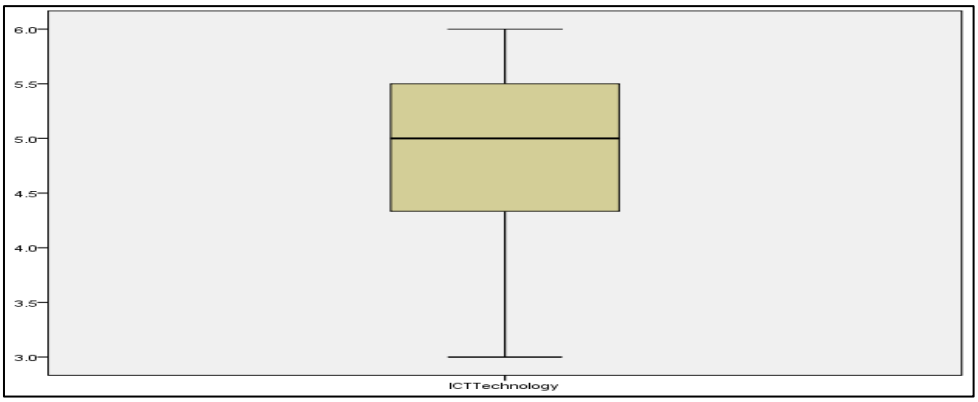

Figure 4.7 Outliers for Information and Communication Technology

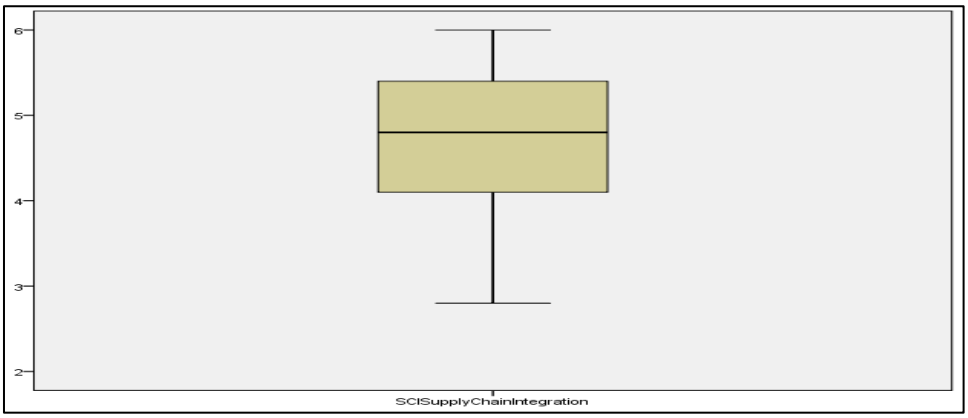

Figure 4.8 Outliers for Supply Chain Integration

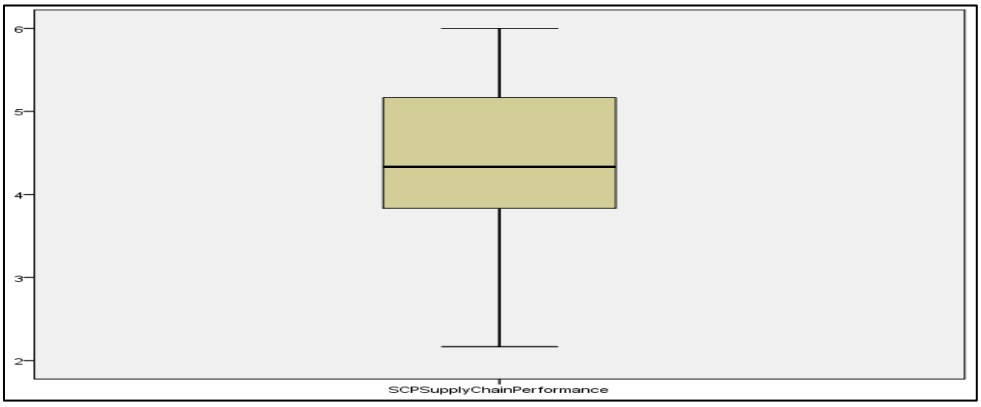

Figure 4.9 Outliers for Supply Chain Performance

4.3 Data Collection

A total of 379 sets of questionnaires were distributed in Klang Valley, Penang, and Johor. The rationale of distributing the questionnaire around Klang Valley, Penang, and Johor was because there are all populated with the most manufacturing firms in Malaysia. This also helped researcher to collect varies of data from North, West, and South part of Malaysia. Only 360 sets of questionnaires were collected, which can be translated into a response rate of 95%. The process of distributing and collecting the questionnaire took approximately four (4) months from August until December 2020.

4.3.1 Profile of Respondents

The respondents of this study were inquired of their gender, age, ethnicity, religion, highest education, position, employment status, location of operation, type of business, and size of company.

Table 4.1
Demographic: Gender

Gender	Frequency (n 360)	Percentages (%)
Male	240	66.7
Female	120	33.3
Total	360	100.0

Table 4.1 above shows the distribution of 360 employees of manufacturing firms in Penang, Klang Valley and Johor in terms of gender. The results of the survey show that 66.7 percent (240) of the employees in manufacturing firms are male while 33.3 percent (120) female.

Table 4.2
Demographic: Age

Age	Frequency (n 360)	Percentages (%)
21 – 30 years	107	29.7
31 – 40 years	92	25.6
41 – 50 years	73	20.3
51 – 60 years	53	14.7
60 years and above	35	9.7
Total	360	100.0

Table 4.2 shows the distribution of 360 employees of manufacturing firms in Penang, Klang Valley and Johor in terms of age. The results of the survey shows that 29.7 percent (107) of employees in manufacturing firms aged between 21 and 30 years old which are more than 25.6 percent (92) of those aged between 31 and 40 years old, 25.6 percent (92) of those aged between 31 and 40 years old, 20.3 percent (73) of those aged between 41 to 50 years, 14.7 percent (53) of those aged between 51 and 60 years, and lastly 9.7 percent (35) of those aged between 60 years and above.

Table 4.3
Demographic: Ethnicity

Ethnicity	**Frequency (n 360)**	**Percentages (%)**
Malay	200	55.6
Chinese	99	27.5
Indian	58	16.1
Others	3	.8
Total	360	100.0

Table 4.3 shows the distribution of 360 employees of manufacturing firms in Penang, Klang Valley and Johor in terms of ethnicity. The results of the survey show that 55.6 percent (200) of the employees in manufacturing firms are Malays compared to 27.5 percent (99) Chinese, 16.1 percent (58) Indians and 0.8 percent (3) other races.

Table 4.4
Demographic: Religion

Religion	**Frequency (n 360)**	**Percentages (%)**
Islam	203	56.4
Hindu	52	14.4
Buddha	54	15.0
Christian	51	14.2
Others	0	0
Total	360	100.0

Table 4.4 above shows the distribution of 360 employees of manufacturing firms in Penang, Klang Valley and Johor in terms of religion. The results of the survey show that 56.4 percent (203) of employees in manufacturing firms are Muslim, 15.0 percent (54) are Buddhist, 14.4 percent (52) are Hindu, 14.2 percent (51) are Christian and lastly 0.00 percent others religion.

Table 4.5
Demographic: Highest Education

Highest Education	Frequency (n 360)	Percentages (%)
PMR/SPM	26	7.2
Diploma / STPM	82	22.8
Bachelor Degree	200	55.6
Master / PHD	52	14.4
Total	360	100.0

Table 4.5 above shows the distribution of 360 employees of manufacturing firms in Penang, Klang Valley and Johor in terms of highest education. The results of the survey show that 55.6 percent (200) of employees in manufacturing firms have a bachelor's degree, while 22.8 percent (82) have a Diploma or STPM, 14.4 percent (52) have a Master's / PhD degree and finally only 7.2 percent (26) have a PMR/SPM.

Table 4.6
Demographic: Position

Position	Frequency (n 360)	Percentages (%)
Support Staff	121	33.6
Middle Management	161	44.7
Top Management	78	21.7
Total	360	100.0

Table 4.6 above shows the distribution of 360 employees of manufacturing firms in Penang, Klang Valley and Johor in terms of position. The results of the survey show that 44.7 percent (162) of employees in manufacturing firms consist of middle management while 33.6 percent (121) are support staff and lastly only 21.7 percent (78) of top management.

Table 4.7
Demographic: Employment Status

Employment Status	Frequency (n 360)	Percentages (%)
Permanent employee	312	86.7
Contract basis	48	13.3
Total	360	100.0

Table 4.7 above shows the distribution of 360 employees of manufacturing firms in Penang, Klang Valley and Johor in terms of employment status. The results of the survey show that 86.7 percent (321) of employees in manufacturing firms are permanent employees and 13.3 percent (48) are contract basis.

Table 4.8
Demographic: Location of Operation

Location of Operation	Frequency (n 360)	Percentages (%)
Penang	89	24.7
Klang Valley	133	36.9
Johor Bahru	138	38.3
Total	360	100.0

Table 4.8 above shows the distribution of 360 employees of manufacturing firms in Penang, Klang Valley and Johor in terms of location of operation. The results of the survey show that 38.3 percent (138) of employees in manufacturing firms work in Johor Bahru meanwhile 36.9 percent (133) in Klang Valley and the least 24.7 percent (89) in Penang.

Table 4.9
Demographic: Type of Business

Type of Business	Frequency (n 360)	Percentages (%)
Transport Equipment & Manufacturers	77	21.4
Petroleum, Chemical, Rubber & Plastic	70	19.4
Wood, Furniture, Paper Products & Printing	50	13.9
Electrical & Electronics Products	48	13.3
Textile, Wearing Apparel, Leather & Footwear	44	12.2
Non-Metalic Mineral Products, Basic Metal & Fabricated Metal Products	44	12.2
Food, Beverages & Tobacco	27	7.5
Total	360	100.0

Table 4.9 above shows the distribution of 360 employees of manufacturing firms in Penang, Klang Valley and Johor in terms of type of business. The results of the survey shows that 21.4 percent (77) of employees in manufacturing firms work in transport equipment & manufacturers, 19.4 percent (70) of those who work in the petroleum, chemical, rubber & plastic sector, 13.9 percent (50), in the Wood, Furniture, Paper Products & Printing, 13.3 percent (48) in Electrical & Electronics Products, 12.2 percent (44) in Textile, Wearing Apparel, Leather & Footwear, 12.2 percent (44) in Non-Metallic Mineral Products, Basic Metal & Fabricated Metal Products and lastly 7.5 percent (27) in Food, Beverages & Tobacco.

Table 4.10
Demographic: Size of Company

Size of Company	Frequency (n 360)	Percentages (%)
< 50 employees	18	5.0
50 – 150 employees	28	7.8
151 – 250 employees	103	28.6
251 – 350 employees	109	30.3
351-450 employees	56	15.6
> 450 employees	46	12.8
Total	360	100.0

Table 4.10 above shows the distribution of 360 employees of manufacturing firms in Penang, Klang Valley and Johor in terms of company size. The results of the survey shows that 30.3 percent (109) of companies that have employees between 251 to 350 employees, 28.6 percent (103) of companies that have employees between 150 to 250 employees, 15.6 percent (56) of companies that have employees between 351 to 450 employees, 12.8 percent (46) of companies that have employees > 450 employees, 7.8 percent (28) of companies that have employees between 50 - 150 employees, and finally the least is 5.0 percent (18) of companies that have employees < 50 employees.

4.4 Goodness of Measure

The most critical features of any quantitative measurement procedure, particularly in the social sciences, are reliability and validity. It highlights that these two measurements are crucial for determining the "goodness of measure" of any construct, ensuring that the research findings are consistent and accurately reflect the concepts being studied (Babbie, 2016). While it is almost confirmed that valid constructs would guarantee reliable measures, reliable scales would not always have guaranteed to produce valid construct. Therefore, for this study, factor analysis was performed prior to the reliability test in order to confirm the scales that are meant to measure the constructs that are based on the conceptualization or underlying theory (Hair, et.al., 2014). In order to evaluate construct validity, a Principle Component Factor Analysis with varimax rotation was performed and this was based on factor loadings result of greater than 0.5 (Hair, Black, Babin & Anderson, 2010).

Reliability test was then used to evaluate the consistency of the scale in measuring a particular construct and according to Nasally (1978), the cut-off point of Cronbach's alpha value should be greater than 0.6 as Cronbach's alpha with value greater than 0.6 is generally considered acceptable for demonstrating internal consistency in exploratory research. However, higher thresholds such as 0.7 or 0.8 are preferred for more established research fields.

4.4.1 Confirmatory Factor Analysis

In order to confirm the construct of this study, factor analysis was conducted to determine the underlying structure among the variables (Hair et al., 2010). For this study, the dimensionality of measurements was conducted so that they are not overlapping with one another. According to the underlying idea of dimension reduction, it is inappropriate to combine all the scales into a single latent variable score. Stangor (2011) stated that, the scales may have had similar conceptual underpinnings, but they are unlikely to be identical. The researcher followed the suggestions of Anderson and Gerbing (1988) to test the model developed using a 2-step approach.

First, by testing the measurement model to test the validity and reliability of the instruments following the guidelines of Hair et al. (2019) and Ramayah et al. (2018), then ran the structural model to test the hypothesis developed. One of the advantages or using factor analysis is that, a large number of measurement variables would be reduced into smaller number of groups or factors that represent the variables with the same traits.

By reducing the complexities of multivariate data, latent factors and relationships that are unidentified could be discovered via the observed data (Kothari, 2004). To conduct factor analysis, several statistical values need to be checked to ensure that all items are suitable to be analyzed. Another method for analysis is Principle Component Analysis (PCA) that was conducted due to its ability to explain the variance and the obtained loadings derived from any other method of factoring (Kothari, 2004).

In this factor analysis, orthogonal varimax rotation was used because of various reasons namely; (i) orthogonal rotations are used frequently in any study as they are well established in comparison with oblique orthogonal rotational procedures; (ii) varimax method is less complicated in comparison with other orthogonal rotations and lastly (iii) the main objective of PCA is to reduce complexity by reducing the data to a smaller number of variables (Hair et al., 2010).

For this study, three (3) factor analyses were conducted independently for each of the variables of this study: independent variables (value chain management practices) which consists of professional human resource, firm infrastructure, procurement and information communication technology. As for dependent variable of this study is supply chain performance and lastly, mediating variable which is supply chain integration.

SmartPLS (PLS-SEM) was used to generate the results of Confirmatory Factor Analysis. Although other analysis programs were available to the researcher, SmartPLS provides a valid and reliable means to carry on a CFA analysis (Asyraf and Afthanorhan, 2013). The first criterion measured was factor loading for the six constructs. According to Hair et. al., (2019) the loadings were also acceptable with only one or two loadings less than 0.708 meanwhile all indicators were greater than the .50 (Hair, Black, Babin, and Anderson, 2010) threshold for the initial measurement instrument, so all items were retained within the scope of factor loading.

Table 4.11 (next page) provides the factor loading values for each of the indicators for the six constructs and as shown in the table, the values of loadings are ≥0.5 and 6 of the items were deleted from the constructs which have less than the loading values.

Table 4.11
Factor Loading for Initial Instrument

Construct	Item	Loading
Firm Infrastructure	FI1	0.689
	FI3	0.735
	FI5	0.678
ICT	ICT1	0.755
	ICT2	0.828
	ICT3	0.826
	ICT4	0.833
	ICT5	0.802
	ICT6	0.613
Professional HR	PHR3	0.724
	PHR4	0.798
	PHR5	0.776
	PHR6	0.501
	PHR7	0.732
	PHR8	0.588
Procurement	PR1	0.534
	PR2	0.701
	PR3	0.627
	PR4	0.794
	PR5	0.752
Supply Chain Integration	SCI1	0.784
	SCI2	0.656
	SCI3	0.902
	SCI4	0.865
Supply Chain Performance	SCP1	0.662
	SCP2	0.525
	SCP4	0.862
	SCP5	0.902
	SCP6	0.782

4.4.2 Internal Consistency Reliability

The suggested method for assessing internal consistency is to evaluate the composite reliability of each scale (Hair, et.al., 2022). Some research indicates that Cronbach's alpha tends to provide a conservative measurement in PLS-SEM (Dijkstra & Henseler, 2015) and that composite reliability should be used as a replacement (Hair, Sarstedt, Ringle, & Mena, 2012; Hair et al., 2014). The researcher wanted to ensure rigor and proper data validation, so composite reliability methods were tabulated in the study. Composite reliability had a required value of 0.70 or higher to be considered reliable (Hair et al., 2011; Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014).

Table 4.12 below shows the results of Internal Consistency Reliability measured with Composite Reliability. The composite reliability value for Firm Infrastructure is 0.744, the value for Information and Communication Technology construct is 0.902, the value for Professional Human Resource construct is 0.845, the value for Procurement construct is 0.815, the value for Supply Chain Integration construct is 0.881, and the value for Supply Chain Performance is 0.868. Thus, all constructs within the research model exceed the minimum value needed to show reliability. As a result, all values fell within the acceptable range for both internal consistency reliability methods and establishes reliability for each latent variable.

Table 4.12
Findings of Internal Consistency Reliability

Construct	Indicator	Composite Reliability
Firm Infrastructure	FI	0.744
ICT	ICT	0.902
Professional HR	PHR	0.845
Procurement	PR	0.815
Supply chain Integration	SCI	0.881
Supply Chain Performance	SCP	0.868

4.4.3 Convergent Validity

Convergent validity measures the degree to which items belonging to one construct correlate with one another (Nurbhai, 2014). It is good when the responses to the question are understood by the participants in the same way they were intended (Hair et al., 2010). Besides that, convergent validity is determined by looking at the average variance extracted (AVE). A good rule of thumb for AVE is that the value of the construct should be above 0.50, which suggests it as an adequate convergence. Therefore, in Table 4.13 below shows the value for the construct Firm Infrastructure is 0.592; the value for the construct Information and Communication Technology is 0.609; the value for the construct Professional Human Resource is 0.583; the value for the construct Procurement is 0.573; the value for the construct Supply Chain Integration is 0.652; and the value for the construct Supply Chain Performance is 0.576. Hence, Table 4.13 shows all of the construct met the AVE requirements for convergent validity and are redeem as acceptable.

Table 4.13
Findings of Convergent Validity

Construct	Item	AVE Value
Firm Infrastructure	FI	0.592
ICT	ICT	0.609
Professional HR	PHR	0.583
Procurement	PR	0.573
Supply chain Integration	SCI	0.652
Supply Chain Performance	SCP	0.576

4.4.4 Indicator Reliability

The next criterion measured was indicator reliability. The acceptable value is 0.70 or higher for the outer loading values (Hair et al., 2014). Nearly all indicator met the requirements for indicator reliability except the indicator FI2 and FI4 for the construct Firm Infrastructure, the indicator PHR1 and PHR2 for the construct Professional Human Resource, the indicator SCI5 for the construct Supply Chain Integration and the indicator SCP3 for the construct Supply Chain Performance in the initial measurement instrument. Table 4.14 provides the Indicator Reliability values for each of the indicators for all six constructs.

Table 4.14
Findings of Indicator Reliability

	Firm Infrastructure	Information & Communication Technology	Professional Human Resource	Procurement	Supply Chain Integration	Supply Chain Performance
FI1	0.689					
FI3	0.735					
FI5	0.678					
ICT1		0.755				
ICT2		0.828				
ICT3		0.826				
ICT4		0.833				
ICT5		0.802				
ICT6		0.613				
PHR3			0.724			
PHR4			0.798			
PHR5			0.776			
PHR6			0.501			
PHR7			0.732			
PHR8			0.588			
PR1				0.534		
PR2				0.701		
PR3				0.627		
PR4				0.794		
PR5				0.752		
SCI1					0.784	
SCI2					0.656	
SCI3					0.902	
SCI4					0.865	
SCP1						0.662
SCP2						0.525
SCP4						0.862
SCP5						0.902
SCP6						0.782

Based on the indicator reliability results, additional analysis was performed to determine if any indicators would need to be removed. In measuring indicator reliability, the indicator FI1, FI5, ICT6, PHR6, PHR8, PR1, PR3, SCI2, SCP1 and SCP2 had an outer loading value of 0.689, 0.678, 0.613, 0.501, 0.588, 0.534, 0.627, 0.656, 0.662, and 0.525 respectively did not met the preferred threshold of 0.70. Typically, to determine if the indicator should be removed, an outer loading relevance test should be conducted (Hair et al., 2014) along with an evaluation of the item's contribution to content validity (Hair et al., 2011).

The relevance test involves deleting the indicator if its value is less than 0.40, or check to see that the AVE and composite reliability values do not meet the minimum thresholds. Through deleting the indicator, it is predicted that the AVE and composite reliability value would increase above the minimum thresholds of 0.50 and 0.70 respectively.

However, it has been determined that because the AVE value of 0.592, 0.609, 0.583, 0.573, 0.652 and 0.576 also the composite reliability value of 0.774, 0.902, 0.845, 0.815, 0.881 and 0.868 already meet the minimum requirements for Firm Infrastructure, Information & Communication Technology, Professional Human Resource, Procurement, Supply Chain Integration and Supply Chain Performance constructs respectively, the indicators should not be removed.

In reviewing the content validity of the items, the researcher determined that removing the item would have an adverse impact on the Firm Infrastructure, Information & Communication Technology, Professional Human Resource, Procurement, Supply Chain Integration and Supply Chain Performance constructs because its defined items represent all facets of the construct itself. Based on these findings and conclusions, the FI1, FI5, ICT6, PHR6, PHR8, PR1, PR3, SCI2, SCP1 and SCP2 indicators were retained.

4.4.5 Discriminant Validity

The next criterion that was measured was discriminant validity. Discriminant validity was analyzed to ensure "each item loads more highly on its own construct than on other constructs and that all constructs share more variance with their measures than with other constructs" (Vinzi, Trinchera, & Amato, 2010). A more rigorous test was applied to compare the AVEs of each latent variable. If a scale has adequate convergent and discriminant validity, the diagonal element should be greater than the entries in the corresponding rows and columns. For each construct, all values exceeded the cross-loading values of all squared correlations between constructs. Based on these findings, this indicated that there were no discriminant validity issues and each construct is unique. Table 4.15 below shows the results of the cross loadings.

Table 4.15
HTMT Ratio of Correlations

	FI	ICT	PHR	PR	SCI	SCP
FI						
ICT	0.831					
PHR	0.801	0.742				
PR	0.884	0.834	0.802			
SCI	0.546	0.466	0.418	0.377		
SCP	0.454	0.526	0.352	0.402	0.847	

Note: the heterotrait-monotrait (HTMT) ratio of correlations

The discriminant validity was assessed using the heterotrait-monotrait (HTMT) criterion suggested by Henseler et al. (2015) and updated by Franke and Sarstedt (2019). The HTMT values should be ≤ 0.85 the stricter criterion and the mode lenient criterion is it should be ≤ 0.90. As shown in Table 4.15, the values of HTMT were all lower than the stricter criterion of ≤ 0.85 as such it can be concluded that the respondents understood that the 9 constructs are distinct. Taken together both these validity test has shown that the measurement items are both valid and reliable.

In summary, the HTMT values in this matrix generally indicate good discriminant validity among the constructs. The values are below the commonly recommended threshold of 0.85 (Kline, 2011), suggesting that the constructs are adequately distinct from each other. This is important in SEM, as it ensures that the model is not biased by strong correlations between constructs, allowing for more accurate and reliable interpretation of the relationships in the model.

In addition, discriminant validity can also be assessed through cross loading testing of study items (Hair et al., 2017). Through the cross-loading test, a study construct is considered to meet the requirements of discriminant validity when the weighting value of the study item is higher for the construct it represents and vice versa is lower for other constructs. Through this test, all study items were found to pass the criteria as shown in the Table 4.16 (next page).

