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THE IMPACT OF INTERNET OF THINGS (IoT) ON SUPPLY CHAIN OF SMES IN KLANG VALLEY, MALAYSIA.

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Abstract

The Internet of Things (IoT) is a next generation of Internet connected devices embedded within information and communication technology (ICT) systems in a digitally-enabled environment. It supports supply chain process by capturing and transferring key information in real-time. Integrating emerging IoT in supply chain will impact in improving business supply chain performance and hence, firm growth. The study shows and suggests that SMEs developing IoT-enabled to supply chain will benefit in supply chain and business performance. This study reflects on the impact of IoT in Malaysian SMEs supply chain. There are 3 main objectives in successfully carrying out this research. The objectives were derived from the hypotheses that were created. The study is supported by the theories and conceptual framework listing all the independent and dependent variables was created to help test the hypothesis. The independent variables used to test the acceptance of IoT in supply chain performance through the integration of supplier integration, internal integration and customer integration.

The study was carried out in Klang Valley, Malaysia and an estimated total number of 265 respondents were surveyed by the use of a questionnaire. The data was analysed using the IBM SPSS software and results and discussions posted up. This report has 5 chapters which includes the summary of the findings and discussions of the data in detail. Based on the results obtained, all hypotheses were successfully tested and the objectives of the study were satisfied.

Acknowledgement

First and foremost, I would like to express my deepest appreciation to all those who provided me the possibility to complete this report. This project would be close to impossible to complete without the vast help of Mr Francis Wong. I would like to present my utmost and deepest gratitude towards him for his wise supervision and guidance throughout the entire project.

I would like to express my deepest thanks to my parents who in their own way were able to motivate, encourage and provide constructive suggestion to the end of the project despite them being thousands of miles away. I also owe my sincere appreciation to all my friends who supported me during this journey. Further, I'd like to show gratitude toward the staff at the Inti International University Library and Miss Farah from Faculty of business, communication and law, who were always ready and available to assist me and providing adequate information needed towards completing the report.

Lastly, I would like to thank all those who participated in the survey for genuinely answering the questions and taking their time in order for me to obtain reliable results.

Declaration

I hereby declare that this thesis is my own work and effort and that it has not been submitted anywhere for any award. Where other sources of information have been used, they have been duly acknowledged.

TABLE OF CONTENTS

List of Figures

List of Tables

Title: The impact of Internet of Things (IoT) on supply chain of SMEs in Klang Valley, Malaysia

List of Abbreviations

- IoT – Internet of Things
- SCM - Supply Chain Management
- SCI - Supply Chain Integration
- SME - Small and Medium Enterprises
- OC – Organization Capability
- RBV - Resources-Based View Theory

CHAPTER 1 INTRODUCTION

1.0 Background

In recent years, real competition is no longer between firms, but however it has been between firms supply chain, as firms have valued supply chain as a critical source of competition (Al-tarawneh and Al-Shourah, 2018). The supply chain management is going through transformation of driven development of innovation as digitization is happening all over the world, including business transformation of its management and operations (Agrawal and Narain, 2018). Through integration of technologies into the business, firms will enhance productivity while cutting costs and increase customer satisfaction from efficient supply chain management. Few years back, Digitalization of Industry 4.0 was seemed hard to achieve and unrealistic. Today, businesses have started implementing these technologies to enhance their process and compete in the markets. Internet of things (IoT) is the ninth component among industry 4.0 technologies which is applied in the industries for different purpose (Rose et al., 2016). Internet of things (IoT) is a form of internet communication that involves devices to prepare for any automation system. IoT is changing business operations methods to automation processes of smart technology. The IoT has a great potential contribution to supply chain management.

Supply chain management (SCM) is a system or function that requires movement of goods and services from the movement of raw materials to the area of consumption. It develops sustainable competitive advantages to meet customer demand and maximize customer value. It covers everything by integrating and coordinating activities in a business from product development to logistics. Supply chain management purposes is to enhance business overall performance and efficiency to reduce cost, improve quality and increase profit margins. SME businesses rely to remain competitive where the drive is to automate its processes to have efficiency and effectiveness to increase their value chain and connect with customers.

The study is to consider the competence of IoT in supply chain management to the business industry of SME to research on the efficient ways SME can benefit through integrating IoT with SCM in their business processes.