Table 4.16
Discriminant Validity

	FI	ICT	PHR	PR	SCI	SCP
FI1	0.689	0.364	0.525	0.331	0.266	0.143
FI3	0.735	0.37	0.321	0.257	0.279	0.215
FI5	0.678	0.43	0.435	0.576	0.19	0.217
ICT1	0.422	0.755	0.459	0.692	0.295	0.308
ICT2	0.377	0.828	0.49	0.623	0.193	0.311
ICT3	0.419	0.826	0.465	0.618	0.225	0.304
ICT4	0.435	0.833	0.591	0.638	0.341	0.315
ICT5	0.414	0.802	0.495	0.658	0.346	0.396
ICT6	0.445	0.613	0.422	0.403	0.428	0.399
PHR3	0.299	0.473	0.724	0.452	0.161	0.23
PHR4	0.362	0.516	0.798	0.42	0.325	0.295
PHR5	0.352	0.473	0.776	0.525	0.227	0.187
PHR6	0.433	0.265	0.501	0.281	0.189	0.094
PHR7	0.624	0.485	0.732	0.464	0.319	0.236
PHR8	0.462	0.367	0.588	0.344	0.174	0.051
PR1	0.516	0.312	0.362	0.534	0.095	0.069
PR2	0.354	0.436	0.528	0.701	0.231	0.182
PR3	0.383	0.291	0.412	0.627	0.243	0.166
PR4	0.471	0.746	0.455	0.794	0.165	0.277
PR5	0.301	0.714	0.366	0.752	0.284	0.356
SCI1	0.367	0.414	0.327	0.346	0.784	0.558
SCI2	0.185	0.293	0.234	0.202	0.656	0.434
SCI3	0.279	0.322	0.311	0.234	0.902	0.592
SCI4	0.286	0.305	0.262	0.233	0.865	0.626
SCP1	0.127	0.313	0.127	0.225	0.592	0.662
SCP2	0.255	0.308	0.295	0.282	0.381	0.525
SCP4	0.205	0.385	0.251	0.297	0.553	0.862
SCP5	0.195	0.329	0.186	0.239	0.56	0.902
SCP6	0.285	0.369	0.282	0.275	0.484	0.782

4.4.6 Factor Analysis of Independent Variable – Value Chain Management Practices (Professional Human Resource, Firm Infrastructure, Information and Communication Technology, and Procurement)

Confirmatory factor analysis was conducted to assess the construct validity of the independent variable of this study and this was based on the initial measurement scale adapted from Michael E. Porter (2008), Edgar Shikumo (2012), Emmanuel (2017) and lastly from Smith Doerflin (2011). For this variable, there were 24 items which were further divided into four (4) dimensions namely professional human resource, firm infrastructure, procurement and information & communication technology.

For the construct from Independent Variable, four (4) items were deleted from Firm Infrastructure and Professional Human Resource. The items were as follows (their respective original dimension in "[ ]" parentheses).

- Our firm administration protects all the organization core business property, equipment and assets against any security alert. [Firm Infrastructure FI2]
- Our firm participates in the marketing efforts of its customer to maintain the desired level of excellence. [Firm Infrastructure FI4]
- It is relatively easy for the company to have employees with educational levels above college. [Professional Human Resource PHR1]
- It is relatively easy for the company to find R&D talents with educational level of master or doctor. [Professional Human Resource PHR2]

4.4.7 Factor Analysis of Dependent Variable - Supply Chain Performance

Confirmatory Factor analysis was conducted in assessing the validity of the dependent variable of this study which is supply chain performance. This construct of questionnaire is by Waseem (2018). For this variable, there were 6 items and for the construct from this Dependent Variable, one (1) item was deleted from Supply Chain Performance. The item was as follows (the respective original dimension in "[ ]" parentheses).

- With organized information in supply chain, it reduces errors in work process in my organization. [Supply Chain Performance SCP3]

4.4.8 Factor Analysis of Moderating Variable – Supply Chain Integration

Confirmatory factor analysis was conducted in assessing the construct validity of supply chain integration scale, which was designated as the mediating variable. The items for supply chain integration were adapted from Sezen (2008). For this variable, there were 5 items and for the construct from this Mediating Variable, one (1) item was deleted from Supply Chain Integration. The item was as follows (the respective original dimension in "[ ]" parentheses).

- Our firm participates in the sourcing decisions of its suppliers. [Supply Chain Integration SCI5]

4.5 Structural Model

The structural model as shown in Figure 4.10 below was evaluated by examining R^2 values, path coefficients, and heterogeneity (Hair et. al., 2011). Conversely, Olalere (2013) states that the results for the structural model are divided into four parts: first, the R^2 value of the endogenous latent variable (variables/constructs with arrows pointing into them are discussed in this model; the endogenous variables are creativity, motivation, inhibitor and stimulants). Second, is the path coefficients in the structural model are discussed; third is the predictive relevance Q^2 is presented and fourth, discusses the mediating effects of the study. On the other hand, recently, Lewis (2015) added that, the assessment procedure for structural model are; assessing the model for collinearity issues, access the significance and relevance of the relationships, assess the level of R^2 value, assess the f^2 effect size, and assess the predictive relevance of Q^2 and the q^2 effect sizes. Provided now is the level of acceptance for each category.

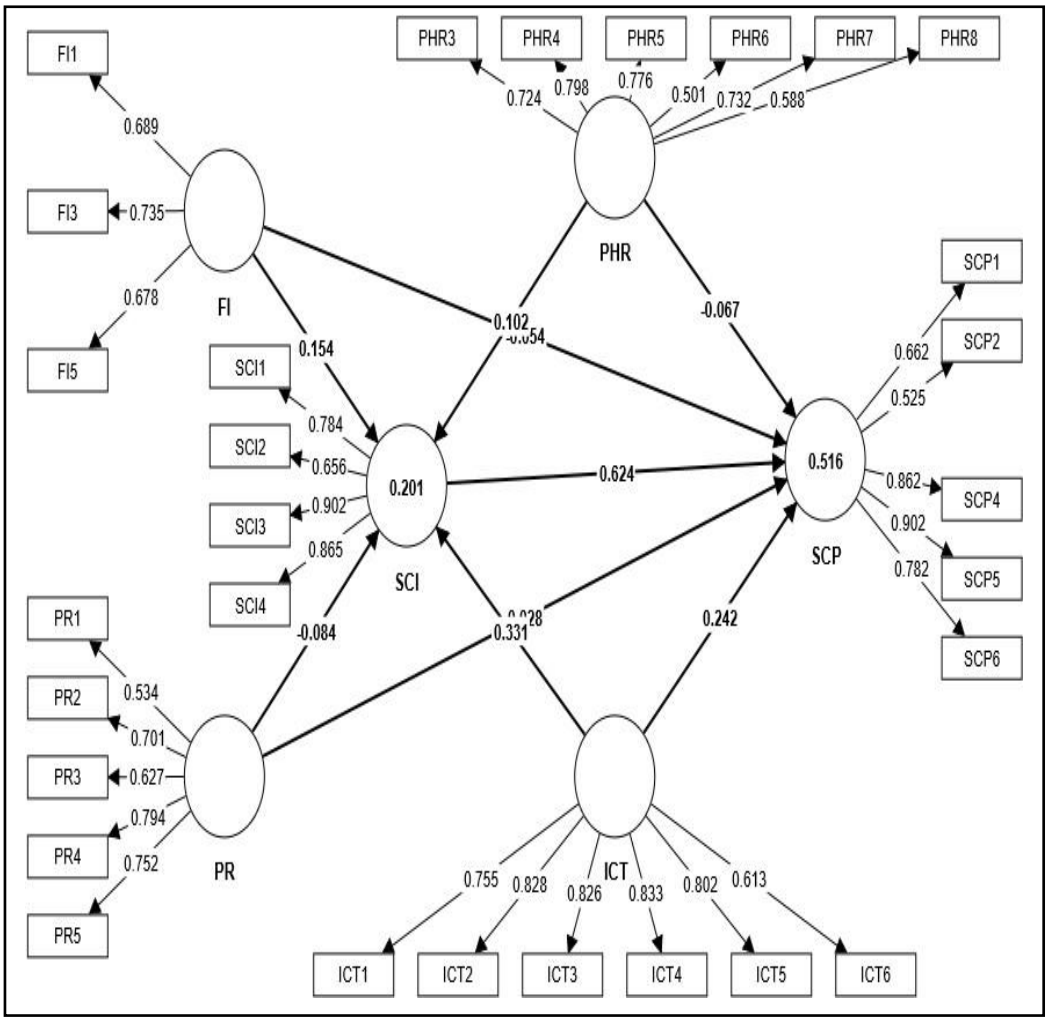

Figure 4.10 PLS-SEM Model

4.5.1 Collinearity

Collinearity is measured based on tolerance levels and the variance inflation factor (VIF). If the tolerance levels are below 0.20 and VIF is above 5.00 for the predictor constructs, then collinearity issues exist and would need to be addressed. Partial least squares (PLS) modelling was used through the SmartPLS (Ringle et. al., 2005) as the statistical tool to examine the measurement and structural model as it does not require normality assumption and survey research is normally not normally distributed (Chin et. al., 2003). The data shows that the skewness 55.196 and Kurtosis 296.96 then the data were not normally distribute based on Mardias Skewness & Kurtosis measurement. As suggested by Hair et. al. (2017) and Cain et. al. (2017), researcher assessed the multivariate skewness and kurtosis. The results showed that the data which have been collected was not multivariate normal, Mardia's multivariate skewness ($\beta = 5.196$, $p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 296.961$, $p < 0.01$), thus following the suggestions of Hair et al. (2019) it is reported that the path coefficients, the standard errors, t-values and p-values for the structural model using a 5,000-sample re-sample bootstrapping procedure (Ramayah et al. 2018).

The researcher took the initiative to address the issue of Common Method Bias, as suggested by Kock and Lynn (2012) and Kock (2015), because the data of this research comes from a single source. A thorough collinearity test was conducted to achieve this, and all of the variables from Professional human resources, firm infrastructure, procurement, information & communication technology, Supply chain integration and Supply chain performance were involved. All of these variables had a Variance Inflation Factor (VIF) of less than or equal to 3.3 when they were analyzed by regressing them against a common variable. Based on these results, it appears that using data from a single source does not introduce any substantial bias.

Therefore, in this study, none of the constructs exceeded the 5.00 value. Table 4.17 below shows the results of collinearity assessment, where the value for construct Professional Human Resource is 2.948, the value for construct Firm Infrastructure is 1.729, the value for construct Procurement is 3.118, the value for construct Information & Communication Technology is 3.239, the value for construct Supply Chain Integration is 2.789 and the value for construct Supply Chain Performance is 3.239. Therefore, the findings indicated that no collinearity issues existed.

Table 4.17
Findings of the Collinearity Assessment

Collinearity Statistics	VIF Value	Collinearity Issues
Professional Human Resources	2.948	No
Firm Infrastructure	1.729	No
Procurement	3.118	No
Information & Communication Technology	3.239	No
Supply Chain Integration	2.789	No
Supply Chain Performance	3.123	No

4.6 General Assumptions

Once the variables have their validity and reliability tested, the next step is to ensure that the assumptions for regression are not violated. According to Field (2013), this is done to eliminate potential statistical bias involving parameter estimates, standard errors, confidence intervals and p-values. Any statistical bias will create inaccuracy in the output of the findings, hence lead to invalid interpretation and conclusion. The main general assumptions that need to be considered are continuous variable, linearity, normality, multicollinearity, for statistical inference to be analyzed correctly.

4.6.1 Continuous Variable

The first assumption of this study is continuous variable. Table 4.18 below illustrates the mean and standard deviation values for all the variables in this study. Based on the table, there were four (4) dimensions under independent variables: namely, professional human resource, firm infrastructure, procurement and information & communication technology. For professional human resource, the mean and standard deviation scores are 5.02 and 0.54 respectively. Next, firm infrastructure, the mean and standard deviation scores are 5.34 and 0.43. The third variable of this study which is procurement, the mean and standard deviation scores are 4.89 and 0.58. The last element of the independent variables of this study is information & communication technology with the mean and standard deviation scores are 4.91 and 0.68. As for the dependent variable of this study which is supply chain performance, the scores for mean and standard deviation are 4.42 and 0.86 respectively meanwhile supply chain integration which is designated as mediating variable, the scores for mean and standard variation are 4.70 and 0.79 respectively.

Table 4.18
Continuous Variable

Variable	Mean	Standard Deviation
Professional human resource	5.02	0.54
Firm infrastructure	5.34	0.43
Procurement	4.89	0.58
Information & communication technology	4.91	0.68
Supply chain integration	4.70	0.79
Supply chain performance	4.42	0.86

4.6.2 Linearity

According to Hair et al. (2010), the linearity of the relationship between independent variable and dependent variable show the degree to which the change in the dependent variable is linked to the change in the independent variable. In addition, a linear association would be able to evaluate on how much two (2) cases that are separated by one unit on X are estimated to differ on Y (Hayes, 2013). The calculation of Y is derived via the following formula.

$$Y_k = a + bX_k + e_k \quad (4.1)$$

Y is the criterion or known as dependent variable. X is the predictor or known as independent variable, b is the coefficient regression or weight regression for X predictor variable. Next, a is the intercept regression or known as constant regression and lastly, e is the residual or error in the estimation of Y from X. The correlation concept is based on the linear relationship, in which the closer the r value is to I, the stronger the linear relationship.

Referring to the above formula, r is represented by b. If b posits a value that is positive, high values of X will be as the same as high values of Y. Likewise, if b has a value that is negative, it will be paired with lower values of Y. Hence, linearity is perceived as a vital issue in any regression analysis. The result of the correlation analysis will not be corrected if the independent and dependent variables had no linear relationship.

Linearity of the study can be achieved using a simple regression analysis. The residuals of the study are observed in the standard error of estimate, where it forms the non-linear portion in the relationship between the variables. Furthermore, linearity also serves as an indicator of a tit model in which, the higher the standard error of estimate, the greater the discrepancy between predicted Y values and the "real life" Y values (Hayes, 2013). Based on the regression analysis and the scatterplot of the residuals, the linearity assumption of the correlational analysis was not violated. The data distribution must be linear, otherwise it is difficult to measure the contribution. Possible causes of non-linearity are: [i.] Constructed likert items are not good, [ii.] incorrect sample selection (sample lacks information/information) and [iii.] items are not computed from negative (if any) to positive. To check linearity use graph > scatter plots, usually contribution between 20 - 40 percent range. If the correlation is high, then it is called multicollinearity. Linear Correlation measures the strength of the linear relationship between two variables. (Correlation coefficient for population = rho (Greek symbol) and for sample = r).

Correlation between Supply Chain Performance*Supply Chain Integration r = .690, p<.000 (r<.900), Correlation between Supply Chain Performance*Professional Human Resource r = .338, p<.000 (r<.900), Correlation between Supply Chain Performance*Firm's Infrastructure r = .178, p<.000 (r<.900), Correlation between Supply Chain Performance*Procurement & Supplies Services r = .331, p<.000 (r<.900), Correlation between Supply Chain Performance*ICT Technology r = .423, p<.000 (r<.900). Correlation between Supply Chain Integration*Professional Human Resource r = .362, p<.000 (r<.900), Correlation between Supply Chain Integration*Firm's Infrastructure r = .264, p<.000 (r<.900), Correlation between Supply Chain Integration*Procurement & Supplies Services r = .309, p<.000 (r<.900), Correlation between Supply Chain Integration*ICT Technology r = .409, p<.000 (r<.900).

Correlation between Professional Human Resource*Firm's Infrastructure r = .533, p<.000 (r<.900), Correlation between Professional Human Resource*Procurement & Supplies Services r = .635, p<.000 (r<.900), Correlation between Professional Human Resource*ICT Technology r = .627, p<.000 (r<.900). Correlation between Firm's Infrastructure*Procurement & Supplies Services r = .515, p<.000 (r<.900), Correlation between Firm's Infrastructure*ICT Technology r = .495. p<.000 (r<.900). Correlation between Procurement Supplies Services*ICT Technology r = .717, p<.000 (r<.900). Table 4.19 below shows the linearity test of all the variables.

Table 4.19
Correlation Matrix

		SCP	SCI	PHR	FI	PSS	ICT
Pearson Correlation	Supply Chain Performance	1					
	Supply Chain Integration	.690	1				
	Professional Human Resource	.338	.362	1			
	Firm Infrastructure	.178	.264	.533	1		
	Procurement	.331	.309	.635	.515	1	
	Information and Communication Technology	.423	.409	.627	.495	.717	1
Sig. (1-tailed)	Supply Chain Performance	.	.000	.000	.000	.000	.000
	Supply Chain Integration	.000	.	.000	.000	.000	.000
	Professional Human Resource	.000	.000	.	.000	.000	.000
	Firm's Infrastructure	.000	.000	.000	.	.000	.000
	Procurement Supplies Services	.000	.000	.000	.000	.	.000
N	Supply Chain Performance	360	360	360	360	360	360
	Supply Chain Integration	360	360	360	360	360	360
	Professional Human Resource	360	360	360	360	360	360
	Firm's Infrastructure	360	360	360	360	360	360
	Procurement Supplies Services	360	360	360	360	360	360
	ICT Technology	360	360	360	360	360	360

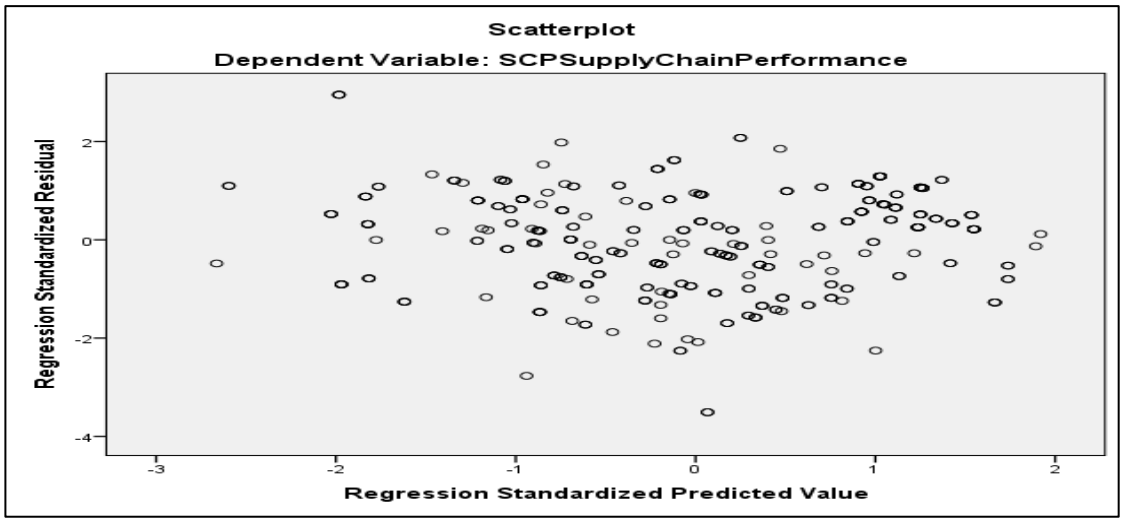

Figure 4.11 Scatterplot Linearity Test

Researchers have also ascertained whether there is multicollinearity in the displayed data, this can be detected by referring to the correlation between the independent variable and the dependent variable preferably having a correlation value of less than r = <0.7 (Pallant, 2013). Based on the Excluded Variables[a] table (refer to partial correlation table 4.20) all variables were found: model 1 Partial Correlation Professional Human Resource r = .103, p<.000 (r<.900), Partial Correlation Firm Infrastructure r = -.006, p<. 000 (r<.900), Partial Correlation Procurement Supplies Services r = .170, p<.000 (r<.900), Partial Correlation ICT Technology r = .213, p<.000 (r<.900). Thus, it can be assumed that the results of this study do not have multicollinearity problems in the data displayed.

Table 4.20
Partial Correlation Excluded Variables[a]

						Collinearity Statistics		
Model		Beta In	t	Sig.	Partial Correlation	Tolerance	VIF	Minimum Tolerance
1	PHR	.101b	2.479	.014	.130	.869	1.151	.869
	FI	-.005b	-.118	.906	-.006	.930	1.075	.930
	Procurement	.130b	3.269	.001	.170	.904	1.106	.904
	ICT	.169b	4.126	.000	.213	.832	1.201	.832

The Coefficients[a] table shows all variables meet the Tolerance value = >0.10 and the VIF value = <10.0 for that there is no multicollinearity problem between the variables.

The results of the analysis through the following Coefficients[a] table shows that there is no multicollinearity problem between the variables below:

(i) Professional Human Resource
= Tolerance >0.869 (>0.10), VIF value = 1.151 (<10.0)

(ii) Firm Infrastructure
= Tolerance > 0.930 (>0.10), VIF value = 1.075 (<10.0)

(iii) Procurement Supplies Services
= Tolerance > 0.904 (>0.10), VIF value = 1.106 (<10.0)

(iv) ICT Technology
= Tolerance > 0.832 (>0.10), VIF value = 1.201 (<10.0).

4.6.3 Normality

The next assumption that needs to be considered is the normality as normality is being perceived as the most basic assumption in multivariate data analysis. The main purpose of analyzing the normality is to recognize the shape of distribution where it should be normally distributed on the predicted dependent variable scores. This study test for the symmetric nature and flatness for the data set using the shape descriptors, skewness and kurtosis, respectively. A variety of opinions can be found concerning the acceptable level of skewness (the symmetry of a distribution) and kurtosis (the clustering of scores toward the centre of a distribution) for a particular variable (George & Mallery, 2019; Morgan, Griego, & Gloekner, 2001).

The data normality test needs to be done to see if the data is distributed normally (parametric) or not normally (nonparametric). The determination of the normality test whether the data is normally distributed or not is to determine the appropriateness of using parametric or nonparametric statistics. If the data is normally distributed then parametric statistics should be used, on the other hand if the data is not normally distributed then non-parametric statistics will be used. There are several ways to detect the distribution of data through the normality test. In this study, researchers used three types of normality tests, namely through; (1) histogram bell curve, (2) mean, median and mode values that are the same or almost the same, and (3) skewness and kurtosis tests (± <.2) for univariate tests (Ghazali Darusalam & Sufean Hussin, 2021).

Fidell (2007) explained that the value of skewness and kurtosis refers to the shape of the data distribution, ie: a value of zero for skewness and kurtosis describes a 100% normal distribution. Data is normally distributed when both skewness and kurtosis values are in the range of ±1.00 or ±2.00 or ±3.00. Skewness value should be less than <±1.7 or <±2.00 or <±3.00 and also kurtosis value should be less than <±1.7 or <±2.00 or <±3.00. Kline (2011) stated that the value of skewness is <±3.00 and kurtosis <±8.00, on the other hand Tabachnik & Fidel (2007) explained that the value of skewness is <±2.00 and kurtosis <±7.00. If the kurtosis value is greater than >+1 then it is too peaked (too peak) otherwise if it is lower than <-1 then it is too flat (too flat). For Chou & Bentler (1995) put a value that is considered to be less than <±3.00 as a benchmark to see the normality of the skewness and kurtosis values.

In this study, normality test was conducted on all variables to check on their level of skewness and kurtosis. According to Field (2013), if the value is far from zero, it is most likely that the data is not distributed normally. But the data is perceived as normally distributed if the skewness and kurtosis values fall between +-3. Figure 4.12, 4.13, 4.14, 4.15, 4.16 and 4.17 below shows the bell curve histogram curve. The results of the normality test showed that six constructs: (i) Professional Human Resource, (ii) Firm Infrastructure, (iii) Procurement Supplies Services, (iv) ICT Technology, (v) Supply Chain Integration, and (vi) Supply Chain Performance were distributed normal based on the shape of the histogram curve which is the bell curve, thus any inference test such as Correlation, Regression, Mediator analysis test and others can be done using parametric statistics to answer all research questions as will be reported in chapter 4. The following figure 4.12 shows the bell curve histogram curve, and table 4.21 shows the mean, median and mode values as well as skewness and kurtosis tests.

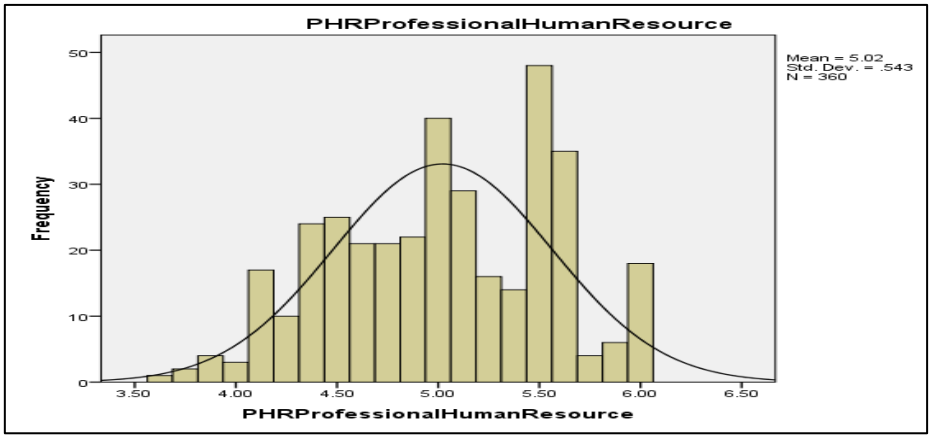

Figure 4.12 Histogram Bell Curve PHR

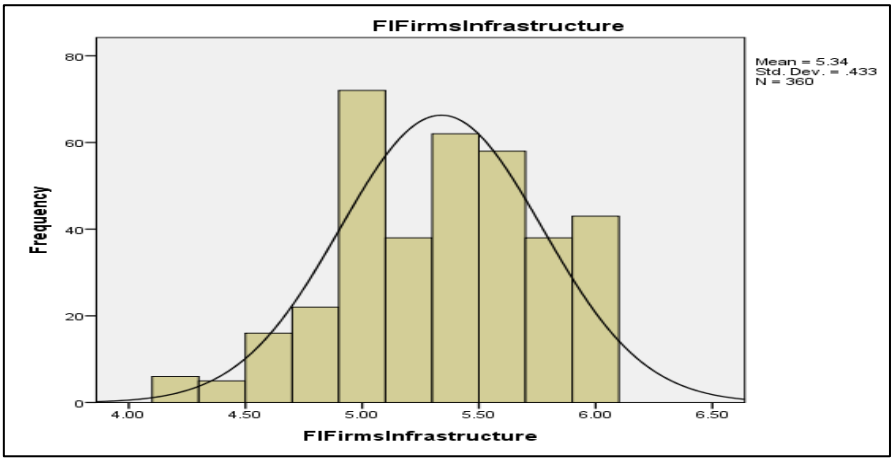

Figure 4.13 Histogram Bell Curve FI

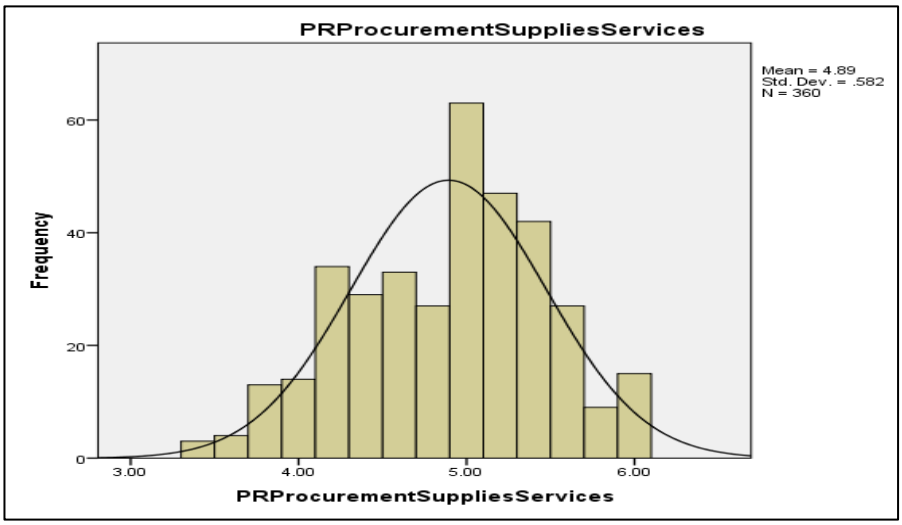

Figure 4.14 Histogram Bell Curve PSS

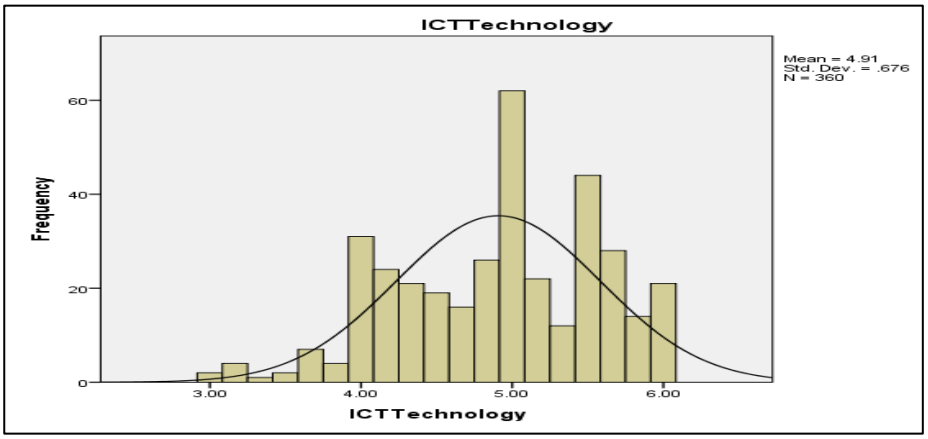

Figure 4.15 Histogram Bell Curve ICT

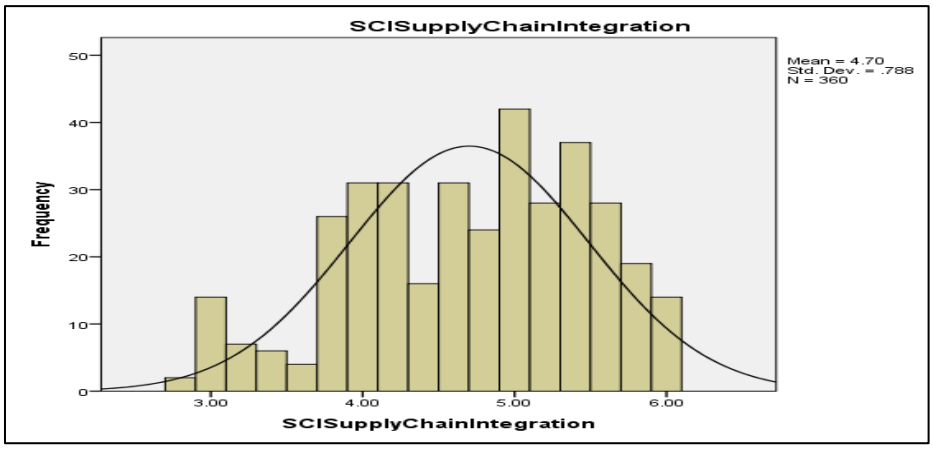

Figure 4.16 Histogram Bell Curve SCI

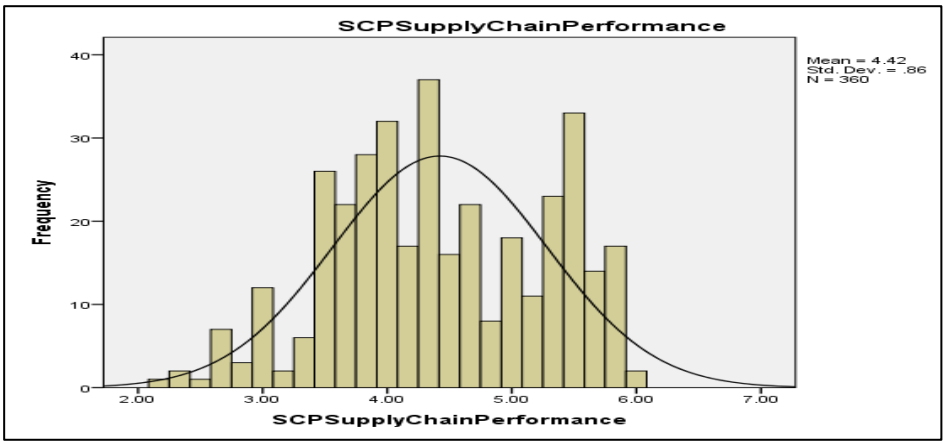

Figure 4.17 Histogram Bell Curve SCP

Based on table 4.21 below, the results of the normality test also show that all six constructs are normally distributed based on the mean, median and mode tests showing the same or almost the same values as the constructs: (i) Professional Human Resource mean = 5.02, median = 5.00 and mode = 5.50, (ii) Firm Infrastructure mean = 5.33, median = 5.40 and mode = 5.00, (iii) Procurement Supplies Services mean = 4.89, median = 5.00 and mode = 5.00, (iv) ICT Technology mean = 4.90, median = 5.00 and mode = 5.00, (v) Supply Chain Integration mean = 4.70, median = 4.80 and mode = 5.00, and (vi) Supply Chain Performance mean = 4.42, median = 4.33 and mode = 4.33.

Table 4.21
Normality Test (Mean Value and Median)

		PHR	FI	PSS	ICT	SCI	SCP
N	Valid	360	360	360	360	360	360
	Missing	0	0	0	0	0	0
Mean		5.0219	5.3389	4.8928	4.9079	4.7011	4.4218
Median		5.0000	5.4000	5.0000	5.0000	4.8000	4.3333
Mode		5.50	5.00	5.00	5.00	5.00	4.33
Std. Deviation		.54266	.43322	.58233	.67572	.78751	.85996

Based on table 4.22 below, the results of the normality test show that all three constructs are normally distributed when the results of the normality test show that all three constructs are normally distributed through skewness <±2.00 and kurtosis <±7.00. For the construct: (i) Professional Human Resource skewness = -.156, kurtosis = -.782, (ii) Firm Infrastructure skewness = -.296, kurtosis = -.470, (iii) Procurement Supplies Services skewness = -.250, kurtosis = -.516, (iv) ICT Technology skewness = -.364, kurtosis = -.502, (v) Supply Chain Integration skewness = -.376, kurtosis = -.629, and (vi) Supply Chain Performance skewness = -.091, kurtosis = -.769.

Table 4.22
Skewness and Kurtosis

Variables	Skewness	Kurtosis
Professional Human Resource	-.156	-.782
Firm Infrastructure	-.296	-.470
Procurement	-.250	-.516
Information Communication Technology	-.364	.502
Supply Chain Integration	-.376	-.629
Supply Chain Performance	-.091	.769

4.6.4 Multicollinearity

According to Hair et al. (2010), multicollinearity exists when there is high relationship among independent variables in which it is non-ideal for this study as it may reduce the overall R^2 value and give an impact to the overall statistical significance test of coefficients. For this purpose, Variance Inflation Factor (VIF) is set at the value of 10 (Hair et al., 2010). The VIFs were examined in the relationships of this study. The results of the multiple regression analyses show that multicollinearity did not occur in the regression models. In addition, mean-centering process can be used to avoid multicollinearity issue due to its ability to make the regression coefficients of the independents and moderating variables more reliable and interpretable.

However, Hayes (2013) stated that, the practice of mean-centering as a clear-cut remedy for multicollinearity is a myth, since the alteration in the regression analyses, coefficients and their standard errors are not lined with the multicollinearity reduction when mean-centering is implied. To test the mediating effect via linear regression, multicollinearity is not considered as an issue, as the interaction variable "XM" itself is a by-product of variable X which is the predictor and M is the moderator. Hence, multicollinearity was not a problem in the analysis conducted in this study.

Furthermore, multicollinearity also has no impact on the accuracy estimation, hypotheses testing or standard errors of regression coefficients (Hayes, 2013). To test multicollinearity, the correlation matrix of the variables was studied to identify the occurrence of multicollinearity. The correlation coefficient is a measure of the closeness of 156 the relationships or association between independent and dependent variables (Hair, et al., 1995). Multicollinearity problem exists when the independent variables are too highly correlated, for instance Pearson's r between each pair of independent variables does not exceed 0.85 (Hair, et al., 1995). The results in Table 4.23 indicate that none of the squared correlations was close to 0.85 to suggest a problem with multicollinearity among the research variables. Therefore, there is no evidence of significant multicollinearity among the research variables.

Tab1e 4.23
Multicollinearity Statistic for Independent Variables

Variables	Collinearity Statistic Tolerance	VIF
Professional Human Resource	.597	1.676
Firm Infrastructure	.734	1.362
Procurement	.904	1.106
Information Communication Technology	.891	1.123

4.6.5 Homoscedasticity

Parallel with the linearity assumption. homoscedasticity refers to the errors or residuals in the model that should be fit to the data of the study. According to Hayes (2013), the assumption of homoscedasticity stated that the errors in estimation are equally the same on the outcome of the dependent variable. In simpler terms, a dependent variable of the study should showcase the equal level of variance across the predictor variables.

In any study, homoscedasticity is a must as the variance of the dependent variable will be explained in the dependence relationship as it should not only concentrate in only a limited range of the independent values (Hair or al., 2010).

4.6.6 Independence of Observation

According to Hair et al. (2010), independence of observation requires that the dependent variable measures for each respondent to be uncorrelated with the responses from other respondents in the sample. In other words, the errors in estimation are statistically independent in which the error in estimation for observation on respondent A could not be used to determine the error in estimation for respondent B. Durbin-Watson was used to test the independence of observation. The values should be between 1.5 to 2.5 for the indication of the independent observations. The results of regression analyses showed that there was no serious violation in the assumption of the independence of observation.

4.6.7 Correlation Matrix

A total of 360 questionnaires were used for the correlation analysis. The Pearson correlation analysis was used to diagnose the inter-relationships among the variables in this study. The correlation values between the independent variables ranging from low to high, indicates convergent validity. The correlation coefficients that are in the range of low and high between the independent variable, mediating variable and the dependent variable indicate the potential influence of the independent variable (value chain management practices) on the dependent variable (supply chain performance) and the influence of mediating variable (supply chain integration) on the independent and dependent variable. To interpret the correlation between the variables, the degrees of correlation by Pearson correlation coefficient was used. Table 4.24 shows the interpretation of correlation coefficients.

Table 4.24
Guidelines for Interpreting The Correlation and Coefficient

"r" value	**Degree of correlation**
+.70 and higher	Very strong positive relationship
+.40 to .69	Strong positive relationship
+.30 to +.39	Moderate positive relationship
+.20 to +.29	Weak positive relationship
+.01 to +.19	Very weak relationship
0	No relationship [zero correlation]

-.01 to -.19	Very weak negative relationship
-.20 to -.29	Weak negative relationship
-.30 to -.39	Moderate negative relationship
-.40 to -.69	Strong negative relationship
-.70 to higher	Very strong negative relationship

Results of correlation analysis as shown in table 4.25 indicate the inter-correlation among the variables involved in this study. Some are very weakly correlated, while others are moderately and strongly correlated. The significance of the correlation indicates the extent of how much a variable tends to change when other variables change. All value chain management practices dimensions are found to be significantly and positively correlated with each other. The linkages between value chain management practices and the dependent variables were also established.

Based on the result, all dimensions of independent variables (professional human resource, firm infrastructure, procurement and information communication technology) are significantly and positively correlated with supply chain performance. As for the supply chain performance, professional human resource has moderate positive relationship ($r = .338$, $p < 0.01$), firm infrastructure sadly has very weak relationship ($r = .178$, $p < 0.01$). However, procurement has moderate positive relationship ($r = .331$, $p < 0.01$).

Meanwhile, information and communication technology have strong positive relationship ($r = .423$, $p < 0.01$). The correlation coefficient between value chain management practices and supply chain integration are as follows; professional human resource and firm infrastructure has moderate positive relationship and very strong positive relationship ($r = .362$, $p < .0.01$) and ($r = .70$, $p < 0.264$) respectively.

Next, information and communication technology have strong positive relationship ($r = .409$, $p < .0.01$). As for procurement, it has moderate positive relationship ($r = .309$, $p < 0.01$). Lastly, the linkages between mediating variable (supply chain integration) and supply chain performance were established. Supply chain integration and supply chain performance has strong positing relationship ($r = .690$, $p < 0.690$).

Table 4.25
Correlation Matrix

		SCP	SCI	PHR	FI	PSS	ICT
Pearson Correlation	Supply Chain Performance	1					
	SCI	.690	1				
	PHR	.338	.362	1			
	FI	.178	.264	.533	1		
	PSS	.331	.309	.635	.515	1	
	ICT	.423	.409	.627	.495	.717	1

4.6.8 Dependency Durbin-Watson

Durbin Watson statistic is a statistic used to detect the presence of autocorrelation which is a relationship between values separated from each other by a time lag (Shisei & Taniguchi. 1999). Autocorrelation occurs when the error terms of a regression model is not independent, and that is when the value of historical periods in the forecast influence the values of current period. If the Durbin-Watson value is low (<1.50), that indicates the presence of positive autocorrelation. When the value is high (<1.50), that indicates the presence of negative autocorrelation.

Dependency Durbin-Watson checks the correlation between the remaining values of checks that can invalidate this test. This value should be between 1 and 3, and ideally around 2. The results from the regression show the Durbin-Watson value between the evaluated variables showing that Durbin-Watson = 1.649 is between 1 and 3 which is acceptable, Table 4.26 below shows the value of Dependence Durbin-Watson for this study.

Table 4.26
Dependency Durbin-Watson

				Std. Error	Change Statistics					
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.635a	.403	.402	.41978	.403	241.951	1	358	.000	
2	.681b	.464	.461	.39855	.060	40.156	1	357	.000	
3	.708c	.501	.497	.38498	.037	26.594	1	356	.000	
4	.714d	.510	.504	.38200	.009	6.591	1	355	.011	1.649

Model 1 : Procurement Supplies Services
Model 2 : ICT Technology
Model 3 : Firm Infrastructure
Model 4 : Supply Chain Integration

4.7 The Correlation of Value Chain Management Practices, Supply Chain Performance and Supply Chain Integration

This section is targeted to answer the first research question of this study; What is the level of value chain management practices (professional human resource, firm infrastructure, procurement, information and communication technology), supply chain performance and supply chain integration among firms in manufacturing industry?

This section aims to determine the highest score of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology), supply chain performance and supply chain integration among firms in manufacturing industry. The respondents of this study were selected from manufacturing firms around Klang Valley, Penang, and Johor. The rationale of distributing the questionnaire around Klang Valley, Penang, and Johor was because there are all populated with the most manufacturing firms in Malaysia.

The items in this section were scaled based on the six-point Likert Scale. The questionnaire consists of 45 questions by using a scale of 1 to 6 (strongly disagree to strongly agree). The interpretation of scores for service quality in the form of the average score is based on Best's Principles (Thaoprom, 2004). The minimum-maximum scores are divided into 3 ranges of score which are high, medium, low that is 5-1/3 = 1.33. The interpretation of the scores were divided by three stages such as high scores (3.68 to 5.00), average scores (2.34 to 3.67), and low scores (1 to 2.33). Table 4.27 below shows the score and the level.

Table 4.27
Best Principle Score

Score's range	Level
1.00 to 2.33	Low scores
2.34 to 3.67	Average scores
3.68 to 5.00	High scores

Source: Tschannen-Moran & Gareis, 2004

Based on table 4.27, all dimensions of value chain management practices; namely, professional human resource, firm infrastructure, procurement and information communication technology have high scores with firm infrastructure having the highest mean score (M=5.200, SD=.9920), followed by professional human resource (M=5.140, SD=.9780), information and communication technology with (M=5.100,

SD=.9650) and lastly, procurement with (M=5.010, SD=.9510). As for the mediating variable of this study, supply chain integration has high score with (M=4.680, SD=.8550). Lastly, in relation to dependent variable, it was found out that supply chain performance has high mean score with (M=4.640, SD=.8470).

For the dimensions with mean score more than 5.00, it can be concluded that the dimensions have very high scores based on table 4.28. This includes firm infrastructure, professional human resource, information and communication technology and lastly procurement.

Table 4.28
Mean of 6 Likert Scale

Min Interval	Level of Interpretasion
1.00 – 1.49	very low
1.50 – 2.49	Low
2.50 – 3.49	Average
3.50 – 4.49	above average
4.50 – 5.49	high
5.50 - 6.00	very high

Source: Tschannen-Moran & Gareis, 2004

4.8 Hypotheses Testing

Hypotheses testing for this study are divided into two (2) stages; (1) to investigate the influence of independent variables (value chain management practices dimensions) on the dependent variable (supply chain performance); (2) to analyze the mediating effects of supply chain integration on the relationship between value chain management practices variables and supply chain performance variable.

The summary of the hypotheses testing, and the area of research investigation are shown in Figure 4.18. The first group of hypotheses involve direct relationship between value chain management practices and supply chain performance variable which involve hypotheses H1 to H3d. The mediating effect of supply chain integration on the relationship between value chain management practices and supply chain performance are organized from H4 to H4d.

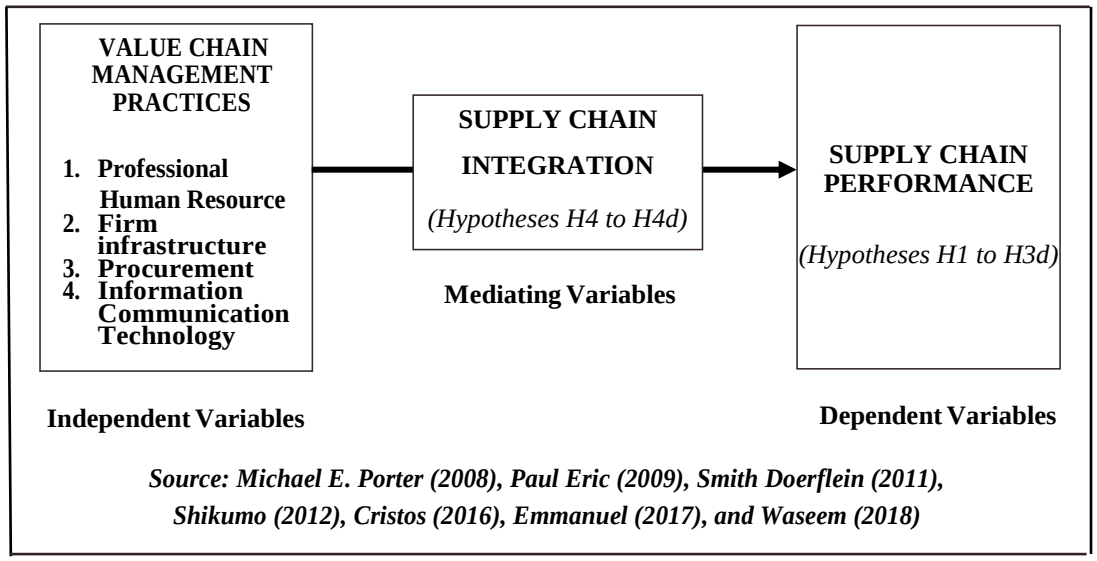

Figure 4.18 Hypotheses Testing Summary

4.8.1 The influence of Value Chain Management Practices on Supply Chain Performance

This section aims to answer the second research objective which is to investigate the influence of value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology) and supply chain performance among firms in manufacturing industry. Under this part of analysis, Hypotheses Hl to H1d were tested by examining the influence of the independent variables on the dependent variables. The independent variables are the dimensions of value chain management practices; professional human resource, firm infrastructure, procurement and information communication technology. Meanwhile, the dependent variable is supply chain performance. The hypotheses involved in this study are as follows:

H1 : **Value chain management practices** has a positive effect on **supply chain performance.**

H1a : **Professional human resource** has a positive effect on **supply chain performance.**

H1b : **Firm infrastructure** has a positive effect on **supply chain performance**.

H1c : **Procurement** has a positive effect on **supply chain performance**.

H1d : **Information and communication technology** has a positive effect on **supply chain performance**.

A multiple regression analysis was conducted by entering the four (4) independent variables and a dependent variable in the regression model. Table 4.29 summarizes the result of the regression analyses between value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology) on supply chain performance.

Table 4.29
Regression Analysis between VCMP and SCP

Model	Standardized Coefficients Beta
Professional Human Resource	.143**
Firm Infrastructure	. 091
Procurement	.031
Information and Communication Technology	.356**
R	.440
R^2	.193
Adjusted R^2	.184
F Change	21.254
Significance F Change	.000
Durbin Watson	1.359

As illustrated in the table 4.29, the regression table indicates significant F score (F 21.254, p <0.01) which further indicates that the group of independent variables (professional human resource, firm infrastructure, procurement and information communication technology) significantly produce joint effects on the regression model. However, F-statistic is not sufficient enough to make a conclusion of this study. R-Square (R^2) explains the variance in the dependent variable which was contributed by the independent variables. The regression table above shows R^2 of 0.193 which indicates that 19.3% of the variance in the supply chain performance is sufficiently explained by four (4) dimensions of value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology).

Based on the above findings, only two (2) variables of value chain management practices (professional human resource and information communication technology) are significant predictors of supply chain performance. The following are the summary of hypotheses testing involving value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology) and supply chain performance.

Table 4.30
Hypotheses Results for VCMP and SCP

Hypotheses	Statements	Results
H1	Value chain management practices has a positive effect on supply chain performance.	Supported
Hl_a	Professional human resource has a positive effect on supply chain performance.	Supported
$H1_b$	Firm infrastructure has a positive effect on supply chain performance.	Not Supported
HI_c	Procurement has a positive effect on supply chain performance.	Not Supported
$H1_d$	Information communication technology has a positive effect on supply chain performance.	Supported

4.8.2 The influence of Value Chain Management Practices on Supply Chain Integration

This section aims to answer the third research objective which is to investigate the influence of value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology) on supply chain integration among firms in manufacturing industry. Under this part of analysis, Hypotheses H3 to H3d were tested by examining the influence of the independent variables on the mediator variable. The independent variables are the dimensions of value chain management practices; professional human resource, firm infrastructure, procurement and information communication technology. Meanwhile, the mediating variable is supply chain integration act here as dependent for VCMP. The hypotheses involved in this study are as follows:

H3 : **Value chain management practices** has a positive effect on **supply chain integration.**

H3a : **Professional human resource** has a positive effect on **supply chain integration.**

H3b : **Firm infrastructure** has a positive effect on **supply chain integration**.

H3c : **Procurement** has a positive effect on **supply chain integration**.

H3d : **Information and communication technology** has a positive effect on **supply chain integration**.

A multiple regression analysis was conducted by entering the four (4) independent variables and a mediating variable in the regression model. Table 4.31 summarizes the result of the regression analyses between value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology) on supply chain integration.