1.1 Problem Statement

According to Rubaneswaran (2017), Digitalization of Industry 4.0 is taking over globally and it has entered Malaysia at a fast rate. The transformation of technology will impact Malaysia's economy in which will replace labour of direct human engagement (Liu, Zhou and, 2015). SME's are 97% of Malaysia's businesses that contributes 36% of if the GDP and 65% of the employment (World Bank, 2016). As a result, SMEs are very important to Malaysia. IoT has the capability to fit itself rendering radically to SCM, despite of its advantages, yet there is a need for IoT adoption as it is still not widely adopted by Malaysian SME's. On the other hand, SMEs in Malaysia are mostly driven as factor through supply chain management. However, based on SME Corp (2019), Malaysian SMEs has worsened its performance in 2018 that have contributed its failures due to supply chain inefficiencies. Malaysian SMEs have shown a decline in growth in most of the years as (Figure 2 and 3), out of 13 years, 9 years Malaysian SMEs have shown a decline in its growth and recent has been in 2018 (SMECorp, 2018; Dosm, 2019). On the other hand, Malaysian SMEs failure is around 60% for the first 5 years as noted by Yusoff et al., (2018). According to Radzi, Nor and Ali, (2017) Malaysian SMEs has business performance issues form SC practices to provide SC performance. SCM has always presented a big challenge in SMEs by numerous factors such as decision making, order fulfilment of delivery, on-site real-time information, inventory management, automating processes and etc. (Phase and Mhetre, 2018). Nevertheless, there exist other challenges of improper handling of data, inefficient handling of stock, lack of visibility of assets, improper logistic management and ineffective supply chain risk management contribute to the challenges that businesses often face (Kothari, Jain and Venkteshwar, 2018). Many outside inefficiency factors contribute adversely to affect supply chain management.

Many businesses have not translated the benefit of IoT technology in their firms as they are not ready being utilised (Liu, Prajogo and Oke, 2016). Vass, Shee and Miah (2018) stated that, there are no enough studies on managerial aspects on IoT as a solution to improvise supply chain management. Therefore, this makes it challenging for Malaysian SMEs to make informed decisions on the adoption and implementation of IoT to business processes. A study by (Abdullah, Yaakub and Subhan, 2016) reveals that the causes of failures of Malaysian SMEs are due to effective supply chain management, logistics and high cost of distribution. The issues of Malaysian SMEs in supply chain management have led to decrease in flexibility for firm's competitive positioning, increase in supply chain cost, inventory shortages and poor customer service. Customer demands are highly sensitive from service to product quality, price and the desire of timely delivery. Having uncertainty in supply chain process makes it a big challenge, therefore unpredictable control factors affect timely fulfilment of orders causing traffic, inventory shortages and late deliveries. The biggest problem is the industry lacks coherent strategy to manage total supply chain sustainability to deliver fully automation workflow (Bag et al., 2018).

Malaysia SME's will have impact on the adoption of IoT in its business operational roles as digitalization has begun being widely embedded across assets, operations and inventories. No study is conducted to empirically assess the impact of emerging IoT adoption on supply chain management integration in Malaysia SME's. However, as a result of technological change, Malaysian economy will face difficulties as its industry is not ready (Rubaneswaran 2017). Never the less, there is a research gap on how Malaysian SMEs can adopt IoT in their business operations on supply chain management as shown in (Figure 1). This research aims to fill the gap on how Malaysian SMEs can adopt IoT in their business operations in supply chain management by exploring numerous advantages of IoT in SCM and contribute to literatures as reference of knowledge on operational supply chain performance. Hence, the study aims to examine the supply chain factors that will influence supply chain performance on SMEs in Malaysia.

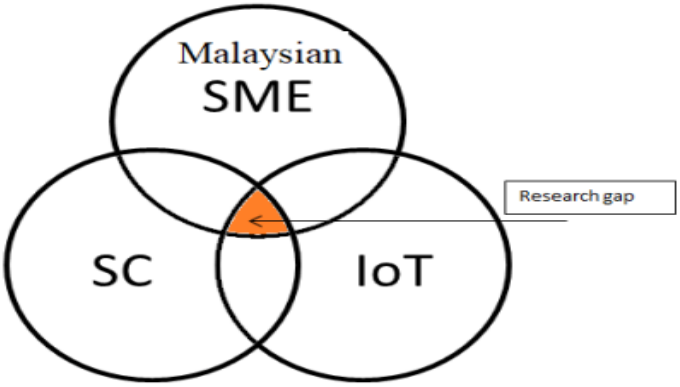


Figure 1: Research gap

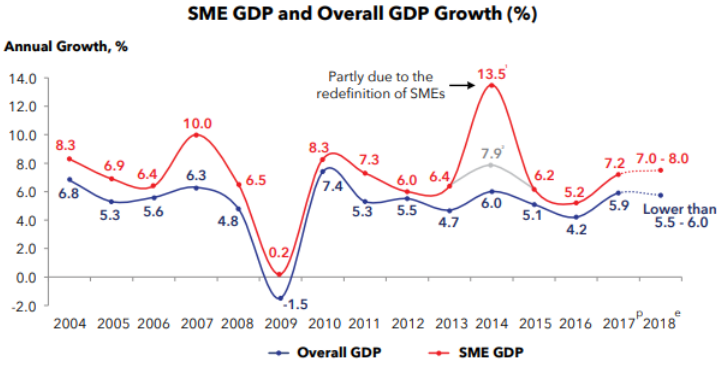


Figure 2: SMEs GDP Growth Source: (SMECorp, 2018)