Table 4.31
Regression Analysis between VCMP and SCI

Model	Standardized Coefficients Beta
Professional Human Resource	.174**
Firm Infrastructure	. 041
Procurement	.047
Information and Communication Technology	.314**
R	.433
R^2	.188
Adjusted R^2	.179
F Change	20.505
Significance F Change	.000
Durbin Watson	1.611

As illustrated in the table 4.31, the regression table indicates significant F score (F 20.505, p <0.01) which further indicates that the group of independent variables (professional human resource, firm infrastructure, procurement and information communication technology) significantly produce joint effects on the regression model. However, F-statistic is not sufficient enough to make a conclusion of this study. R-Square (R^2) explains the variance in the mediating variable which was contributed by the independent variables. The regression table above shows R^2 of 0.188 which indicates that 18.8% of the variance in the supply chain integration is sufficiently explained by four (4) dimensions of value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology). Based on the above findings, only two (2) variables of value chain management practices (professional human resource and information communication technology) are significant predictors of supply chain performance. The following are the summary of hypotheses testing involving value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology) and supply chain integration.

Table 4.32
Hypotheses Results for VCMP and SCI

Hypotheses	Statements	Results
H1	Value chain management practices has a positive effect on supply chain integration.	Supported
Hl_a	Professional human resource has a positive effect on supply chain integration.	Supported
$H1_b$	Firm infrastructure has a positive effect on supply chain integration.	Not Supported
HI_c	Procurement has a positive effect on supply chain integration.	Not Supported
$H1_d$	Information communication technology has a positive effect on supply chain integration.	Supported

4.8.3 Mediating Effect of Supply Chain Integration on The Relationship Between VCMP and Supply Chain Performance: An Overview

The second part of the data analysis of this study focuses on the mediating effect of supply chain integration on the relationship between value chain management practices variables and supply chain performance. This section investigates the research question of "how' does supply chain integration mediates the relationship between value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) and supply chain performance among firms in manufacturing industry. For this purpose, hypotheses H4 until H4d were tested. The hypotheses involved in this section are as follows:

H4 : Supply chain integration positively mediates the relationship between **value chain management practices** and supply chain performance

H4a : Supply chain integration positively mediates the relationship between **professional human resource** and supply chain performance

H4b : Supply chain integration positively mediates the relationship between **firm infrastructure** and supply chain performance

H4c : Supply chain integration positively mediates the relationship between **procurement** and supply chain performance

H4d : Supply chain integration positively mediates the relationship between **information and communication technology** and supply chain performance

A series of mediated regression analysis were conducted. Each analysis which involves interaction between the independent variable and the mediator variable were done separately. In this study, hierarchical regression analysis was selected for all mediated regression analysis.

4.8.3.1 Supply Chain Integration (SCI) Mediates the Relationship between Professional Human Resource (PHR) and Supply Chain Performance (SCP)

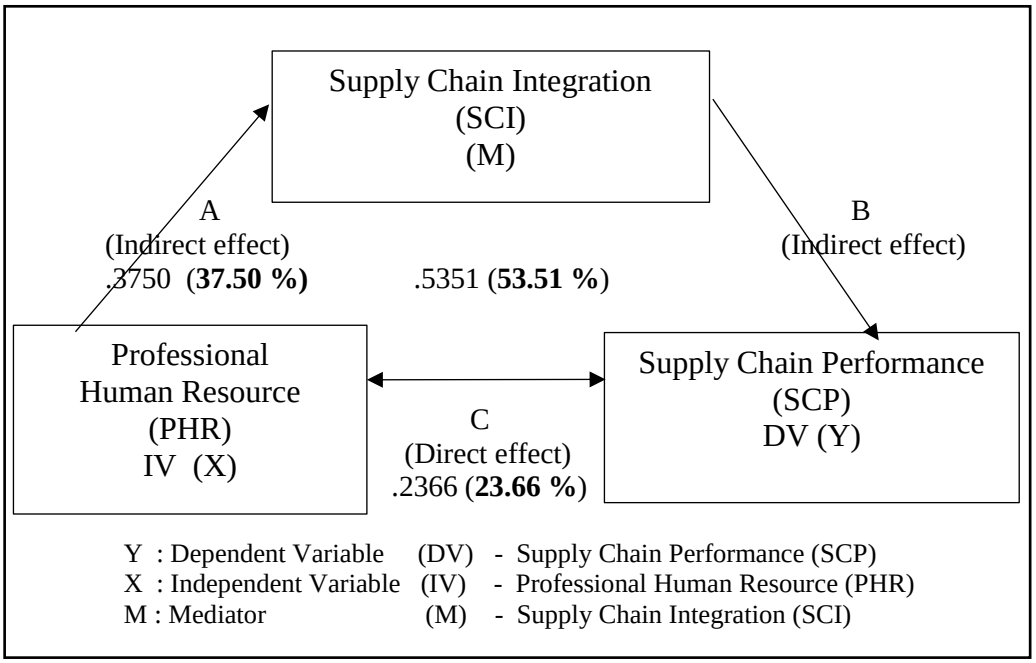

Figure 4.19 SCI Mediates the Relationship between PHR and SCP

Table 4.33
SCI Mediates the Relationship between PHR and SCP

Model Mediator	**Variable**	**Line**	**Effect**	**Coefficiant**	**P <0.05**	**Indirect effect(s) of X on Y**	**Total effect of X on Y**	**Effect size Mediator**
						Boot LLCI	BootULCI Direct effect of X on Y	Indirect effect(s) of X on Y
X	Professional Human Resource (PHR)	A	Professional Human Resource (PHR)	.5257	.0000	.2810	.4707	
Y	Supply Chain Performance (SCP)	C	Supply Chain Performance (SCP)	.1601	.0136		.5351 P<.0000 (.5351 x 100 = 53.51%)	
M	Supply Chain Integration (SCI)	B	Supply Chain Integration (SCI)	.7133	.0000			.2366 P<.0000 (.2366 x 100 = 23.66%)
		a'b	Professional Human Resource (PHR) ' Supply Chain Performance (SCP)			.3750 (.3750 x 100 = 37.50%)		

The table 4.33 above shows Supply Chain Integration (SCI) mediates the relationship between Professional Human Resource (PHR) and Supply Chain Performance (SCP). The results of the study show that the 'a' line above is the effect or influence of Professional Human Resource (PHR) to Supply Chain Integration (SCI) (mediator). from the output above, the findings of the study show that the r value coefficient of line 'a' of the effect or influence of Professional Human Resource (PHR) to Supply Chain Integration (SCI) (mediator) is r= .5257 and significant at the p<.0000 level (p <0.05).

While Line c' is the effect or influence of Professional Human Resource (PHR) to Supply Chain Performance (SCP) or a direct effect from X to Y. The value coefficient r of the effect or influence of Professional Human Resource (PHR) to Supply Chain Performance (SCP) line c is as large as r = .1601 and is not significant at the level of p>.0136 (p>0.05). With that it can be concluded that there is no effect or influence between Professional Human Resource (PHR) to Supply Chain Performance (SCP).

Line b is the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) or a direct effect from M to Y. The value coefficient r of the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) line b is as large as r = .7133 and is significant and significant at the p<.0000 level (p<0.05). With that it can be concluded that there is an effect or influence between Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP).

Line a'b is an indirect effect or influence between the relationship between Professional Human Resource (PHR) and Supply Chain Performance (SCP) through Supply Chain Integration (SCI). From the output above it can be seen that the indirect effect or influence is .3750 (.3750 x 100 = 37.50%).

Line c is the total effect of Professional Human Resource (PHR) to Supply Chain Performance. Total effect can also be calculated by summing the direct effect or influence plus the indirect effect or influence, or the summation of line a + line (a*b). The size of the total effect coefficient is .5351 (.5351 x 100 = 53.51%) and is significant at the p<.0000 level (p<0.05).

Because line (a) line 'a' above is the effect or influence of Professional Human Resource (PHR) to Supply Chain Integration (SCI) (mediator) is a = .5257 and significant at the p<.0000 level (p<0.05) and line (b) the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) is b = .7133

and significant at the p<.0000 (p<0.05) level, then if take the guidance of Baron and Kenny (1986), it can be concluded that Supply Chain Integration (SCI) Mediates the relationship between Professional Human Resource (PHR) and Supply Chain Performance (SCP).

To see if there is an effect or influence of the mediator or not, it is necessary to look at the output in the indirect effect(s) of X on Y. There is written an indirect effect of .3750 (by multiplying the a*b line). The confidence interval (Confidence Interval / CI) from the bootstrap result* is written BootLLCI (lower level for CI) = .2810 and BootULCI (upper level for CI) = .4707*. If the range of BootLLCI and BootULCI does not include a zero value (0), then it can be concluded that there is a significant estimate and there is an effect or influence of a mediator (Supply Chain Integration (SCI) as a mediator). The effect size of Supply Chain Integration (SCI) as a mediator can be seen from the coefficient of completely standardized indirect effect (s) of X on Y which is .2366 (.2366 x 100 = 23.66%).

*(Bootstrapping is used to solve the problem of non-normality of data through resampling by assuming that the original sample represents the population. Bootstrapping allows researchers to assess the stability of parameters in the model)

*(Mediator with values of BootLLCI = .2810 and BootULCI = .4707 which means the perception of Supply Chain Integration (SCI) Mediates the relationship between Professional Human Resource (PHR) and Supply Chain Performance (SCP).

From the results of the analysis above, the bootstrap unstandardized indirect effect value is .3750 (.3756 x 100 = 37.50 %), and the 95% confidence interval (CI) ranges from .2810 to .4707. Because zero is not included in the 95% confidence interval range, it can be concluded that there is a significant indirect effect or influence on the relationship between Professional Human Resource (PHR) and Supply Chain Performance (SCP) through Supply Chain Integration (SCI) as the mediator. Or in other words, Supply Chain Integration (SCI) acts as a mediator (given an impact or influence) as much as r = .2366 (23.66 %) in the relationship between Professional Human Resource (PHR) and Supply Chain Performance (SCP). Thus, hypothesis H4a failed to be accepted.

4.8.3.2 Supply Chain Integration (SCI) Mediates the relationship between Firm Infrastructure (FI) and Supply Chain Performance (SCP)

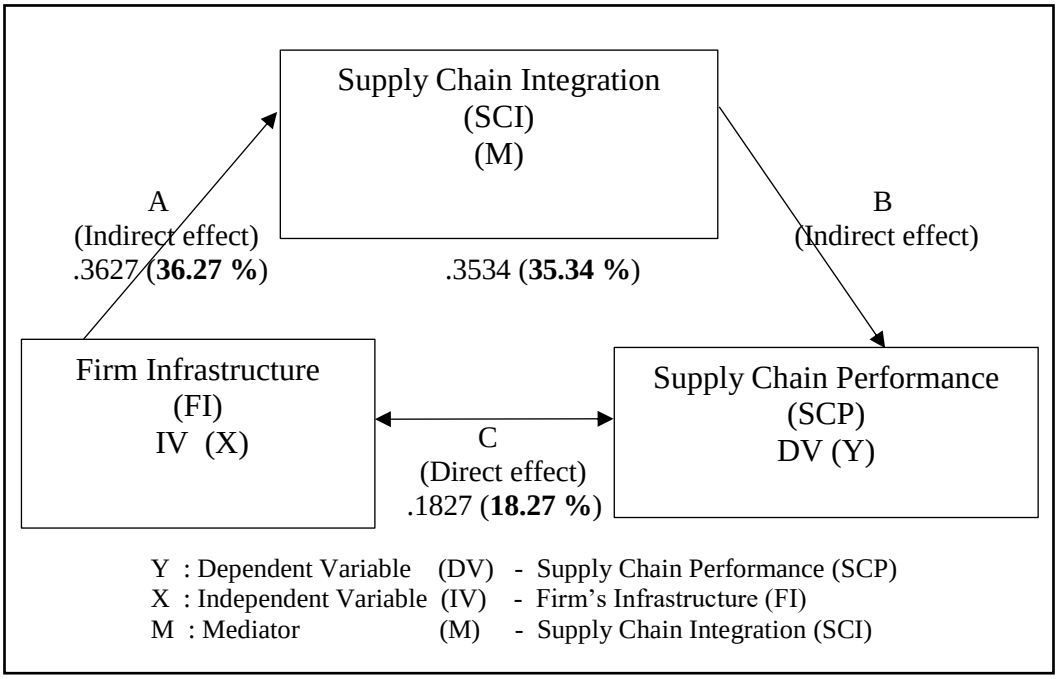

Figure 4.20 SCI Mediates the Relationship between FI and SCP

Table 4.34
SCI Mediates the Relationship between FI and SCP

Model Mediator	**Variable**	**Line**	**Effect**	**Coefficiant**	**P <0.05**	**Indirect effect(s) of X on Y**	**Total effect of X on Y**	**Effect size Mediator**
						Boot LLCI	BootULCI Direct effect of X on Y	Indirect effect(s) of X on Y
X	Firm's Infrastructure (FI)	A	Firm's Infrastructure (FI)	.4807	.0000	.2392	.4889	
Y	Supply Chain Performance (SCP)	C	Supply Chain Performance (SCP)	-.0093	.9061		.3534 P<.0007 (.3534 x 100 = 35.34%)	
M	Supply Chain Integration (SCI)	B	Supply Chain Integration (SCI)	.7547	.0000			.1827 P<.0000 (.1827 x 100 = 18.27%)
		a'b	Firm's Infrastructure (FI)' Supply Chain Performance (SCP)			.3627 (3627 x 100 = 36.27%)		

The table 4.34 above shows Supply Chain Integration (SCI) Mediates the relationship between Firm's Infrastructure (FI) and Supply Chain Performance (SCP). The results of the study show that the line 'a' above is the effect or influence of Firm's Infrastructure (FI) to Supply Chain Integration (SCI) (mediator). from the output above, the findings of the study show that the r value coefficient of line 'a' of the effect or influence of Firm's Infrastructure (FI) to Supply Chain Integration (SCI) (mediator) is as large as r = .4807 and significant at the p<.0000 level (p<0.05).

Line c' represents the impact or influence that is being exerted of Firm's Infrastructure (FI) to Supply Chain Performance (SCP) or a direct effect from X to Y. the value coefficient r of the effect or influence of Firm's Infrastructure (FI) to Supply Chain Performance (SCP) of line c is r = -.0093 and not significant at the p>.9061 level (p>0.05). With that it can be concluded that there is no effect or influence between Firm's Infrastructure (FI) to Supply Chain Performance (SCP).

Line b is the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) or a direct effect from M to Y. The value coefficient r of the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) line b is as large as r = .7547 and significant at the p<.0000 level (p<0.05). With that it can be concluded that there is an effect or influence between Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP).

Path a'b is an indirect effect or influence between the relationship between Firm's Infrastructure (FI) and Supply Chain Performance (SCP) to Supply Chain Integration (SCI). From the output above it can be seen that the indirect effect or influence is .3627 (.3627 x 100 = 36.27%), (Hair, Matthews, & Sarstedt. M., 2017).

Line c is the total effect of Firm's Infrastructure (FI) to Supply Chain Performance. Total effect can also be calculated by summing the direct effect or influence plus the indirect effect or influence, or the summation of line a + line (a*b). The size of the total effect coefficient is .3534 (.3534 x 100 = 35.34%) and is significant at the p<.0007 level (p<0.05).

Because line (a) line 'a' above is the effect or influence of Firm's Infrastructure (FI) to Supply Chain Integration (SCI) (mediator) is a = .4807 and significant at the p<.0000 level (p<0.05) and line (b) the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) is b = .7547 and significant at the p<.0000 (p<0.05) level, then by the guidance of Baron and Kenny (1986), it can be

concluded that Supply Chain Integration (SCI) Mediates the relationship between Firm's Infrastructure (FI) and Supply Chain Performance (SCP).

To see if there is an effect or influence of the mediator or not, it is necessary to look at the output in the indirect effect(s) of X on Y. There it is written indirect effect equal to .3627 (just like multiply the a*b line). The confidence interval (Confidence Interval / CI) from the bootstrap result* is written BootLLCI (lower level for CI) = .2392 and BootULCI (upper level for CI) = .4889*. If the range of BootLLCI and BootULCI does not include a zero value (0), then it can be concluded that there is a significant estimate and there is an effect or influence of a mediator (Supply Chain Integration (SCI) as a mediator). The effect size of Supply Chain Integration (SCI) as a mediator can be seen from the coefficient of completely standardized indirect effect (s) of X on Y which is .1827 (.1827 x 100 = 18.27%).

*(Bootstrapping is used to solve the problem of non-normality of data through resampling by assuming that the original sample represents the population. Bootstrapping allows researchers to assess the stability ‘’.,of parameters in the model)

*(Mediator with values of BootLLCI = .2392 and BootULCI = .4889 which means the perception of Supply Chain Integration (SCI) Mediates the relationship between Firm's Infrastructure (FI) and Supply Chain Performance (SCP).

From the results of the analysis above, the bootstrap unstandardized indirect effect value is .3627 (.3627 x 100 = 36.27 %), and the 95% confidence interval (CI) ranges from .2392 to .4889. Because zero is not included in the 95% confidence interval range, it can be concluded that there is a significant indirect effect or influence the relationship between Firm's Infrastructure (FI) and Supply Chain Performance (SCP through Supply Chain Integration (SCI) (mediator). Or with in other words, Supply Chain Integration (SCI) acts as a mediator (having an impact or influence) of r = .1827 (18.27%) in the relationship between Firm's Infrastructure (FI) and Supply Chain Performance (SCP). Thus, hypothesis H4b fails to be accepted.

4.8.3.3 Supply Chain Integration (SCI) Mediates the Relationship between Procurement Supplies Services (PRS) and Supply Chain Performance (SCP)

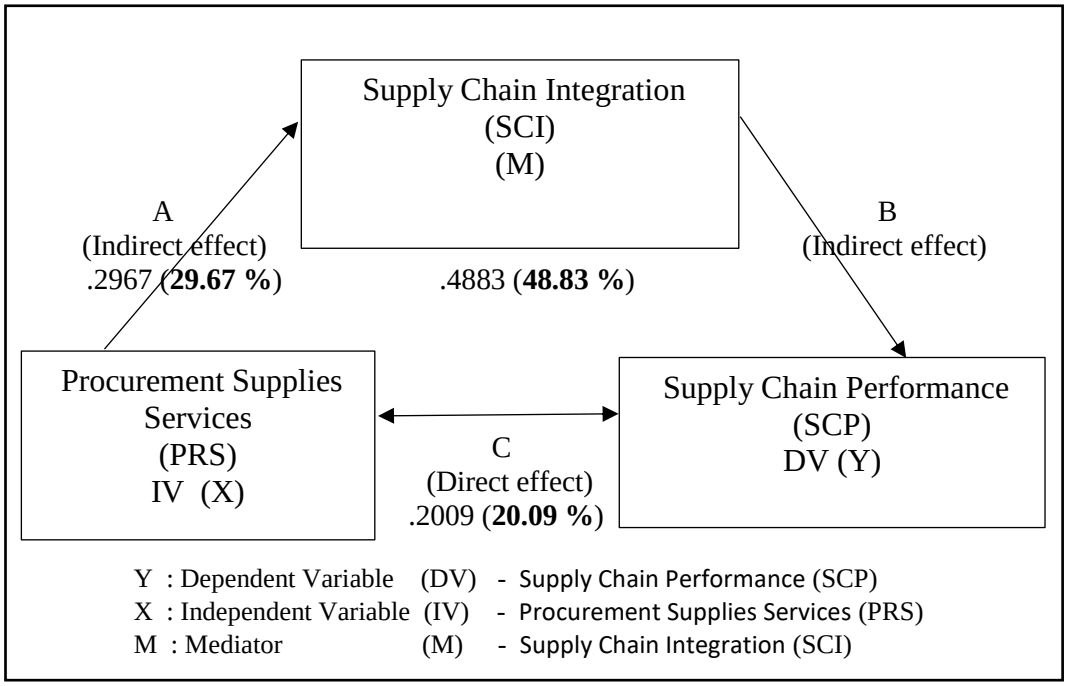

Figure 4.21 SCI Mediates the Relationship between PRS and SCP

Table 4.35
SCI Mediates the Relationship between PRS and SCP

Model Mediator	**Variable**	**Line**	**Effect**	**Coefficiant**	**P <0.05**	**Indirect effect(s) of X on Y**	**Total effect of X on Y**	**Effect size Mediator**
						Boot LLCI	BootULCI Direct effect of X on Y	Indirect effect(s) of X on Y
X	Procurement Supplies Services (PRS)	a	Procurement Supplies Services (PRS)	.5257	.0000	.1971	.4025	
Y	Supply Chain Performance (SCP)	c	Supply Chain Performance (SCP)	.1917	.0012		.4883 P<.0000 (.4883 x 100 = 48.83%)	
M	Supply Chain Integration (SCI)	b	Supply Chain Integration (SCI)	.7095	.0000			.2009 P<.0000 (.2009 x 100 = 20.09%)
		a'b	Procurement Supplies Services (PRS) Supply Chain Performance (SCP)			.2967 (.2697 x 100 = 29.67%)		

The table 4.35 above shows Supply Chain Integration (SCI) mediates the relationship between Procurement Supplies Services (PRS) and Supply Chain Performance (SCP). The results of the study show that the 'a' line above is the effect or influence of Procurement Supplies Services (PRS) to Supply Chain Integration (SCI) (mediator). from the output above, the findings of the study show that the r value coefficient of line 'a' of the effect or influence of Procurement Supplies Services (PRS) to Supply Chain Integration (SCI) (mediator) is r = .4181 and significant at the p<.0000 level (p <0.05).

Line c' represents the outcome or consequence resulting from the influence or effect being exerted of Procurement Supplies Services (PRS) on Supply Chain Performance (SCP) or a direct effect from X to Y. the value coefficient r of the effect or influence of Procurement Supplies Services (PRS) on Supply Chain Performance (SCP) line c is as large as r = .1917 and significant at the p<.0012 level (p<0.05). With that it can be concluded that there is an effect or influence between Supplies Services (PRS) to Supply Chain Performance (SCP).

Line b is the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) or a direct effect from M to Y. The value coefficient r of the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) line b is as large as r = .7095 and significant at the p<.0000 level (p<0.05). With that it can be concluded that there is an effect or influence between Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP).

Line a'b is an indirect effect or influence between the relationship between Supplies Services (PRS) and Supply Chain Performance (SCP) to Supply Chain Integration (SCI). From the output above it can be seen that the indirect effect is .2967 (.2967 x 100 = 29.67%), (Hair,Jr, Matthews, & Sarstedt. M., 2017).

Line c is the total effect of Procurement Supplies Services (PRS) to Supply Chain Performance (SCP). Total effect can also be calculated by summing the direct effect or influence plus the indirect effect or influence, or the summation of line a + line (a*b). The size of the total effect coefficient is .4883 (.4883 x 100 = 48.83%) and is significant at the p<.0000 level (p<0.05).

Because line 'a' above is the effect or influence of Procurement Supplies Services (PRS) to Supply Chain Integration (SCI) (mediator) is a = .4181 and significant at the p<.0000 (p<0.05) level and line (b) the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) is b = .7095 and

significant at the p<.0000 level (p<0.05), then by the guidance of Baron and Kenny (1986), can be concluded that Supply Chain Integration (SCI) Mediates the relationship between Procurement Supplies Services (PRS) and Supply Chain Performance (SCP).

To see if there is an effect or influence of the mediator or not, it is necessary to look at the output in the indirect effect(s) of X on Y. There is written an indirect effect of .2967 (if multiply the a*b line). The confidence interval (Confidence Interval / CI) from the bootstrap result* is written BootLLCI (lower level for CI) = .1971 and BootULCI (upper level for CI) = .4025*. If the range of BootLLCI and BootULCI does not include a zero value (0), then it can be concluded that there is a significant estimate and there is an effect or influence of a mediator (Supply Chain Integration (SCI) as a mediator). The effect size of Supply Chain Integration (SCI) as a mediator can be seen from the coefficient of completely standardized indirect effect (s) of X on Y which is .2009 (.2009 x 100 = 20.09%).

*(Bootstrapping is used to solve the problem of non-normality of data through resampling by assuming that the original sample represents the population. Bootstrapping allows researchers to assess the stability of parameters in the model)

*(Mediator with a value of BootLLCI = .1971 and BootULCI = .4025 which means the perception of Supply Chain Integration (SCI) Mediates the relationship between Procurement Supplies Services (PRS) and Supply Chain Performance (SCP)

From the results of the analysis above, the bootstrap unstandardized indirect effect value is .2967 (29.67 x 100 = 29.67%), and the 95% confidence interval (CI) ranges from .1971 to .4025. Because zero is not included in the 95% confidence interval range, it can be concluded that there is a significant indirect effect or influence on the relationship between Procurement Supplies Services (PRS) and Supply Chain Performance (SCP) through Supply Chain Integration (SCI) (mediator). Or in other words Supply Chain Integration (SCI) acts as a mediator (gives an impact or influence) as much as r = .2009 (20.09%) in between Procurement Supplies Services (PRS) and Supply Chain Performance (SCP). Thus, hypothesis H4c failed to be accepted.

4.8.3.4 Supply Chain Integration (SCI) Mediates the relationship between ICT Technology (ICT) and Supply Chain Performance (SCP)

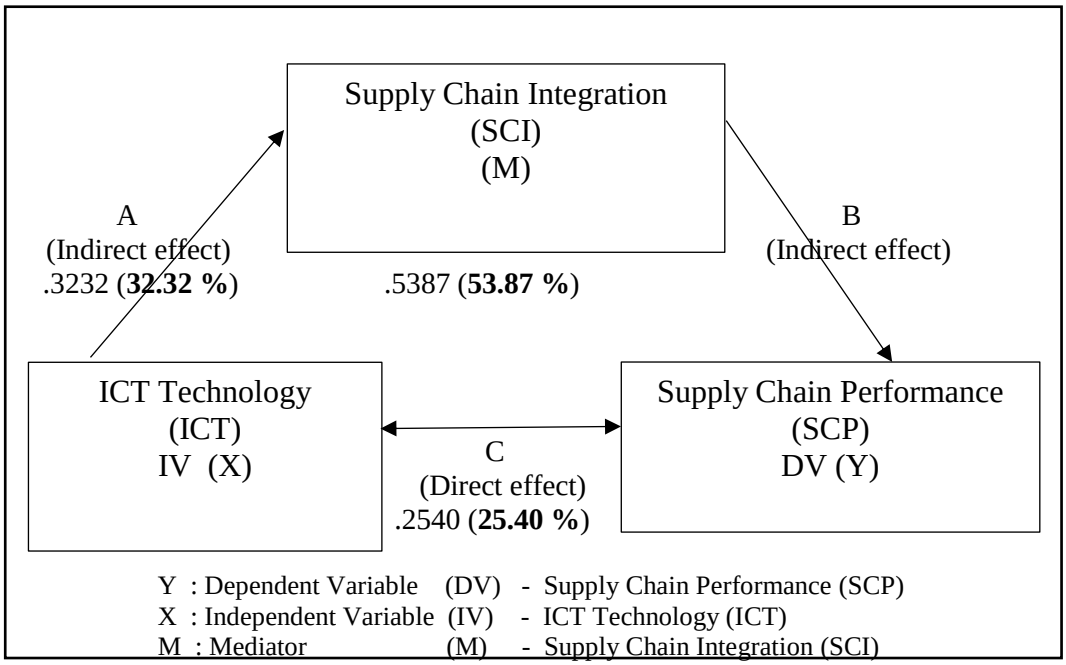

Figure 4.22 SCI Mediates the Relationship between ICT and SCP

Table 4.36
SCI Mediates the Relationship between ICT and SCP

Model Mediator	**Variable**	**Line**	**Effect**	**Coefficiant**	**P <0.05**	**Indirect effect(s) of X on Y**	**Total effect of X on Y**	**Effect size Mediator**
						Boot LLCI	BootULCI Direct effect of X on Y	Indirect effect(s) of X on Y
X	ICT Technology (ICT)	A	ICT Technology (ICT)	.4770	.0000	.2423	.4113	
Y	Supply Chain Performance (SCP)	C	Supply Chain Performance (SCP)	.2154	.0000		.5387 P<.0000 (.5387 x 100 = 53.87%)	
M	Supply Chain Integration (SCI)	B	Supply Chain Integration (SCI)	.6777	.0000			.2540 P<.0000 (.2540 x 100 = 25.40%)
		a'b	ICT Technology (ICT) ' Supply Chain Performance (SCP)			.3232 (.3232 x 100 = 32.32%)		

The following table 4.36 shows Supply Chain Integration (SCI) Mediates the relationship between ICT Technology (ICT) and Supply Chain Performance (SCP). The results of the study show that 'a' above is the effect or influence of ICT Technology (ICT) on Supply Chain Integration (SCI) (mediator). from the output above, the findings of the study show that the r value coefficient of line 'a' of the effect or influence of ICT Technology (ICT) to Supply Chain Integration (SCI) (mediator) is r = .4770 and significant at the p<.0000 level (p< 0.05).

Line c' denotes the impact or effect being generated of ICT Technology (ICT) on Supply Chain Performance (SCP) or a direct effect from X to Y. the value coefficient r of the effect or influence of ICT Technology (ICT) on Supply Chain Performance (SCP) of line c is r = .2154 and significant at the p<.0000 level (p<0.05). With that it can be concluded that there is an effect or influence between ICT Technology (ICT) to Supply Chain Performance (SCP).

Line b is the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) or a direct effect from M to Y. The value coefficient r of the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) line b is as large as r = .6777 and significant at the p<.0000 level (p<0.05). With that it can be concluded that there is an effect or influence between Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP).

Path a'b is an indirect effect or influence between the relationship of ICT Technology (ICT) with Supply Chain Performance (SCP) to Supply Chain Integration (SCI). From the output above it can be seen that the indirect effect or influence is .3232 (.3232 x 100 = 32.32%), (Hair,Jr, Matthews, & Sarstedt. M., 2017).

Line c is the total effect of ICT Technology (ICT) to Supply Chain Performance (SCP). Total effect can also be calculated by summing the direct effect or influence plus the indirect effect or influence, or the summation of line a + line (a*b). The size of the total effect coefficient is .4883 (.5387 x 100 = 53.87%) and is significant at the p<.0000 level (p<0.05). Because line 'a' above is the effect or influence of ICT Technology (ICT) to Supply Chain Integration (SCI) (mediator) is a = .4770 and significant at the p<.0000 level (p<0.05) and line (b) the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) is b = .6777 and significant at the p<.0000 (p<0.05) level, then by the guidance of Baron and Kenny (1986), it can be concluded that Supply Chain Integration (SCI) Mediates the relationship between ICT Technology (ICT) and Supply Chain Performance (SCP).

To see if there is an effect or influence of the mediator or not, it is necessary to look at the output in the indirect effect(s) of X on Y. There it is written indirect effect equal to .3232 (same as multiply the a*b line). The confidence interval (Confidence Interval / CI) from the bootstrap result* is written BootLLCI (lower level for CI) = .2423 and BootULCI (upper level for CI) = .4113*. If the range of BootLLCI and BootULCI does not include a zero value (0), then it can be concluded that there is a significant estimate and there is an effect or influence of a mediator (Supply Chain Integration (SCI) as a mediator). The effect size of Supply Chain Integration (SCI) as a mediator can be seen from the coefficient of completely standardized indirect effect (s) of X on Y which is .2540 (.2540 x 100 = 25.40%).

*(Bootstrapping is used to solve the problem of non-normality of data through resampling by assuming that the original sample represents the population. Bootstrapping allows researchers to assess the stability of parameters in the model)

*(Mediator with values of BootLLCI = .2423 and BootULCI = .4113 which means the perception of Supply Chain Integration (SCI) Mediates the relationship between ICT Technology (ICT) and Supply Chain Performance (SCP)

From the results of the analysis above, the bootstrap unstandardized indirect effect value is .3232 (.3232 x 100 = 32.32%), and the 95% confidence interval (CI) ranges from .2423 to .4113. Because zero is not included in the 95% confidence interval range, it can be concluded that there is a significant indirect effect or influence on the relationship between ICT Technology (ICT) and Supply Chain Performance (SCP) through Supply Chain Integration (SCI) (mediator). Or in other words Supply Chain Integration (SCI) acts as a mediator (gives an impact or influence) as much as r = .2540 (25.40%) between ICT Technology (ICT) and Supply Chain Performance (SCP). Thus, hypothesis H4d failed to be accepted.

4.8.3.5 Mediating Effect of Supply Chain Integration (SCI) on The Relationship Between VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) and Supply Chain Performance (SCP)

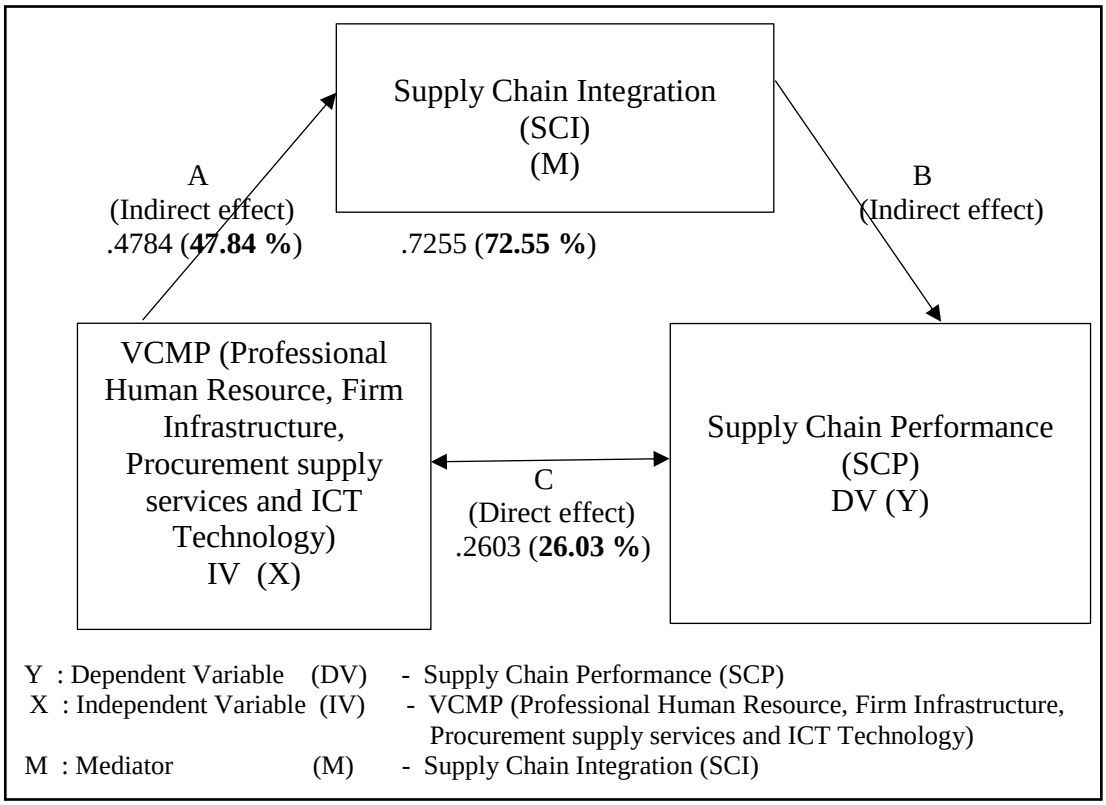

Figure 4.23 Mediating Effect of SCI on The Relationship between VCMP and SCP

Table 4.37
Mediating Effect of SCI on The Relationship between VCMP and SCP

Model Mediator	**Variable**	**Line**	**Effect**	**Coefficiant**	**P <0.05**	**Indirect effect(s) of X on Y**	**Total effect of X on Y**	**Effect size Mediator**
						Boot LLCI	BootULCI Direct effect of X on Y	Indirect effect(s) of X on Y
X	VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology)	a	VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology)	.6903	.0000	.3687	.5964	
Y	Supply Chain Performance (SCP)	c	Supply Chain Performance (SCP)	.2471	.0013		.7255 P<.0000 (.7255 x 100 = 72.55%)	
M	Supply Chain Integration (SCI)	b	Supply Chain Integration (SCI)	.6931	.0000			.2603 P<.0000 (.2603x 100 = 26.03%)
		a'b	VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) ' Supply Chain Performance (SCP)			.4784 (.4784 x 100 = 47.84%)		

The table 4.37 above shows the Mediating Effect of Supply Chain Integration (SCI) on The Relationship Between VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) and Supply Chain Performance (SCP). The results of the study show that 'a' above is the effect or influence of VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) to Supply Chain Integration (SCI) (mediator). from the output above, the findings of the study show that the r value coefficient of line 'a' of the effect or influence of VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) to Supply Chain Integration (SCI) (mediator) is r = .6903 and significant at the p<.0000 level (p<0.05).

Line c' signifies the effect or influence being exerted of VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) to Supply Chain Performance (SCP) or a direct effect from X to Y. The value coefficient r of the effect or influence of VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) to Supply Chain Performance (SCP) line c is as large as r = .2471 and significant at the p<.0013 level (p<0.05). With that it can be concluded that there is an effect or influence between VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) to Supply Chain Performance (SCP).

Line b is the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) or a direct effect from M to Y. The value coefficient r of the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) line b is as large as r =.6931 and significant at the p<.0000 level (p<0.05). With that it can be concluded that there is an effect or influence between Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP).

Path a'b is an indirect effect or influence between the VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) relationship with Supply Chain Performance (SCP) to Supply Chain Integration (SCI). From the output above it can be seen that the indirect effect is .4784 (.4784 x 100 = 47.84%), (Hair, Matthews & Sarstedt, 2017). Path c is the total effect of VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) to Supply Chain Performance (SCP). Total effect can also be calculated by summing the direct effect or influence plus the indirect effect or influence, or the summation of line a + line (a*b). The size of the total effect coefficient is .7255 (.7255 x 100 = 72.55%) and is significant at the p<.0000 level (p<0.05).

Because path 'a' above is the effect or influence of VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) to Supply Chain Integration (SCI) (mediator) is a r = .6903 and significant at p<. 0000 (p<0.05) and line (b) the effect or influence of Supply Chain Integration (SCI) (mediator) to Supply Chain Performance (SCP) is b r = .6931 and significant at the p<.0000 (p<0.05) level, then by guidance of Baron and Kenny (1986), it can be concluded that Supply Chain Integration (SCI) Mediates the relationship between VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) and Supply Chain Performance (SCP).

To see if there is an effect or influence of the mediator or not, it is necessary to look at the output in the indirect effect(s) section of X on Y. There is written an indirect effect of .4784 (same as multiply the a*b line). The confidence interval (Confidence Interval / CI) from the bootstrap result* is written BootLLCI (lower level for CI) = .3687 and BootULCI (upper level for CI) = .5964*. If the range of BootLLCI and BootULCI does not include a zero value (0), then it can be concluded that there is a significant estimate and there is an effect or influence of a mediator (Supply Chain Integration (SCI) as a mediator). The effect size of Supply Chain Integration (SCI) as a mediator can be seen from the coefficien ^{2} $R2$ of completely standardized indirect effect (s) of X on Y which is .2603 (.2603 x 100 = 26.03%).

*(Bootstrapping is used to solve the problem of non-normality of data through resampling by assuming that the original sample represents the population. Bootstrapping allows researchers to assess the stability of parameters in the model)

*(Mediator with values of BootLLCI = .3687 and BootULCI = .5964 which means the perception of Supply Chain Integration (SCI) Mediates the relationship between ICT Technology (ICT) and Supply Chain Performance (SCP)

From the results of the analysis above, the bootstrap unstandardized indirect effect value is .4784 (.4784 x 100 = 47.84%), and the 95% confidence interval (CI) ranges from .3687 to .5964. Because zero is not included in the 95% confidence interval range, it can be concluded that there is a significant indirect effect or influence on the relationship between VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) and Supply Chain Performance (SCP) through Supply Chain Integration (SCI) (mediator). Or in other words Supply Chain Integration (SCI) acts as a mediator (having an effect or influence) as much as r = .2603 (26.03%) between VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) and Supply Chain Performance (SCP). Thus, hypothesis H1 failed to be accepted.

4.8.3.6 Summary of Mediating Effect of Supply Chain Integration on The Relationship Between VCMP and Supply Chain Performance:

Table 4.38
Hypotheses Results Mediating Effect of SCI

Hypotheses	Statements	Results
H4	Supply chain integration positively mediates the relationship between value chain management practices and supply chain performance	Not Supported
$H4_a$	Supply chain integration positively mediates the relationship between professional human resource and supply chain performance	Not Supported
$H4_b$	Supply chain integration positively mediates the relationship between firm infrastructure and supply chain performance	Not Supported
$H4_c$	Supply chain integration positively mediates the relationship between procurement and supply chain performance	Not Supported
$H4_d$	Supply chain integration positively mediates the relationship between information and communication technology with supply chain performance.	Not Supported

4.9 Summary of Hypotheses Testing

The null hypothesis (Ho) is a hypothesis in the form of a negative rejection of the variables measured through significant values. The null hypothesis (Ho) exists in all inferential statistics related to correlation analysis, mean difference (such as: Independent sample t-Test, MANOVA and Multiple Regression (multiple regression). The following table 4.39 lists the null hypothesis test (Ho) based on the research question and statistical metrics.

If the results of the study show that the significance level obtained is greater than the significance level $P>0.05$, then Ho = failed to be rejected.

If the results of the study show that the significance level obtained is smaller than the significance level $P<0.05$, Ho = failed to be accepted.

Table 4.39
Alternative Hypothesis Test (H_o) Based on Statistical Metrics

No	Research objective	Result Hypothesis	Hypothesis Null
1	Supply Chain Integration (SCI) Mediates the relationship between Professional Human Resource (PHR) and Supply Chain Performance (SCP)	Supply Chain Integration (SCI) acts as a mediator (gives an impact or influence) as much as r = .2366 (23.66 %) in the relationship between Professional Human Resource (PHR) and Supply Chain Performance (SCP)	H4a failed to be accepted
2	Supply Chain Integration (SCI) Mediates the relationship between Firm's Infrastructure (FI) and Supply Chain Performance (SCP)	Supply Chain Integration (SCI) acts as a mediator (gives an impact or influence) as much as r = .1827 (18.27%) in the relationship between Firm's Infrastructure (FI) and Supply Chain Performance (SCP)	H4b failed to be accepted
3	Supply Chain Integration (SCI) Mediates the relationship between Procurement Supplies Services (PRS) and Supply Chain Performance (SCP)	Supply Chain Integration (SCI) acts as a mediator (gives an impact or influence) as much as r = .2009 (20.09%) in between Procurement Supplies Services (PRS) and Supply Chain Performance (SCP)	H4c failed to be accepted
4	Supply Chain Integration (SCI) Mediates the relationship between ICT Technology (ICT) and Supply Chain Performance (SCP)	Supply Chain Integration (SCI) acts as a mediator (gives an impact or influence) as much as r = .2540 (25.40%) between ICT Technology (ICT) and Supply	H4d failed to be accepted

		Chain Performance (SCP)	
5	Mediating Effect of Supply Chain Integration (SCI) on The Relationship Between VCMP (Professional Human Resource, Firm Infrastructure, Procurement supply services and ICT Technology) and Supply Chain Performance (SCP)	Supply Chain Integration (SCI) acts as a mediator (gives an impact or influence) as much as r = .2540 (25.40%) between ICT Technology (ICT) and Supply Chain Performance (SCP)	H4 failed to be accepted

In view of the various hypotheses proposed in this study, the results of the hypotheses testing are grouped in separate tables. For direct relationship hypotheses testing, it is only supported when the regression coefficient p-value is less than 0.05. For the mediating test, the hypotheses are also supported if the interaction effect produces regression coefficient with p-value of less than 0.05. Hence, the following table 4.40 is the summary of the hypotheses involving direct relationship between value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology) and supply chain performance.

Table 4.40
Hypothesis Results for VCMP on SCP

Hypothesis	Statements	Results
H1	Value chain management practices has a positive effect on supply chain performance.	Supported
Hl_a	Professional human resource has a positive effect on supply chain performance.	Supported
$H1_b$	Firm infrastructure has a positive effect on supply chain performance.	Not Supported
HI_c	Procurement has a positive effect on supply chain performance.	Not Supported
$H1_d$	Information communication technology has a positive effect on supply chain performance.	Supported

The table 4.41 below is the summary of the hypotheses involving direct relationship between supply chain integration and supply chain performance.

Table 4.41
Hypothesis Results for SCI on SCP

Hypothesis	Statements	Results
H2	Supply chain integration has a positive effect on supply chain performance.	Supported

The table 4.42 below is the summary of the hypotheses involving direct relationship between value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology) and supply chain integration.

Table 4.42
Hypothesis Results for VCMP on SCI

Hypothesis	Statements	Results
H3	Value chain management practices has a positive effect on supply chain integration.	Supported
$H3_a$	Professional human resource has a positive effect on supply chain integration.	Supported
$H3_b$	Firm infrastructure has a positive effect on supply chain integration.	Not Supported
$H3_c$	Procurement has a positive effect on supply chain integration.	Not Supported
$H3_d$	Information communication technology has a positive effect on supply chain integration.	Supported

The table 4.43 below is the summary of the hypotheses involving the mediating effect of supply chain integration on the relationship between value chain management practices (professional human resource, firm infrastructure, procurement and information communication technology) and supply chain performance.

Table 4.43
Hypothesis Results for SCI on VCMP and SCP

Hypotheses	Statements	Results
H4	Supply chain integration positively mediates the relationship between value chain management practices and supply chain performance	Not Supported
$H4_a$	Supply chain integration positively mediates the relationship between professional human resource and supply chain performance	Not Supported
$H4_b$	Supply chain integration positively mediates the relationship between firm infrastructure and supply chain performance	Not Supported
$H4_c$	Supply chain integration positively mediates the relationship between procurement and supply chain performance	Not Supported
$H4_d$	Supply chain integration positively mediates the relationship between information and communication technology with supply chain performance.	Not Supported

4.10 The Levels of Value Chain Management Practices, Supply Chain Performance and Supply Chain Integration

Table 4.44
Research Objective 1 and Research Question l

No	Research objective	Research question
1	To identify the level of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology), supply chain performance and supply chain integration among firms in manufacturing industry.	What is the level of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology), supply chain performance and supply chain integration among firms in manufacturing industry?

In order to answer the research question 1 related to the level, the following interpretation was made to measure the level of attitude towards statistics, subjective norms, notions of behavioural control, contextual factors, intentions and statistical concerns among university students. This is because the research data was collected through a questionnaire using 6 Likert scales, so it is considered very appropriate if the mean interval from the descriptive analysis is used to measure the 6 levels above. The mean value of the 6 Likert scale is divided into 6 points according to the level as shown in table 4.45 below.

Table 4.45
Mean of 6 Likert Scale Level Measurement

Min Interval	Level of Interpretasion
1.00 – 1.49	very low
1.50 – 2.49	Low
2.50 – 3.49	Average
3.50 – 4.49	above average
4.50 – 5.49	High
5.50 - 6.00	very high

Source: Tschannen-Moran and Gareis (2004)

4.10.1 The Levels of VCMP Professional Human Resource

Table 4.46 below shows the distribution of 360 employees in manufacturing firms from the Professional Human Resource aspect. The results of the study show that, 100 percent (360) with mean 5.26 agree that it is relatively easy for the company to obtain core technological talents, meanwhile 98.2 percent (354) with mean 5.21 agree that the company can obtain human resources from government, universities, and research institutes, followed by 98.0 percent (353) with mean 5.24 stated it is relatively easy for the company to retain professional technological talents. According to SHRM (2024), the ability to attract core technological talent is supported by an increasing focus on creative talent acquisition methods. In recent studies, it has been noted that while the competition for technological talent remains fierce, many companies find it easier to retain skilled professionals by focusing on specific retention strategies (The CEO Magazine, 2023). Companies today leverage technology, such as AI, to enhance recruitment processes, making it easier to identify and engage top talent. Many firms are shifting to skill-based hiring, broadening their talent pools, and ensuring they can meet specialized technological needs even in competitive labor markets.

Moreover, 97.7 percent (352) with mean 5.04 employees of manufacturing believe that it is relatively easy for the company to find talents with innovative capabilities, 94.4 percent (329) with mean 4.67 employees of manufacturing stated it is relatively easy for the company to find professional labor of various levels and lastly 91.6 percent (330) with mean 4.69 employees of manufacturing mentioned that it is relatively easy for the company to find technological personnel of sufficient experience. According to Schmidt et.al. (2014), innovative companies like Google and Apple offer employees "innovation time," where they can pursue personal projects, which helps to both attract and retain top talent. These organizations focus on creating environments that nurture creativity and provide opportunities for professional growth, making it easier for them to retain individuals with innovative capabilities (Bersin, 2020). The Average of the levels for professional human resource is 94.8 percent (341) with mean 4.96 which actually is at a high level.

Table 4.46
The Level of VCMP Professional Human Resource

No	Items	Scale						Sum	Mean	Sd	Level
		1	2	3	4	5	6				
3	It is relatively easy for the company to find technological personnel of sufficient experience.	0.8 (3)	1.4 (5)	6.1 (22)	32.2 (116)	38.6 (139)	20.8 (75)	**91.6 (330)**	**4.69**	**.969**	high
4	It is relatively easy for the company to find talents with innovative capabilities.			2.2 (8)	23.6 (85)	42.2 (152)	31.9 (115)	**97.7 (352)**	**5.04**	**.803**	high
5	It is relatively easy for the company to find professional labor of various levels.	0.3 (1)	0.3 (1)	8.1 (29)	31.1 (112)	46.9 (158)	16.4 (59)	**94.4 (329)**	**4.67**	**.873**	high
6	The company can obtain human resources from government, universities, and research institutes.	0.6 (2)	0.3 (1)	0.8 (3)	12.2 (44)	47.8 (172)	38.2 (138)	**98.2 (354)**	**5.21**	**.780**	high
7	It is relatively easy for the company to obtain core technological talent.				16.1 (58)	41.9 (151)	41.9 (151)	**100 (360)**	**5.26**	**.718**	high
8	It is relatively easy for the company to retain professional technological talents.	0.6 (2)		1.4 (5)	10.0 (36)	49.4 (178)	38.6 (139)	**98.0 (353)**	**5.24**	**.759**	high
							Average	**94.8 (341)**	**4.96**	**.738**	high

1.Extremely Dissatisfied, 2.Very Dissatisfied, 3.Somewhat Dissatisfied, 4.Somewhat Satisfied, 5.Very Satisfied, 6. Extremely Satisfied

4.10.2 The Levels of VCMP Firm's Infrastructure

Table 4.47 below shows the distribution of 360 employees of manufacturing from the aspect of the Firm's Infrastructure. The results of the study shows that 99.8 percent (359) with mean 5.26 employees of manufacturing stated that "our firms is well organized/structured efficient delivery of its product", followed by 98.6 percent (355) with mean 5.15 employees of manufacturing stated "Our firm to ensure the quality management to standardize supplier quality and performance metrics", and lastly 97.8 percent (352) with mean 5.34 employees of manufacturing mentioned "Our firms all premises owned or related by the organization are in proper state and usable as office facility for goods". According to Mckinsey (2021), by implementing well-structured processes and investing in technologies like AI and automation, firms not only ensure efficient product delivery but also enhance their overall operational effectiveness. This leads to higher customer satisfaction and competitive advantage in the marketplace (PwC, 2022). These technological investments lead to greater customer satisfaction and create a competitive edge in the marketplace. The Average of the levels of Firm's Infrastructure is 99.2 percent (357) with mean 5.20 which is the value is at a high level meaning that the firms have high customer satisfaction.

Table 4.47
The Level of VCMP Firm's Infrastructure

No	Items	Scale						Sum	Mean	Sd	Level
		1	2	3	4	5	6				
1	Our firm is well organized/structured efficient delivery of its products.			0.3 (1)	11.4 (41)	50.3 (181)	38.1 (137)	**99.8 (359)**	**5.26**	**.662**	high
3	All premises owned or related by the organization are in proper state and usable as office facility.		0.3 (1)	1.9 (7)	7.5 (27)	43.9 (158)	46.4 (167)	**97.8 (352)**	**5.34**	**.726**	high
5	Our firm ensure the quality management to standardize supplier quality and performance metrics.			1.4 (5)	15.8 (57)	49.2 (177)	33.6 (121)	**98.6 (355)**	**5.15**	**.727**	high
							Average	**99.2 (357)**	**5.20**	**.694**	high

1.Extremely Dissatisfied, 2.Very Dissatisfied, 3.Somewhat Dissatisfied, 4.Somewhat Satisfied, 5.Very Satisfied, 6. Extremely Satisfied

4.10.3 The Levels of VCMP Procurement & Supplies Services

Table 4.48 shows the distribution of 360 employees of manufacturing firms from the aspect of procurement and supplies services. The results of the study shows that 99.4 percent (358) with mean 5.18 employees of manufacturing stated that "My firm offers an effective plan by providing a framework to guide procurement officers in achievement of their tasks", as well as 97.8 percent (352) with mean 4.93 employees of manufacturing stated that firm planners can estimate the time required to complete the procurement process and award contract for each requirements, while 92.0 percent (331) with mean 4.84 employees of manufacturing stated that the firm ensure all the respondents affirmed the existence of a procurement committee as well as entity and evaluation committees, followed by 90.9 percent (327) with mean 4.83 employees of manufacturing stated that the firm ensures that stakeholders have the knowledge of procurement practice and lastly 87.0 percent (313) with mean 4.69 employees of manufacturing stated that the firm gives an effective plan ensures compliances with regulatory policies.

According to Cips (2023), companies can create structured frameworks to support procurement officers in efficiently managing their tasks, focusing on aligning procurement strategies with organizational goals and ensuring efficient task execution. Moreover, developing a structured acquisition plan is crucial, as it helps in estimating the time and resources needed for procurement tasks (Deloitte, 2022). This structured approach ensures that organizations can effectively manage their procurement activities and align them with their operational goals. The average levels of VCMP procurement and supplies services is 95.1 percent (342) with mean 5.01 which is at a high level meaning that most of the stakeholders have good knowledge of procurement practice.

Table 4.48
The Level of VCMP Procurement and Supplies Services

No	Items	Scale						Sum	Mean	Sd	Level
		1	2	3	4	5	6				
1	My firm provides a framework to guide, procurement officers in the achievement of their tasks.			0.6 (2)	10.0 (36)	60.3 (217)	29.2 (105)	**99.4 (358)**	**5.18**	**.618**	high
2	My firm ensures compliances with regulatory policies.		1.9 (7)	11.1 (40)	23.6 (85)	43.1 (155)	20.3 (73)	**87.0 (313)**	**4.69**	**.981**	high
3	My firm affirmed the existence of a procurement committee as well as entity and evaluation committees.		0.8 (3)	7.2 (26)	22.8 (82)	45.3 (163)	23.9 (86)	**92.0 (331)**	**4.84**	**.899**	high
4	My firm planners can estimate the time required completing the procurement process.			0.8 (22)	24.7 (89)	51.4 (185)	21.7 (78)	**97.8 (352)**	**4.93**	**.741**	high
5	My firm stakeholders have the knowledge of procurement practice.	0.3 (1)	0.6 (2)	8.3 (30)	21.4 (77)	45.6 (164)	23.9 (86)	**90.9 (327)**	**4.83**	**.924**	high
							Average	**95.1 (342)**	**5.01**	**.771**	high

1.Extremely Dissatisfied, 2.Very Dissatisfied, 3.Somewhat Dissatisfied, 4.Somewhat Satisfied, 5.Very Satisfied, 6. Extremely Satisfied

4.10.4 The Levels of VCMP Information and Communication Technology

Table 4.49 shows the distribution of 360 employees of manufacturing firms from the aspect of ICT Technology. The results of the study show that 97.7 percent (359) with mean 5.31 employees of manufacturing stated the firm's regularly make new enhancements/improvements to its existing services, likewise 95.3 percent (343) with mean 4.90 employees of manufacturing stated that the firm provides systems and services which are cost-effective, timely, secure and reusable, also 95.3 percent (343) with mean 4.90 employees of manufacturing stated that the firm explores and pursues opportunities of employing new techniques that meet the requirements and expectation of users, followed by 93.9 percent (338) with mean 4.84 employees of manufacturing stated that the firm provides leadership in facilitating technology-driven improvements, and proactive technology management, moreover 92.5 percent (333) with mean 4.87 employees of manufacturing stated that the firm continuously reengineers the business processes and modernizes its technology. Lastly 88.1 percent (317) with mean 4.63

employees of manufacturing stated that the firm ensures quality checks on all the software before release to internal and external users.

According to Yoon (2023), companies can achieve significant enhancements through structured approaches focused on small, incremental changes. This philosophy is rooted in the Kaizen principle, which advocates for continual refinement in processes and services, ultimately leading to higher quality and customer satisfaction. For example, companies like Toyota and Amazon are highlighted as models of continuous improvement, showcasing how systematic innovations and adjustments contribute to their operational success and competitive advantage. The Average of the levels of VCMP ICT Technology is 96.5 percent (351) with mean 5.10 which is at a high level.

Table 4.49
The Level of VCMP ICT Technology

No	Items	Scale						Sum	Mean	Sd	Level
		1	**2**	**3**	**4**	**5**	**6**				
1	My firm provides systems and services which are cost-effective, timely, secure, and reusable.			4.7 (17)	24.7 (89)	46.7 (168)	23.9 (86)	**95.3 (343)**	**4.90**	**.816**	high
2	My firm explores and pursues opportunities of employing new techniques that meet the requirements and expectation of users.	0.3 (8)	0.6 (2)	3.3 (12)	21.7 (78)	50.0 (180)	23.6 (85)	**95.3 (343)**	**4.90**	**.873**	high
3	My firm continuously re engineers the business processes and modernizes its technology.		1.1 (4)	6.4 (23)	20.3 (73)	48.6 (175)	23.6 (85)	**92.5 (333)**	**4.87**	**.883**	high
4	My firm provides leadership in facilitating technology improvements, and proactive technology management.		0.6 (2)	5.6 (20)	27.5 (99)	42.2 (152)	24.2 (87)	**93.9 (338)**	**4.84**	**.875**	high
5	My firm ensures quality checks on all the software before release to internal and external users.	0.6 (2)	1.7 (6)	9.7 (35)	30.8 (111)	36.7 (132)	20.6 (74)	**88.1 (317)**	**4.63**	**1.00**	high
6	My firm regularly make new improvements to its existing services.			0.3 (1)	13.1 (47)	42.5 (153)	44.2 (159)	**97.7 (359)**	**5.31**	**.701**	high
							Average	**96.5 (351)**	**5.10**	**.787**	high

1.Extremely Dissatisfied, 2.Very Dissatisfied, 3.Somewhat Dissatisfied, 4.Somewhat Satisfied, 5.Very Satisfied, 6. Extremely Satisfied

4.10.5 The Levels of Supply Chain Integration

Table 4.50 shows the distribution of 360 employees of manufacturing firms from the aspect of supply chain integration. The results of the study shows that 89.2 percent (321) with mean 4.86 employees of manufacturing stated that our firm extends its supply chain beyond its customers/suppliers, likewise 86.6 percent (314) with mean 4.60 employees of manufacturing stated that firms in our supply chain create a compatible communication and information system, while 86.4 percent (311) with mean 4.82 employees of manufacturing stated that firms in our supply chain establish more frequent contact with each other, and finally 85.0 percent (306) with mean 4.68 employees of manufacturing stated our firm participates in the marketing efforts of its customers. According to Mckinsey and Company (2022), extending the supply chain beyond immediate customers and suppliers is becoming increasingly essential for organizations aiming to enhance their operational efficiency and resilience. By incorporating additional stakeholders such as logistics providers, distributors, and even end-users into the supply chain network, firms can improve visibility, mitigate risks, and respond more effectively to market demands. The average of the levels of value supply chain integration is 85.7 percent (308) with mean 4.68 which is at a high level.

Table 4.50
The Level of Supply Chain Integration

No	Items	Scale						Sum	Mean	Sd	Level
		1	2	3	4	5	6				
1	Firms in our supply chain establish more frequent contact with each other.	0.8 (3)	1.9 (7)	10.8 (39)	21.1 (76)	31.7 (114)	33.6 (121)	**86.4 (311)**	**4.82**	**1.12**	high
2	Firms in our supply chain create a compatible communication and information system.	1.1 (4)	2.2 (8)	9.4 (34)	26.4 (97)	43.3 (156)	16.9 (61)	**86.6 (314)**	**4.60**	**1.01**	high
3	Our firm extends its supply chain beyond its customers/ suppliers.		3.1 (11)	7.8 (28)	19.2 (69)	40.0 (144)	30.0 (108)	**89.2 (321)**	**4.86**	**1.03**	high
4	Our firm participates in the marketing efforts of its customers.		5.8 (21)	9.2 (33)	20.8 (75)	39.2 (141)	25.0 (90)	**85.0 (306)**	**4.68**	**1.11**	high
							Average	**85.7 (308)**	**4.68**	**1.11**	high

1.Extremely Dissatisfied, 2.Very Dissatisfied, 3.Somewhat Dissatisfied, 4.Somewhat Satisfied, 5.Very Satisfied, 6. Extremely Satisfied

4.10.6 The Levels of Supply Chain Performance

Table 4.51 shows the distribution of 360 employees of manufacturing firms from the aspect of supply chain performance. The results of the study show that 88.3 percent (318) with mean 4.84 employees of manufacturing stated that the organization has achieved high customer satisfaction through supply chain, as well as 81.5 percent (293) with mean 4.31 employees of manufacturing stated that good supply chain reduces administration cost, followed by 81.1 percent (292) with mean 4.44 employee of manufacturing stated organization can attribute high return through effective supply chain process, 77.0 percent (277) with mean 4.36 employee of manufacturing stated good supply chain process reduces work redundancies, and lastly 71.6 percent (258) with mean 4.38 employee of manufacturing stated with organized information. For instance, companies that adopt a customer-driven supply chain strategy prioritize customer preferences and adapt quickly to changes, resulting in improved customer loyalty and increased market share (Agarwal, 2024). The average of the levels of supply chain performance is 84.7 percent (292) with mean 4.64 which is at a high level.

Table 4.51
The Level of Supply Chain Performance

No	Items	Scale						Sum	Mean	Sd	Level
		1		3	4	5	6				
1	My organization has achieved high customer satisfaction through supply chain.	1.1 (4)	3.1 (11)	7.5 (27)	20.8 (75)	34.2 (123)	33.3 (120)	**88.3 (318)**	**4.84**	**1.12**	high
2	With organized information, my organization has increased process transparency.	1.7 (6)	10.6 (39)	16.1 (58)	18.3 (66)	26.4 (95)	26.9 (97)	**71.6 (258)**	**4.38**	**1.39**	above average
4	Good supply chain process reduces work redundancies.	1.1 (4)	7.2 (26)	14.7 (53)	26.4 (95)	33.1 (119)	17.5 (63)	**77.0 (277)**	**4.36**	**1.20**	above average
5	Good supply chain reduces administration cost.	2.2 (8)	6.9 (25)	9.4 (34)	33.1 (119)	35.3 (127)	13.1 (47)	**81.5 (293)**	**4.31**	**1.16**	above average
6	My organization can attribute high return through effective supply chain process.	1.9 (7)	3.6 (13)	13.3 (104)	28.9 (104)	33.9 (122)	18.3 (66)	**81.1 (292)**	**4.44**	**1.15**	above average
							Average	**81.1 (305)**	**4.64**	**1.13**	high

1.Extremely Dissatisfied, 2.Very Dissatisfied, 3.Somewhat Dissatisfied, 4.Somewhat Satisfied, 5.Very Satisfied, 6. Extremely Satisfied

4.10.7 The Average Value Level of VCMP, SCI and SCP

Table 4.52 below shows the levels of value chain management practices, supply chain performance and supply chain integration. The results of the study shows that 99.2 percent (357) with mean 5.20 is in terms of the firm's infrastructure, while 96.5 percent (351) with mean 5.10 is in terms of ICT technology, while 95.1 percent (342) with mean 5.10 is in terms of procurement & supplies services, 94.8 percent (341) with mean 4.96 is in terms of professional human resources, 85.7 percent (308) with mean 4.68 is in terms of supply chain integration and finally 81.1 percent (305) with mean 4.64 is in terms of supply chain performance.

A study by Liu and Huo, (2023) highlights that effective supply chain integration can significantly impact performance metrics, including responsiveness, efficiency, and customer satisfaction. The findings suggest that organizations should focus on aligning their supply chain strategies with overall business goals to optimize performance. Research indicates that effective supply chain integration significantly impacts performance metrics, including responsiveness, efficiency, and customer satisfaction (Gembah, 2023). The six constructs measured in the study 'Value Chain Management Practices and Supply Chain Performance in Manufacturing Industry: The Mediating Role of Supply Chain Integration' shows a high level in overall.

Table 4.52
Average Value Level of VCM, SCI and SCP

No	Items	Sum	Mean	Sd	Level
1	Professional Human Resource	94.8 (341)	4.96	.738	high
2	Firm’s Infrastructure	99.2 (357)	5.20	.694	high
3	Procurement & Supplies Services	95.1 (342)	5.01	.771	high
4	ICT Technology	96.5 (351)	5.10	.787	high
5	Supply Chain Integration	85.7 (308)	4.68	1.11	high
6	Supply Chain Performance	81.1 (305)	4.64	1.13	high

4.11 Summary

This chapter examines the results and findings of this study through data analysis using descriptive analysis and inferential analysis (multivariate analysis). The first section describes the descriptive statistics including the demographic profile of the manufacturing firm respondents. The confirmatory factor analysis (CFA) was also performed, and the correlation analysis was also conducted between the factors extracted followed by measurement model. The measurement model includes detail clarification for confirmatory factor analysis (CFA), internal consistency reliability, convergent validity, indicator reliability, and discriminant validity.

Based on all the reliability and validity analysis of measurement scales using PLS, all remaining indicators as shown in Figure 4.14 were retained. The structural model analysis reveals that the all predictor constructs had no collinearity issues. Based on the results, on both direct and indirect effect, 7 out of the 16 hypotheses and sub-hypotheses were supported. In the multivariate analysis, before the study proceeds with the analysis using hierarchical regression technique, first the assumptions of multivariate analysis were assessed. This consisted of testing for multicollinearity, normality and linearity of the data.

The assumptions were fulfilled. There were no signs that the multivariate requirements were violated. Subsequently, multivariate analysis using hierarchical regression technique was used. The analysis basically examined the effects of the independent variables on the dependent variables. Specifically, Hypothesis 1 to Hypothesis 3d focused on the direct relationship between the variables and Hypothesis 4 to Hypothesis 4d focused on the mediating effect of supply chain integration. In addition, Hypothesis 3 to Hypothesis 3d was focused on the effect of independent variables on the mediating variable and Hypothesis 2 was focused on the effect of mediating variables on the dependent variables.

In testing all the proposed hypotheses, four steps were involved in the regression analysis: (1) Step 1 the mediator was regressed with independent variable, (2) Step 2 the dependent variable was regressed with independent variables, (3) Step 3 the dependent variables were regressed with mediating variable and (4) Step 4 dependent variable was regressed with independent variables entered together with mediator. This chapter concluded with the summary of proposed hypotheses.

Based on the result of this study, it can be concluded that the independent variables which are value chain management practices consisting of professional human resource, firm infrastructure, information communication technology and procurement are important in determining supply chain performance. To examine the inconsistency of the relationship between independent variable and dependent variable, supply chain integration was included as the mediating variable and the result showed that supply chain integration did not mediated the hypotheses directly on the relationship between value chain management practices (professional human resource, firm infrastructure, information communication technology and procurement) and supply chain performance.

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In the earlier reported findings, the hypotheses testing produced mixed results. three (3) out of five (5) hypotheses in regards of the direct relationship between value chain management practices (professional human resource, firm infrastructure, information and communication technology) and supply chain performance were supported. As for the results from the mediating effects of supply chain integration on the relationship between value chain management practices (professional human resource, firm infrastructure, information and communication technology) and supply chain performance, five (5) out of five (5) hypotheses were not supported. The 95% confidence level (p-value < 0.05) was used in rejecting all the null hypotheses due to the wide use of such convention among the scientific community.

In simpler terms, considering all the null hypotheses were supported, any difference observed would be obtained in less than 5% of studies due to random sampling error. The following discussion elaborates the results reported in Chapter 4, their relations to past studies and the explanation of the results. Followed by the research contributions which will also educate future researcher and readers on the study's contribution in terms of practical, theoretical and policy implication and contributions. Furthermore, it enlightens on what are the barriers and limitations of conducting this study. Lastly, this chapter will present the organization of thesis in detail to provide a clear view of the study.

This chapter summarizes the main points of the results and shows how they addressed the research questions. This chapter begins with a summary of the results and presents the findings in a brief manner. This study examined the influence of value chain management practices (i.e. professional human resource, firm infrastructure, information and communication technology) towards supply chain integration and supply chain performance in manufacturing firms in Malaysia.

5.2 Summary of Result of the Hypotheses

This study contributes to the existing body of knowledge by examining the relationship between value chain management practices, supply chain integration and supply chain performance among the firms in manufacturing industry of Malaysia. This study has its novelty in that it provides a holistic perspective of the critical factors that influence value chain management practices towards the supply chain integration and supply chain performance in this particular industry. The model used is based upon a unified framework combining six constructs that constitute the combination of comprehensive model (Shikumo, 2012; Cristos, 2016; Emmanuel, 2017; and Waseem, 2018) which were captured from the extensive literature review. This new combination framework represents a comprehensive value chain management practices which constitute several dimensions such as upstream and downstream sides of a supply chain.

Moreover, the model is interactive, multi-dimensional, and comprehensive to help strategic managers to understand the relationships between value chain management practices, supply chain integration and supply chain performance, which have received very little research attention to date. Thus, by combining the variables and testing them in a separate category singly, has allowed the researcher to generate a more accurate picture of the causal relationships between the variables. In order to close these gaps and verify certain issues of value chain management practices in manufacturing industry of Malaysia, the study suggested a few objectives.

5.2.1 Summary of Result of Hypothesis One

Hypothesis One (1), which indicates the relationship between dimensions of value chain management practices (independent variables) and supply chain performance (dependent variable). Hypothesis [1], Hypothesis [1a] and Hypothesis [1d] posit significant positive relationships between dimensions of value chain management practices and supply chain performance. In relation to the first dimension of the dependent variable (supply chain performance), only three dimensions of the value chain management practices: (1) value chain management practices, (2) professional human resource and (3) information and communication technology have significant relationship with supply chain performance.

The other two dimensions of the value chain management practices: (1) firm infrastructure and (2) procurement support supplies are not significantly related to supply chain performance.

5.2.2 Summary of Result of Hypothesis Two

Hypothesis Two (2), which indicates the relationship between dimensions of supply chain integration (mediating variables) and supply chain performance (dependent variable). Hypothesis [2] posit significant positive relationships between dimensions of supply chain integration and supply chain performance. In relation to the first dimension of the dependent variable (supply chain performance), the supply chain integration has significant relationship with supply chain performance.

5.2.3 Summary of Result of Hypothesis Three

Hypothesis Three (3), which indicates the relationship between dimensions of value chain management practices (independent variables) and supply chain integration (mediating variable). Hypothesis [3], Hypothesis [3a] and Hypothesis [3d] posit significant positive relationships between dimensions of value chain management practices and supply chain performance. In relation to the first dimension of the mediating variable (supply chain integration), only three dimensions of the value chain management practices: (1) value chain management practices, (2) professional human resource and (3) information and communication technology have significant relationship with supply chain integration. The other two dimensions of the value chain management practices: (1) firm infrastructure and (2) procurement support supplies are not significantly related to supply chain integration.

5.2.4 Summary of Result of Hypothesis Four

Hypothesis Four (4), which indicates the mediating effect of supply chain integration in the relationship between dimensions of value chain management practices (independent variables) and supply chain performance (dependent variable). This study hypothesized that supply chain integration has significant mediation effect in the relationship between value chain management practices and supply chain performance (Hypothesis 4). The results show that the Hypothesis 4 is fully not supported.

However, this study found that supply chain integration could not mediate any dimensions of supply chain management practices that are professional human resource, firm infrastructure, procurement support supplies and information & communication technology.

5.3 Readdressing the Research Question and Recapitulation of Main Findings

This section revisits research question or the objectives of study and provides answers with elaboration in accordance to the findings of the research. The four research questions are:

RQ1: What is the level of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology), supply chain performance and supply chain integration among firms in manufacturing industry?

RQ2: What is the extent of the influence of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) on supply chain performance among firms in manufacturing industry?

RQ3: What is the extent of the influence of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) on supply chain integration among firms in manufacturing industry?

RQ4: How does supply chain integration mediate the relationship between value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) and supply chain performance among firms in manufacturing industry?

In further discussion, this section will deliberate the findings in terms of the relationship between the dimensions of value chain management practices (that is professional human resource, firm infrastructure, procurement and information and communication technology), supply chain integration (mediating variable) and dimensions of supply chain performance (dependent variable). Further discussion is on the findings on the mediating effect of supply chain integration towards the relationship between value chain management practices and supply chain performance.

Overall, this current research has generally rendered conclusive and new evidence that contributes significantly to the existing body of knowledge to the literature on the importance of value chain management practices to supply chain integration and supply chain performance in the manufacturing industry in Malaysia. Despite the significant amount of research progress achieved in the field of supply chain management and value chain, the issues of value chain management practices, supply chain integration and supply chain performance in a single setting has seldom been addressed succinctly in the previous literature. By treating the potential impact of value chain management practices and supply chain integration on supply chain performance improvement in this study, important conclusive evidence emerged. The major findings of this study are as follows:

5.4 The Relationship between Value Chain Management Practices and Supply Chain Performance

Table 5.1
Research Objective 2 and Research Question 2

No	Research objective	Research question
2	To determine the influence of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) on supply chain performance among firms in manufacturing industry.	What is the extent of influence of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) on supply chain performance among firms in manufacturing industry?

In answering to the second research question, not all of the value chain management practices dimensions were found to be significant in predicting all the supply chain performance variables. As for the dependent variable which is supply chain performance, two (2) dimensions of value chain management practices which are professional human resource (β=0.143, p <0.01) and information communication technology (β=0.356, p <0.01) are significant.

For professional human resource towards supply chain performance, Guchait and Cho (2010) mentioned that the importance of human resource management (HRM) related to the area of operations as a new research theme. To ensure the success of their supply chain performance (SCP), firms need to commit themselves fully to promoting this human dimension. The result shows that professional human resource highly influence the value chain management practices on supply chain performance.

Supported by research that highlighted the role of PHR in improving coordination and collaboration across supply chain activities, which ultimately enhances operational efficiency and adaptability (Ghadge et al., 2020). Furthermore, by focusing on the human dimension of supply chains, firms can address the complexities of talent management, such as recruiting, training, and retaining professionals with specialized knowledge, which is crucial for achieving superior SCP (Ahmad & Schroeder, 2016). For instance, many firms focus their attention on improving and investing in technology and in infrastructure, but they need to dedicate the same attention to the people that manage and operate the supply chain (SC).

Meanwhile for information and communication technology, IT increases the effectiveness of organizational decision making and learning, and thus indirectly enhances firm performance (Liu, Wei & Hua, 2013). Some researchers argue that IT investments have mixed results because they are often applied ineffectively, hurting the organization's communication infrastructure (Sanders, 2008; Zhang & Van, 2016). However, IT sets a stage where a firm can generate a series of interaction patterns with its customers (Kim et al., 2011). In this case, the result shows that ICT also highly influence the value chain management practices on supply chain performance.

It was proven by the fact that ICT tools enhance internal communication and collaboration among employees. Platforms such as Microsoft Teams, and Zoom allow for real-time communication, leading to greater employee engagement and satisfaction. Research indicates that organizations leveraging effective communication technologies see higher retention rates and improved morale (Huang et al., 2020). Other than that, the COVID-19 pandemic has accelerated the adoption of remote work technologies, highlighting the critical role of ICT in supporting flexible work arrangements. Organizations that effectively implemented remote work solutions were better able to maintain productivity and employee satisfaction during challenging times (Choudhury et al., 2020).

Apart from that, the result shows that firm infrastructure not directly influence supply chain performance (SCP) because it may primarily encompass administrative activities like general management, finance, and legal support, which do not have immediate operational impacts on the supply chain. While infrastructure provides necessary organizational support, it does not directly interact with the supply chain's key functions such as procurement, production, and logistics, which are more directly responsible for SCP (Porter, 1985).

Instead, elements like supplier relationships, inventory management, and transportation systems have a more direct influence on supply chain outcomes (Deloitte, 2022). Moreover, the effectiveness of SCP is often more dependent on factors such as technology integration and the human workforce, rather than the structural or administrative aspects of the firm (Christopher, 2016).

Last but not least, the result shows that procurement may not directly influence supply chain performance (SCP) because it primarily focuses on the sourcing of materials and services, which is just one aspect of the entire supply chain. While procurement ensures the availability of raw materials, SCP depends more on the efficiency of logistics, inventory management, and coordination between various supply chain functions (Christopher, 2016). If other areas like transportation, warehousing, or production are not optimized, strong procurement practices alone may not improve overall performance (Li, Huo & Han, 2022). Moreover, Nasiri et. al. (2020) mentioned that procurement is often reactive to market conditions, whereas supply chain success depends on proactive strategies such as integration, responsiveness, and technology adoption.

5.5 The Relationship between Value Chain Management Practices and Supply Chain Integration

Table 5.2
Research Objective 3 and Research Question 3

No	Research objective	Research question
2	To determine the influence of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) on supply chain integration among firms in manufacturing industry.	What is the extent of influence of value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) on supply chain integration among firms in manufacturing industry?

In answering to the third research question, not all of the value chain management practices dimensions were found to be significant in predicting all the supply chain integration variables. As for the mediating variable which is supply chain integration, two (2) dimensions of value chain management practices which are professional human resource (β=0.174, p <0.01) and information communication technology (β=0. 178, p <0.01) are significant.

The result shows that professional human resources significantly influence supply chain integration (SCI) by ensuring that skilled employees are in place to manage and coordinate the complex interactions between suppliers, customers, and internal processes. According to Jenna and Ghadge (2021), effective HR practices, such as training, development, and fostering a collaborative culture, enable supply chain professionals to better align supply chain activities with organizational goals. Moreover, fostering a collaborative culture encourages teamwork among supply chain members, improving communication and efficiency (Dabral & Purohit, 2023). Studies highlight that organizations with a strong focus on HR are more likely to achieve higher levels of SCI, which leads to better performance outcomes, including efficiency, responsiveness, and innovation (Kembro et al., 2023).

Information and Communication Technology (ICT) plays a pivotal role in influencing supply chain integration (SCI) by enhancing communication, data sharing, and collaboration among supply chain partners (Kumar & Singh, 2022). The result shows that ICT does influence the supply chain integration by enabling real-time information flow and access to data, ICT fosters transparency and responsiveness, allowing organizations to synchronize their activities more effectively. This alignment not only optimizes inventory management and logistics but also strengthens relationships with suppliers and customers (Helo & Shankar, 2023).

Moreover, advanced ICT solutions such as cloud computing and IoT facilitate better decision-making and operational efficiency, leading to improved performance outcomes across the supply chain (Gunasekaran et al., 2020). The integration of these technologies enables firms to adapt swiftly to market changes and customer demands, ultimately driving competitive advantage in today's dynamic business environment. Firm infrastructure typically does not have a direct influence on supply chain integration (SCI) because integration relies more heavily on operational processes and relationships rather than organizational structure.

While a well-structured firm can provide the necessary support for integration, it is often the dynamic interactions between supply chain partners—such as effective communication and collaboration—that drive successful integration (Kumar & Singh, 2022). Elements such as supplier relationships, inventory management, and transportation systems play a more critical role in influencing SCI outcomes than the internal infrastructure of a firm (Tjahjono et al., 2021).

Furthermore, research indicates that integration is more about strategic alignment and operational synergy among supply chain participants rather than the characteristics of individual firms' infrastructures (Cai et al., 2022). Consequently, focusing on relationships and collaborative efforts is essential for achieving effective SCI rather than solely relying on firm infrastructure.

Procurement does not significantly influence supply chain integration (SCI) because it primarily focuses on the acquisition of goods and services rather than the collaborative processes required for effective integration across the supply chain. While procurement plays a crucial role in sourcing and purchasing, SCI relies more on the alignment and collaboration between different supply chain partners, such as suppliers and customers (Zhang et al., 2021). Moreover, effective SCI demands open communication and information sharing, which are often driven by relational dynamics and technology integration rather than procurement processes alone (Helo & Shankar, 2023). Consequently, organizations must prioritize building collaborative relationships and fostering communication among all supply chain participants to achieve effective integration, rather than focusing solely on procurement activities.

5.6 The Mediating Effect of Supply Chain Integration on the Relationship between Value Chain Management Practices and Supply Chain Performance

Table 5.3
Research Objective 4 and Research Question 4

No	Research objective	Research question
4	To investigate the mediating effect of supply chain integration on the relationship between value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) and supply chain performance among firms in manufacturing industry.	How does supply chain integration mediate the relationship between value chain management practices (professional human resource, firm infrastructure, procurement and information and communication technology) and supply chain performance among firms in manufacturing industry?

In answering to the last research question, all of the relationship of value chain management practices and supply chain performance were not significantly mediated by supply chain integration. As for the mediating variable which is supply chain integration, none of the four (4) dimensions of value chain management practices towards supply chain performance are significant.

The relationship between value chain management practices and supply chain performance may not be significantly mediated by supply chain integration due to the complex interplay of various factors that directly influence performance outcomes. While supply chain integration facilitates better coordination and collaboration among partners, it does not always translate into enhanced performance if value chain practices are not effectively implemented (Cai et al., 2022). Moreover, organizations may have robust integration frameworks yet lack the necessary strategic alignment or operational efficiencies required for optimal performance (Kembro et al., 2023).

Additionally, external factors such as market dynamics, customer expectations, and technological advancements can further dilute the mediating role of supply chain integration, suggesting that while it plays a supportive role, it is not a guaranteed pathway to improved performance outcomes (Kumar & Singh, 2022). Consequently, organizations must focus on optimizing both their value chain management practices and supply chain integration strategies independently to achieve superior performance.

The results indicate that the way value chain management practices and supply chain integration influence overall supply chain performance is not uniform across firms of different sizes. Specifically, micro and small enterprises (MSEs) typically operate with fewer financial and technological resources, less formalized systems, and weaker integration capacity than larger companies. In contrast, larger firms often have well-developed structures, more advanced processes, and greater ability to coordinate complex supply chain activities, which can lead to divergent performance outcomes when similar practices are implemented. Recent research highlights that firm size contributes to differences in how supply chain strategies are executed and the resulting effects on performance outcomes, with smaller firms displaying greater heterogeneity in responses to integration efforts compared to larger, more resource-endowed firms.

In smaller enterprises, improvements in supply chain outcomes tend to stem from simplified coordination mechanisms and the strengthening of core operational competencies, whereas larger firms benefit more from formal integration practices and structured resource deployment that support performance gains.

Prior studies suggest that supply chain strategies enhance performance in SMEs by improving internal capabilities, yet this effect may be constrained by limited absorptive capacity, a constraint that is less evident in larger firms possessing established resources and organizational depth. Consequently, organizational scale appears to act as a moderating factor, where MSEs emphasize adaptive and relational approaches, while larger firms leverage formalized integration and broad resource bases to optimise value chain outcomes. This variation suggests that future research should explicitly consider firm size as a contextual moderator in supply chain frameworks to better capture these differential effects.

However, the data analysis proves that even though supply chain integration as the mediator gives an impact of 25.40% in the relationship between value chain management practices and supply chain performance, the direct relationship between value chain management practices with supply chain integration and relationship between supply chain integration and supply chain performance is very high. This result marks that relationship of value chain management practices with supply chain performance without supply chain integration as the mediator is convincing enough.

Increasing the level of integration and sharing of information between the members of a supply chain has become a prerequisite for improving supply chain performance. Such organizational cooperative behaviours provide quick access to the information required, more concentration to customer needs, and faster time to market than competitors. Therefore, it proves that supply chain integration mediates the relationship between professional human resource, firm infrastructure and ICT towards supply chain performance. Past studies showed positive relationships between the level of supply chain integration and performance (e.g., Kim, 2006; Zailani and Rajagopal, 2015). By reducing costs and increasing market share, well-integrated supply chains create value for shareholders (Lee, 2010; Zhang, Liu & Wang, 2020).

5.7 Research Contributions

The contributions of this study are divided into three (3) categories; theoretical contribution, practical contribution, and policy contribution. Theoretical contribution relates to the methodological and hypothetical aspects of this research which will then be used to improve the current knowledge on supply chain. The second part discusses on the practical outcomes that are provided to mitigate the issues faced by manufacturing firms in Malaysia. Last but not least, policy contribution relates to policy implemented by Government to boost economy by help manufacturing industry improve their supply chain.

5.7.1 Theoretical Contributions

In essence, findings provide authentic support for the proposition that value chain management practices will has a more effectual influence on supply chain performance. Additionally, the study tried to adopt the theory of relational view which has relevance in supply chain research. Drawing from the results, it can therefore be put forward that the theory of relational view remains insufficient to ground alone some research within the supply chain literature. This study clarified the applicability of the resource-based-view theory (RBV). The result of this study might be helpful to better understand which dimensions of value chain management practices can be recognized to be translated into supply chain performance. The result of this study may trigger and allow others to conduct research on other dimensions, factors, or perhaps variables that would strengthen the relationship between value chain management practices, supply chain integration, and supply chain performance.

This research has combined several theories within the areas of value chain management practices, which also include the mediating effect of supply chain integration into one unified framework. The resource-based view theory served as a main theory that bonds the variables involved in this study. Importantly, this study further contributes to theory by demonstrating that the applicability of value chain management practices and supply chain integration is conditioned by firm size. Drawing from the findings, the resource-based view (RBV) appears more explanatory for larger firms with established resources and formalized integration mechanisms, whereas micro and small enterprises (MSEs) rely on more relational, flexible, and informal configurations of value chain practices.

This suggests that neither RBV nor the relational view alone is sufficient to fully explain supply chain performance across different organizational scales. By introducing firm size as a contextual boundary condition, this study extends existing supply chain theory beyond the implicit assumption of homogeneous firm structures. In addition, by combining the extended variables of supply chain management practices and testing them in a single setting, this would allow the study to generate a comprehensive framework of the relationships between the variables. Further, this study analyses the relationship between supply chain management practices, supply chain integration and supply chain performance in the electronics manufacturing industry.

Besides, the study establishes both theoretical and empirical argument not only to justify that this relationship exists, but also identified the mediating role played by supply chain integration. In terms of theoretical contribution, this study also extends previous research conducted in Western countries (Aloini et al, 2012; Mathiyazhagan et al., 2013; Pereira, Christopher & Silva, 2014; García, Gonzalez & Prado, 2014; Zhang & Kuo, 2021) and advances our understanding of the relationship between supply chain management practices and supply chain performance in a developing and Asian economy. Past studies on similar supply chain management practices (manufacturing context) in Asian countries have tended to study countries such as Singapore (Teo, Lin & Lai, 2009; Zangoueinezhad, Azar & Kazazi, 2011), Thailand (Vanichchinchai & Igel, 2011) and China (Zhao et al., 2007; Yang et al., 2020).

For instance, this study has integrated supply chain performance which discussed the influence of supply chain integration as the mediating variable. Therefore, this research was able to yield 5 hypotheses that investigate the chances of supply chain integration in mediating the relationship between value chain management practices and supply chain performance but none of them were empirically supported, suggesting that the effectiveness of supply chain integration as a mediating mechanism may vary depending on organizational scale and resource endowment. Moreover, the literature often presents inconsistencies regarding the role of supply chain integration (SCI) in mediating the relationship between value chain management practices and SCP. Some studies suggest that integration is a key driver of performance, while others argue that integration alone is insufficient to guarantee success without a well-aligned value chain (Zhang et al., 2021; Helo & Shankar, 2023). This suggests that both SCI and VCPs are necessary but not sufficient on their own to optimize performance outcomes.

The findings also address unanswered questions about the role of technology in SCP. While previous studies emphasized the importance of ICT and other technologies, they often lacked a clear framework for how these tools directly contribute to integration and performance. According to Kumar and Singh (2022), by demonstrating the positive effects of technologies like big data analytics on both value chain management and SCI, newer research could clarify the pathways through which technology impacts SCP. In conclusion, there are adequate empirical evidences that address the earlier research questions. Next, this study was able to empirically establish the link between value chain management practices and supply chain performance with supply chain integration as the mediating variable.

5.7.2 Practical Contributions

This research will likely aid practitioners and stakeholders of the industry by fostering a better understanding of the impact of value chain management practices toward its supply chain performance. The application of research findings of this study has significant implications for industry practices, as it provides a clear framework for improving operational efficiency and competitiveness. Studies show that when firms implement effective value chain management practices—such as supplier collaboration, logistics optimization, and technology integration—there are direct improvements in key supply chain performance metrics, including responsiveness, cost-efficiency, and customer satisfaction (Cai et al., 2022). Kumar and Singh (2022) have shown that industries such as manufacturing, retail, and technology have gained tangible benefits from aligning their value chain management practices with supply chain strategies.

The best practices derived from the study highlight several key areas for enhancing organizational processes and operational efficiency. One of the most significant findings is the importance of collaborative relationships with suppliers and partners, which can lead to improved efficiency and enhanced product quality. Helo and Shankar (2023) explain that firms that foster strong supplier relationships through joint planning, information sharing, and the integration of logistics processes can streamline their operations and respond more effectively to market changes. The application of value chain management practices to problem-solving and stakeholder benefits yields significant positive outcomes for both internal and external stakeholders.

Effective problem-solving in the value chain allows organizations to address operational inefficiencies and respond swiftly to supply chain disruptions. Gunasekaran et al (2020) and Zhang et al (2021) have found that firms adopting collaborative supply chain practices and advanced technological tools like big data analytics have improved their capacity to identify bottlenecks and streamline processes, leading to enhanced overall supply chain performance. Other than that, stakeholder benefits are closely tied to the organization's ability to create value throughout the supply chain. Cai et al (2022) mentioned that suppliers, customers, and employees benefit when firms optimize their value chain, leading to improved product quality, faster delivery times, and reduced costs. From a social impact perspective, companies that implement sustainable value chain practices would positively contribute to broader societal goals. Kumar and Singh (2022) stated that companies such as Unilever and Nestlé have been recognized for integrating sustainability into their supply chain, demonstrating that socially responsible value chains can drive both business success and positive societal outcomes.

Next, the long-term impact of value chain management practices on organizations is evident in the areas of sustainability, legacy, and future applications. First, sustainability is a key focus for organizations seeking to establish resilient and environmentally responsible supply chains (Kumar & Singh, 2022). In terms of legacy, organizations that adopt effective value chain management practices leave behind systems and frameworks that can continue delivering value long after implementation. Looking forward, future applications of value chain management practices are likely to be driven by advancements in technology, such as artificial intelligence and the Internet of Things (IoT). Wamba et al (2020) highlights that these technologies are expected to further enhance supply chain transparency, efficiency, and adaptability, allowing firms to respond quickly to market changes and disruptions.

Consequently, collaborative opportunities in value chain management, particularly in terms of partnerships and knowledge transfer, are essential for enhancing supply chain performance and driving innovation (Kembro et al., 2023). Additionally, knowledge transfer plays a critical role in maximizing the benefits of collaboration. For example, collaborative knowledge sharing between firms and suppliers can optimize production processes and improve demand forecasting (Helo & Shankar, 2023). Therefore, fostering collaborative partnerships and promoting knowledge transfer are key to creating a competitive advantage in value chain management.

These strategies help organizations adapt to changing market conditions, reduce operational risks, and create synergies that enhance overall supply chain performance. As such, these critical success factors will be identified as the key result area (KRA) to formulate key performance indicator (KPI) to measure the effectiveness and efficiency of the organizational resources and supply chain in total.

5.7.3 Policy Contributions

This study has benefitted to all practitioners, academician, researchers, policy makers, and government administration in Malaysia and globally. In this competitive market, an organization should be intelligent in utilizing the resources at hand and devising a plan to strive forward where all information at hand and with the coming of industry 4.0 that make it more challenging. An organization must be innovative in this era of technology which can be referring to supply chain innovation. This concepts of VCMPs such as professional human resource, firm infrastructure, information communication technology and procurement will be used to gain a great supply chain performance.

This study can have a profound impact on policy development within industries and government bodies, especially in relation to supply chain performance. As firms and regulators recognize the importance of efficient and sustainable value chains, policies are often adjusted or created to encourage best practices in areas like sustainability, transparency, and innovation. Kumar and Singh (2022) suggest that governments can create incentives for companies that adopt sustainable sourcing or environmental management practices, encouraging a more responsible approach to resource utilization and waste reduction.

The policy implementation strategies are also essential for ensuring that value chain management practices effectively translate into improved supply chain performance. To implement these policies, organizations typically focus on integrating regulatory requirements with their operational goals, fostering collaboration among stakeholders, and leveraging technological innovations. Seuring et al (2020) emphasize the importance of aligning internal processes with regulatory frameworks, requiring companies to translate policies into actionable strategies across the supply chain. This includes enforcing sustainable sourcing practices and ensuring compliance with labor and environmental standards.

As for the government, researcher should start embrace more the value chain management practices and integrate effort to promote supply chain performance among manufacturing industry in Malaysia. This study also can be an eye opener for the government and industry to help Malaysia's Education in promote more courses related to supply chain and logistics management to equip more professionals with the right supply chain knowledge, and to continuously embrace new technologies.

Other than that, evaluation and monitoring of policies are critical to ensure that policy objectives are met and that any adjustments can be made to optimize their impact on supply chain performance. This process involves regularly assessing whether the implemented policies are aligned with organizational goals and regulatory requirements, as well as measuring their effectiveness. Gunasekaran et al (2020) identify key indicators of successful policy implementation, including improvements in sustainability, operational efficiency, and compliance with legal standards.

Furthermore, stakeholder engagement is key to promoting social responsibility within the supply chain. By collaborating with non-governmental organizations (NGOs), governments, and local communities, businesses can develop policies that not only enhance performance but also contribute to broader social and environmental goals (Mitchell et al., 2022). Freeman et al (2020) highlight that these practices lead to sustainable development while also providing a competitive advantage through enhanced brand reputation and customer loyalty. Additionally, continuous dialogue between stakeholders fosters transparency for maintaining long-term relationships.

Lastly, a focus on sustainability fosters innovation and encourages companies to rethink their processes and product offerings. By investing in sustainable technologies and practices, firms can create new market opportunities and adapt to evolving consumer preferences, which increasingly demand eco-friendly and socially responsible products (Porter & Kramer, 2011). This proactive approach not only contributes to long-term business viability but also addresses broader societal issues such as climate change and resource depletion, aligning corporate strategies with global sustainability goals (Bocken et al., 2014). In terms of long-term impact, organizations that embed sustainability into their value chains are better equipped to navigate uncertainties and disruptions. Gunasekaran et al (2020) assert that strategic alignment with sustainability can lead to a more robust supply chain that not only supports the company's goals but also contributes positively to communities.

Therefore, sustainability is not merely a regulatory or ethical obligation; it is a strategic imperative that ensures long-term success and resilience in an increasingly complex global landscape. Thus, having a workforce with strong supply chain knowledge gives an added advantage to Malaysia, and it would enhance Malaysia's reputation as the most ideal supply chain hub. However, SCM is pivotal in leapfrogging Malaysia's logistics to become world class, faster, cost effective and better requirements are the ingredients to successful supply chain.

5.8 Limitations

This study has contributed to several insightful information regarding the relationship between value chain management practices and supply chain performance. The intervention of supply chain integration as the mediating variable of this study is significant to support at least two (2) hypotheses. However, similar to other empirical studies, this research indeed has its own boundaries. In view of this, it is very important to consider actions that could mitigate these limitations.

First and foremost, this study only focuses on three (3) state which are Klang Valley, Penang, and Johor. The result of this study might not be applied to other population outside the geographical location of this study. This research used cross-sectional study in which the data was collected within a period of three (3) months. The duration taken only provides a glimpse of the response of this study. Hence, the limitations of this study arise when the response by the respondents might be based on their level of readiness to answer the questionnaire at the point of data collection. Some scholars argue that the drawback of the cross-sectional study is that it is not comprehensive or detail enough as it measures the view of the customers only at certain time.

Secondly, this research was only limited in investigating the relationship between value chain management practices and supply chain integration without considering other factors that could contribute to supply chain performance such as marketing mix strategies, inventory management, or logistic function. While studying a single line industry allows for greater control over secondary factors, it is not without its disadvantages. Therefore, it would be most advisable to investigate differences between various industries.

This is because, using a single industry such as the manufacturing sector forming a single tier in the supply chain may allow a better specificity in describing the types of green practice activities taking place, but potentially limits generalizations. This research was conducted on only one industry which is manufacturing. Hence, the results of this study are only suitable to this industry. The results of this study might not be suitable to other industries such as fashion, tourism, and entertainment.

Thirdly, the data was start collected on September until December 2020, and during that time Malaysia were attacked by the pandemic Corona Virus (Covid19). Due to that, there are so many limitations to the researcher to get total respondents as much as the sample size. The targeted respondents are not approachable to distribute the questionnaire. Even though, researcher had to use only online medium to get the data and the respondents are not so cooperative in answer the questionnaire as expected.

Not only that, but the current study is also limited in the sense that data was gathered from single respondents within an organization. This could result in potential response bias, and as such all interpretation of the findings should be done carefully. Moreover, studies in the future should seek to obtain data from more than one party across a supply chain. In addition, the current study recorded responses at a fixed point in time and does not account for evolutions in trends or other changes. As such, the conclusions from this study are indefinite, and additional research could improve upon the range and inclusivity of the results

It is believed that this research has its own strong point. This study has emphasized the view of the manufacturing firms in Malaysia to identify suitable value chain management practices that could be implemented by the organizations to improve their supply chain performance. The result of this study is verb fled with evidence and explanation of the reason behind any phenomenon. In a nutshell, the outcome this of study equips the organizations with new insights on a supply chain which can be further ventured into any business operations or trading with other country.

5.9 Recommendations

Value chain management has become an essential aspect of modern business strategy, especially in the face of rapid technological advancements, global disruptions, and increasing pressure for sustainability. Effective supply chain management requires a well-integrated approach that leverages both internal and external resources, as well as advanced technological tools. To stay competitive and efficient, firms must focus on refining value chain management practices through collaboration, digital transformation, resilience-building, and data-driven decisions.

5.9.1 Recommendations for the Study

To build and provide better value chain management practices is a vital component in an organization's operation and achieve a supply chain performance. A well-applied of value chain management practices will assist the managers in ensuring that the organizations achieve sustained supply chain performance. One of the key factors of the effective supply chain performance is via gaining a lot of information on practices of value chain and supply chain integration are leveraged at different stages within the organization and the interrelationship between these stages (Christopher, 2016). This research combined the element of value chain management into better performance that contributes to the sustainability of the business.

The role of value chain management practices is critical in facilitating communication between organizations and their customers, enhancing the overall performance of the supply chain. This concept draws heavily from Li et al. (2016), who examined the operational dimensions of value chain practices, emphasizing the importance of internal and external integration in driving supply chain efficiency. These practices are rooted in the resource-based view (RBV) of the firm, originally proposed by Barney (1991), which posits that an organization's internal resources—if valuable, rare, inimitable, and non-substitutable—can provide a sustained competitive advantage.

The resource-based view (RBV) highlights the role of intangible resources, such as organizational knowledge and relationship management, which are essential in value chain practices for optimizing communication flows and ensuring that customer needs are aligned with organizational capabilities.

The focus on leveraging organizational resources for better supply chain performance has been supported by many studies, suggesting that superior resource management can create competitive advantages (Kang, Kim & Lee, 2021). Network theory, which gained prominence in the 1970s and 1980s, further supports the relationship between value chain management and supply chain performance. This theory highlights the importance of networks—both within the organization and externally with partners such as suppliers and customers. According to network theory, the strength of a firm's network ties affects the flow of information and resources, and therefore, its supply chain performance. Efficient communication channels and strong partnerships across the supply chain enable organizations to respond quickly to market changes and reduce inefficiencies, thus enhancing overall performance (BCG, 2023).

The theory of competition, particularly Porter's Five Forces Model, also explains the relationship between value chain management and supply chain performance. This theory underscores the idea that competitive advantage can be achieved through better management of supplier relationships, customer interactions, and the use of integrated supply chain practices. By managing these factors effectively, companies can reduce costs, improve product quality, and increase market responsiveness (APQC, 2023).

Lastly, transaction cost economics (TCE), introduced by Williamson (1981), is a theory that explores the costs associated with economic exchanges within the supply chain. TCE suggests that integrating supply chain activities—through both vertical and horizontal integration—reduces transaction costs, leading to improved supply chain performance. By minimizing the costs of coordination, communication, and negotiation with external partners, supply chain integration leads to greater efficiency and cost-effectiveness (Christopher, 2016).

These theoretical frameworks collectively provide a comprehensive understanding of how value chain management practices, when aligned with organizational resources, competitive strategy, and integration efforts, drive superior supply chain performance.

5.9.2 Recommendations for the Future Research

Since the result of this study showed that supply chain integration that acts as the mediating variable of this study is partially significant in strengthening the relationship between value chain management practices and supply chain performance, future research might want to consider other factors as mediating variables. To date, most of the organizations leverage on supply chain as the core metric to create competitive advantage. Future research may explore the model proposed in this study with other independent variables within the scope of supply chain and operation management. Including other variables may uncover hidden mechanisms that strengthen or weaken observed relationships.

Future research can also consider using the qualitative method to obtain the response from the respondents. Qualitative method is proven to provide certain justifications that are not addressed in the quantitative method, which can further be used to address the missing link of mediating variable in this study. This would certainly enhance or strengthen the relationship between value chain management practices and supply chain performance. Case studies, interviews, or focus groups can reveal practical challenges and organizational behaviors that quantitative surveys may not fully capture.

Future study could consider conducting the research in another sector such as agriculture or aviation industry to gauge their perception on supply chain especially when it comes to innovation. Another sector or other country might generate different outcomes pertaining to value chain management practices and supply chain performance. Lastly, this study was conducted in a very niche market of supply chain, which creates a limitation in generalizing the result to other industries. Therefore, future research should consider different sectors that examine the role of value chain management practices on supply chain performance such as agriculture, aviation, or tourism industry. This would allow for a verification of the findings especially on supply chain performance and help determine whether the relationships observed in Malaysian manufacturing firms hold in other organizational or cultural contexts.

Future research could also adopt a longitudinal approach to examine how value chain management practices and supply chain integration impact performance over time, providing insights into causal relationships and sustainability of improvements.

5.10 Conclusion

As product markets continue to change rapidly, it is very important to both marketing and managers to seize the opportunity to optimize the available resources to create a very comprehensive and reliable supply chain strategy. The role of value chain management practices in sustaining a business and position of the organization in the global marketplace requires an effective supply chain performance. Overall, the aim of this study is to gain valuable insight on value chain management practices, supply chain integration, and supply chain performance. This study demonstrates that even other sectors are now looking into the good supply chain system which make supply chain as an utmost important factor to be considered by any organization.

The contribution of this study is derived from the resource-based view theory which measures the value chain management practices, supply chain integration, and supply chain performance from the view of the firms, which creates a new perspective to the supply chain. The framework of this study has been successful in examining the relationships among value chain management practices, supply chain integration, and supply chain performance among manufacturing firms in Malaysia. Overall, the unique contributions of this study have significantly improved the concept of supply chain performance by value chain management practices. This study has also produced an understanding of how organizations should include external factors in their decision-making process.

This chapter has discussed all the research questions of this study, the implications which showcase the relevance of independent variables, dependent variables and mediating variable in the manufacturing industry. To sum up this research, supply chain is the secret weapon of most organizations. It is a fact that a great supply chain performance helps organizations to identify and recognize the products and services. Besides, a good supply chain management strategy allows the organizations to connect with customers and suppliers emotionally. In line with this, value chain management practices will assist the organizations to build trust with the target market, create brand loyalty among suppliers and most importantly, the organizations would be able to sustain better supply chain integration.

5.11 Summary

A more complete understanding of the value chain management practices and their relationships, through a logical structure, will help managers to better prioritize and target their resources in a more effective way to help the improvement of manufacturing firms supply chain performance. Other than that, manufacturers need to have a better relationship in order to communication and/or effective involvement with suppliers. This will enhance the development for a greater transition of the value chain initiative towards operational and environmental performance.

In summary, this study provides several understandings that extend the existing research on practices in value chain management. Nevertheless, research focusing on the influence of supply chain integration towards the supply chains performance in order to establish a better performance in manufacturing firm remains a relatively large still to be explore area. Furthermore, this study provided some unique insights on the influence of supply chain integration in mediating value chain management practice.

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APPENDICES

APPENDIX 1

QUESTIONNAIRE

VALUE CHAIN MANAGEMENT PRACTICES AND SUPPLY CHAIN PERFORMANCE IN MANUFACTURING INDUSTRY: THE MEDIATING ROLE OF SUPPLY CHAIN INTEGRATION

Dear respondents,

In order to fulfill the requirement of the Doctor of Philosophy (Business Management), I am conducting a survey on "Value Chain Management Practices and Supply Chain Performance in Manufacturing Industry: The Mediating Role of Supply Chain Integration". I am a postgraduate student of UiTM Shah Alam Selangor.

I am interested in your opinion about the professional human resource, infrastructure, procurement and ICT technology in your organization. I am also looking forward on your view about the supply chain integration and performance of your company. If you are unsure about how to answer the questions, please give the best answer you can. We rely on your sincere response as it is the main contribution for our research.

Your participation in this study is entirely voluntary and the information you provide is completely confidential. By completing this questionnaire, you are giving me permission to use the information you provide. Your time and effort are greatly appreciated.

Thank you for your time and cooperation.

Sincerely,

.....

NOOR ASLEENA ASNORDIN

(Postgraduate Student)

Endorsed by,

.....

PM DR. VEERA PANDIYAN KALIANI SUNDRAM

(Research Supervisor)

1

SOAL SELIDIK

AMALAN PENGURUSAN RANTAIAN NILAI DAN PRESTASI RANTAIAN BEKALAN DALAM INDUSTRI PEMBUATAN: PERANAN PENGANTARAAN INTEGRASI RANTAI BEKALAN

Responden yang dihormati,

Dalam usaha untuk memenuhi keperluan ijazah Doktor Falsafah (Pengurusan Perniagaan), saya sedang menjalankan kajian mengenai " Amalan Pengurusan Rantaian Nilai dan Prestasi Rantaian Bekalan dalam Industri Pembuatan: Peranan pengantaraan Peranan Integrasi Rantaian Bekalan ". Saya merupakan pelajar pascasiswazah di UiTM Shah Alam, Selangor.

Saya berminat dalam pandangan anda tentang sumber manusia profesional, infrastruktur firma, perolehan dan teknologi ICT dalam organisasi anda. Saya juga berharap pada pandangan anda mengenai integrasi rantaian bekalan dan prestasi syarikat anda. Sekiranya anda tidak pasti untuk menjawab soalan, sila berikan jawapan terbaik anda. Kami bergantung pada respon ikhlas anda kerana ini adalah sumbangan utama untuk penyelidikan kami.

Penyertaan anda dalam kajian ini adalah secara sukarela dan maklumat yang anda berikan adalah sulit. Dengan melengkapkan soal selidik ini, anda memberi saya kebenaran untuk menggunakan maklumat yang anda berikan. Masa dan usaha anda amatlah dihargai.

Terima kasih untuk masa dan kerjasama anda.

Yang benar,

.....

NOOR ASLEENA ASNORDIN

(Pelajar pascasiswazah)

Disahkan oleh,

.....

PM DR. VEERA PANDIYAN KALIANI SUNDRAM

(Penyelia penyelidikan)

Section A - Demographic / *Demografi*

Please tick (√) one answer for each question as follows.

Sila tandakan (√) satu jawapan bagi setiap soalan yang berikut.

1. Gender / *Jantina*

	Male / *Lelaki*
	Female / *Perempuan*

2. Age / *Umur*

	21 – 30 years / *tahun*
	31 – 40 years / *tahun*
	41 – 50 years / *tahun*
	51 – 60 years / *tahun*
	60 years and above / *tahun ke atas*

3. Ethnicity / *Etnik*

	Malay / *Melayu*
	Chinese / *Cina*
	Indian / *India*
	Others, state : / *Lain, nyatakan:*

4. Religion / *Agama*

	Islam / *Islam*
	Hindu / *Hindu*
	Buddha / *Buddha*
	Christian / *Kristian*
	Others, state : / *Lain, nyatakan:*

5. Highest Education / *Pendidikan Tertinggi*

	PMR/SPM
	Diploma / STPM
	Bachelor Degree / *Ijazah Sarjana Muda*
	Master / PHD / *Ijazah Sarjana / Ijazah Kedoktoran*

6. Position / *Jawatan*

	Support Staff / *Staf Sokongan*
	Middle Management / *Pengurusan Pertengahan*
	Top Management / *Pihak Atasan*

7. Employment Status / *Status Pekerjaan*

	Permanent employee / *Pekerja tetap*
	Contract basis / *Pekerja kontrak*

8. Location of Operation / *Lokasi Operasi*

	Penang
	Klang Valley / *Lembah Klang*
	Johor Bahru

9. Type of Business / *Jenis Perniagaan*

	Food, Beverages & Tobacco *Makanan & Tembakau*
	Textile, Wearing Apparel, Leather & Footwear *Tekstil, Pakaian, Kulit & Kasut*
	Wood, Furniture, Paper Products & Printing / *Kayu, Perabot, Produk Kertas & Percetakan*
	Petroleum, Chemical, Rubber & Plastic / *Petroleum, Kimia, Getah & Plastik*
	Non-Metalic Mineral Products, Basic Metal & Fabricated Metal Products / *Produk Mineral Bukan Logam, Logam Asas & Produk Logam Fabrikasi*
	Electrical & Electronics Products / *Produk Elektrik & Elektronik*
	Transport Equipment & Manufacturers / *Peralatan & Pengilang Pengangkutan*

10. Size of Company /

Saiz Syarikat

	< 50 employees / *pekerja*
	50 – 150 employees / *pekerja*
	151 – 250 employees / *pekerja*
	251 – 350 employees / *pekerja*
	351-450 employees / *pekerja*
	> 450 employees / *pekerja*

Section B – Professional Human Resource / *Sumber Manusia Profesional*

Please circle your level of satisfaction or dissatisfaction based on the 1 to 6 scale below.

Sila bulatkan tahap persetujuan atau tidak setuju anda berdasarkan skala 1 hingga 6 dibawah.

Extremely Dissatisfied *Amat tidak berpuas hati*	Very Dissatisfied Sangat tidak berpuas hati	Somewhat Dissatisfied *Agak tidak berpuas hati*	Somewhat Satisfied *Agak berpuas hati*	Very Satisfied *Sangat berpuas hati*	Extremely Satisfied *Amat berpuas hati*
1	2	3	4	5	6

PHR1	It is relatively easy for the company to have employees with educational levels above college. *Adalah agak mudah bagi syarikat untuk mempunyai pekerja dengan tahap pendidikan kolej ke atas.*	1	2	3	4	5	6
PHR2	It is relatively easy for the company to find R&D talents with educational level of master or doctor. *Adalah agak mudah bagi syarikat untuk mencari bakat R&D dengan tahap pendidikan ijazah sarjana atau ijazah doktor falsafah.*	1	2	3	4	5	6
PHR3	It is relatively easy for the company to find technological personnel of sufficient experience. *Adalah agak mudah bagi syarikat untuk mencari kakitangan teknologi yang mempunyai pengalaman yang mencukupi.*	1	2	3	4	5	6
PHR4	It is relatively easy for the company to find talents with innovative capabilities. *Adalah agak mudah bagi syarikat untuk mencari bakat dengan kemampuan inovatif.*	1	2	3	4	5	6
PHR5	It is relatively easy for the company to find professional labor of various levels. *Adalah agak mudah bagi syarikat untuk mencari tenaga kerja profesional dari pelbagai peringkat.*	1	2	3	4	5	6
PHR6	The company can obtain human resources from government, universities, and research institutes. *Syarikat boleh mendapatkan sumber manusia daripada kerajaan, universiti dan institusi penyelidikan.*	1	2	3	4	5	6
PHR7	It is relatively easy for the company to obtain core technological talents. *Adalah agak mudah bagi syarikat untuk memperoleh bakat teknologi teras.*	1	2	3	4	5	6
PHR8	It is relatively easy for the company to retain professional technological talents. *Adalah agak mudah bagi syarikat untuk mengekalkan bakat teknologi profesional.*	1	2	3	4	5	6

Section C – Firm's Infrastructure / *Infrastruktur Firma*

Please circle your level of agreement or disagreement based on the 1 to 6 scale below.

Sila bulatkan tahap persetujuan atau tidak setuju anda berdasarkan skala 1 hingga 6 dibawah.

Strongly Disagree *Amat tidak setuju*	Disagree Tidak setuju	Somewhat Dissagree *Agak tidak setuju*	Somewhat Agree *Agak setuju*	Agree *Sangat setuju*	Strongly Agree *Amat setuju*
1	2	3	4	5	6

FI1	Our firm is well organized efficient delivery of its products. *Syarikat kami menyediakan produknya dengan cekap dan tersusun.*	1	2	3	4	5	6
FI2	Our firm administration protects all the organization core business property, equipment and assets against any security alert. *Pentadbiran syarikat kami melindungi semua harta perniagaan organisasi teras, peralatan dan aset terhadap amaran keselamatan.*	1	2	3	4	5	6
FI3	All premises owned or related by the organization are in proper state and usable as office facility. *Semua premis yang dimiliki atau berkaitan dengan organisasi berada dalam keadaan baik dan boleh menjadi kemudahan pejabat.*	1	2	3	4	5	6
FI4	Our firm participates in the marketing efforts of its customer to maintain the desired level of excellence. *Syarikat kami mengambil bahagian dalam usaha pemasaran pelanggannya untuk mengekalkan tahap keunggulan diinginkan.*	1	2	3	4	5	6
FI5	Our firm ensure the quality management to standardize supplier quality and performance metrics. *Syarikat kami memastikan pengurusan kualiti untuk menyeragamkan metrik kualiti dan prestasi pembekal.*	1	2	3	4	5	6

Section D – Procurement & Supplies Services / *Perkhidmatan Perolehan & Bekalan*

PR1	My firm provides a framework to guide procurement officers in the achievement of their tasks. *Syarikat saya menyediakan kerangka kerja untuk membimbing pegawai perolehan dalam pelaksanaan tugas mereka.*	1	2	3	4	5	6
PR2	My firm ensures compliances with regulatory policies. *Syarikat saya memastikan pematuhan terhadap peraturan.*	1	2	3	4	5	6
PR3	My firm affirmed the existence of a procurement committee as well as entity and evaluation committees. *Syarikat saya mengesahkan adanya jawatankuasa perolehan serta jawatankuasa entiti dan penilaian.*	1	2	3	4	5	6
PR4	My firm planners can estimate the time required to completing the procurement process. *Perancang syarikat saya dapat menganggarkan masa yang diperlukan untuk menyelesaikan proses perolehan.*	1	2	3	4	5	6
PR5	My firm stakeholders have the knowledge of procurement practice. *Pihak berkepentingan firma saya mempunyai pengetahuan tentang amalan perolehan.*	1	2	3	4	5	6

Section E – ICT Technology / *Teknologi ICT*

Please circle your level of agreement or disagreement based on the 1 to 6 scale below.

Sila bulatkan tahap persetujuan atau tidak setuju anda berdasarkan skala 1 hingga 6 dibawah.

Strongly Disagree *Amat tidak setuju*	Disagree Tidak setuju	Somewhat Dissagree *Agak tidak setuju*	Somewhat Agree *Agak setuju*	Agree *Sangat setuju*	Strongly Agree *Amat setuju*
1	2	3	4	5	6

ICT1	My firm provides systems and services which are cost-effective, timely, secure, and reusable. *Firma saya menyediakan sistem dan perkhidmatan yang kos efektif, tepat pada masanya, selamat, dan boleh digunakan semula.*	1	2	3	4	5	6
ICT2	My firm explores and pursues opportunities of employing new techniques that meet the requirements and expectation of users. *Firma saya meneroka dan mengejar peluang untuk menggunakan teknik-teknik baru yang memenuhi keperluan dan jangkaan pengguna.*	1	2	3	4	5	6
ICT3	My firm continuously reengineers the business processes and modernizes its technology. *Syarikat saya terus menerus merancang semula proses perniagaan dan memodenkan teknologinya.*	1	2	3	4	5	6
ICT4	My firm provides leadership in facilitating technology-driven improvements, and proactive technology management. *Firma saya menyediakan kepimpinan dalam memudahkan penambahbaikan yang dipacu oleh teknologi, dan pengurusan teknologi proaktif.*	1	2	3	4	5	6
ICT5	My firm ensures quality checks on all the software before release to internal and external users. *Syarikat saya memastikan pemeriksaan kualiti pada semua perisian sebelum dilancarkan kepada pengguna dalaman dan luaran.*	1	2	3	4	5	6
ICT6	My firm regularly make new enhancements/improvements to its existing services. *Syarikat saya secara berkala membuat peningkatan / penambahbaikan baru terhadap perkhidmatan yang ada.*	1	2	3	4	5	6

Section F – Supply Chain Integration / *Integrasi Rantaian Bekalan*

Please circle your level of satisfaction or dissatisfaction based on the 1 to 6 scale below.

Sila bulatkan tahap persetujuan atau tidak setuju anda berdasarkan skala 1 hingga 6 dibawah.

Extremely Dissatisfied *Amat tidak berpuas hati*	Very Dissatisfied Sangat tidak berpuas hati	Somewhat Dissatisfied *Agak tidak berpuas hati*	Somewhat Satisfied *Agak berpuas hati*	Very Satisfied *Sangat berpuas hati*	Extremely Satisfied *Amat berpuas hati*
1	2	3	4	5	6

SCI1	Firms in our supply chain establish more frequent contact with each other. *Firma dalam rantaian bekalan kami mewujudkan hubungan yang lebih kerap dengan satu sama lain.*	1	2	3	4	5	6
SCI2	Firms in our supply chain create a compatible communication and information system. *Firma dalam rantaian bekalan kami mewujudkan sistem komunikasi dan maklumat yang serasi.*	1	2	3	4	5	6
SCI3	Our firm extends its supply chain beyond its customers/suppliers. *Syarikat kami meluaskan rantaian bekalannya melebihi pelanggan / pembekal.*	1	2	3	4	5	6
SCI4	Our firm participates in the marketing efforts of its customers. *Syarikat kami mengambil bahagian dalam usaha pemasaran pelanggannya.*	1	2	3	4	5	6
SCI5	Our firm participates in the sourcing decisions of its suppliers. *Syarikat kami mengambil bahagian dalam pengambilan keputusan pembekal.*	1	2	3	4	5	6

Section G – Supply Chain Performance / *Prestasi Rantaian Bekalan*

SCP1	My organization has achieved high customer satisfaction through supply chain. *Organisasi saya telah mencapai kepuasan pelanggan yang tinggi melalui rantaian bekalan.*	1	2	3	4	5	6
SCP2	With organized information, my organization has increased process transparency. *Dengan maklumat yang teratur, organisasi saya telah meningkatkan ketelusan proses.*	1	2	3	4	5	6
SCP3	With organized information in supply chain, it reduces errors in work process in my organization. *Dengan maklumat yang teratur dalam rantaian bekalan, ia dapat mengurangkan kesilapan dalam proses kerja di organisasi saya.*	1	2	3	4	5	6
SCP4	Good supply chain process reduces work redundancies. *Rantaian bekalan yang baik mengurangkan pemberhentian kerja.*	1	2	3	4	5	6
SCP5	Good supply chain reduces administration cost. *Rantaian bekalan yang baik mengurangkan kos pentadbiran.*	1	2	3	4	5	6
SCP6	My organization can attribute high return through effective supply chain process. *Organisasi saya dapat memberikan pulangan yang tinggi melalui proses rantaian bekalan yang berkesan.*	1	2	3	4	5	6

APPENDIX 2

Krejcie and Morgan Table (1970)

N	S	N	S	N	S	N	S	N	S
10	10	**100**	80	**280**	162	**800**	260	**2800**	338
15	14	**110**	86	**290**	165	**850**	265	**3000**	341
20	19	**120**	92	**300**	169	**900**	269	**3500**	346
25	24	**130**	97	**320**	175	**950**	274	**4000**	351
30	28	**140**	103	**340**	181	**1000**	278	**4500**	354
35	32	**150**	108	**360**	186	**1100**	285	**5000**	357
40	36	**160**	113	**380**	191	**1200**	291	**6000**	361
45	40	**170**	118	**400**	196	**1300**	297	**7000**	364
50	44	**180**	123	**420**	201	**1400**	302	**8000**	367
55	48	**190**	127	**440**	205	**1500**	306	**9000**	368
60	52	**200**	132	**460**	210	**1600**	310	**10000**	370
65	56	**210**	136	**480**	214	**1700**	313	**15000**	375
70	59	**220**	140	**500**	217	**1800**	317	**20000**	377
75	63	**230**	144	**550**	226	**1900**	320	**30000**	379
80	66	**240**	148	**600**	234	**2000**	322	**40000**	380
85	70	**250**	152	**650**	242	**2200**	327	**50000**	381
90	73	**260**	155	**700**	248	**2400**	331	**75000**	382
95	76	**270**	159	**750**	254	**2600**	335	**1000000**	384

Note: N is Population Size; S is Sample Size

Source: Krejcie & Morgan, 1970

AUTHOR'S PROFILE

Noor Asleena Binti Asnordin completed her Bachelor Degree in Human Resource Management at University Selangor Campus Shah Alam in 2017 with first class degree right after she completed her Sijil Tinggi Pelajaran Malaysia (STPM). She finished her Master in Human Resource Management at Universiti Teknologi MARA Shah Alam on July 2019 and supposed to be graduated on March 2020. She once completed her internship at Employees Provident Fund (EPF) Shah Alam branch in May 2017 until September 2017 and currently working as an Administration and Diplomatic Officer at Prime Minister's Office after she did her postgraduate diploma in public management for 10 months at The National Institute of Public Administration.

During her studies in UiTM, she was active with Postgraduate Students Association (PSA) and she was the treasurer for the society. She was also served as one of the UPTA (UiTM Postgraduate Teaching Assistant Scheme) at Faculty of Business and Management. She involved in activities such as Kejohanan Piala Dekan (KPD) Fakulti Perniagaan UiTM 2018 in singing contest and badminton tournaments, organizing Sports Day with PSA, Faculty's Team Building, academic tour and symposium at Universitas 17 Augustus Surabaya Indonesia on November 2019 and many more. She was also the member of Human Resource Club and the academic exco for that club when she was in Unisel Shah Alam.

LIST OF PUBLICATION:

AsleenaAsnordin, N., PandiyanKalianiISundram, V., & Noranee, S. (2021). The effect of information and communication technology and procurement towards supply chain integration. *Turkish Journal of Computer and Mathematics Education*, *12*(14), 1138-1147.

Asnordin, N. A., Sundram, V. P. K., & Noranee, S. (2020). The Influence of Professional Human Resource and Firm Infrastructure towards Supply Chain Performance. *International Journal of Academic Research in Business and Social Sciences*, *10*(12), 718-732.

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