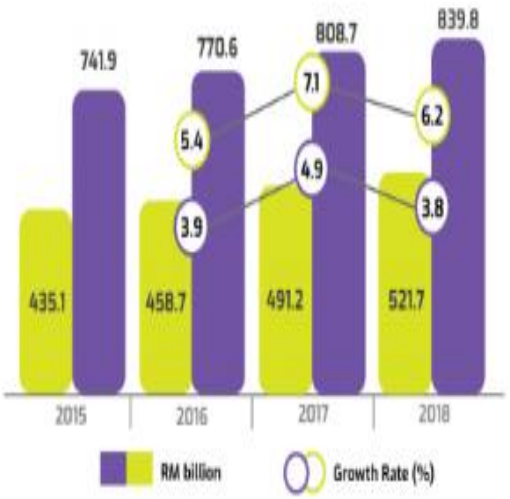


Figure 3: SMEs GDP Growth Source: (Dosm, 2019)

1.2 Research Objectives

1. There is a positive relationship between supplier integration and supply chain performance
2. There is a positive relationship between internal integration and supply chain performance
3. There is a positive relationship between customer integration and supply chain performance

1.3 Research Questions

1. Does supplier integration influence supply chain performance in Malaysian SMEs
2. Does internal integration influence supply chain performance in Malaysian SMEs
3. Does customer integration influence supply chain performance in Malaysian SMEs

1.4 Scope of Study

This study of the research will focus on Internet of Things (IoT) in SCM of Malaysia's SME's. The research of the study's geographical focus will be conducted in Kuala Lumpur and Negeri Sembilan, Malaysia in which the sample collection of the data will be from SME's. Small Medium Enterprises in Malaysia will be in use as the part of analysis target to the research. As for research methodology, quantitative method will be used to perform data analysis and interpretation through cross and descriptive statistical analysis in regards for the reader to understand the data interpreted.

1.5 Significance of Research

This research will be contributing to the literature, by expanding the supply chain model with IoT capabilities in the model of supply chain. The research will aim to integrate the three dimensions of supply chain model (supplier, internal and customer) with IoT to improve supply chain performance. The research will venture the context in Malaysia by testing the efficiency of how IoT technology will impact Malaysian SMEs supply chain to enable supply chain performance. Moreover, the research will combine two theories of organizational capability theory as the main theory and resource based theory to get more comprehensive research to achieve higher capabilities and objectives for higher performance improvements.

1.6 Research Methodology

This research study will use quantitative method of questionnaires via online surveys, as it is time saving to conduct the research analysis. Research questionnaires will be distributed through Google online survey to the targeted respondent in Malaysia. According to RAOSOFT, Malaysia's population is used as a stratified random in which the sampling size should have 385 questionnaires. The data will be collected through online survey of google forms as it will be easier to the participants and the researcher to conduct the study with minimal error. The participants of the survey will be Malaysian SME owners/entrepreneurs, supply chain and operation managers. The data will be analyzed by via IBM SPSS 22 in which the researcher is more accustomed with it and will be able to interpret in the means whereby the reader will be able to understand.

1.7 Limitation of the Study

There will be some limitation when conducting this research study just like any other research, however, there will be just few limitation. There will be time constraints, as there will be a limited time to conduct the study in a short period of time to obtain the total number of respondents. The research scope will be limited as we will be ignoring some of the other geographical areas within Malaysia due to outreach and accessibility to those parts. Some of the data from the participants will be void as the participant might not reflect valid answers

due to other reasons. The data analysis might not also be precise to justify the research findings due to not covering the total number of the target respondents of 385 questionnaires.

1.8 Ethical Consideration

Confidentiality will be assured from the researcher by making it clear to respondents that privacy and security will be perceived, as it is for research purpose only. The researcher will make sure that the questionnaire will be filled with the consent of the participant voluntarily and not by force. The researcher will make sure that the design questionnaires would not trigger and reflect any harmful effect to the participant and on the investigated business.

1.9 Organisations of chapters

Chapter 1: Introduction	Background and Problem Statement Research objectives and Research Questions
Chapter 2: Literature Review	Literature Review Hypothesis
Chapter 3: Research Methods	Research Methodology
Chapter 4: Data Analysis	Data collection and Analysis Rejection or acceptance of proposed hypothesis
Chapter 5: Discussion and Recommendations	Discussion of results Recommendations based on results Conclusion

Table 1*: Chapter outline and the key components for this research study*

Chapter 1

This chapter gives an overview of the entire research structure through providing a brief introduction of the study, followed by the problem statement, research objectives, questions and scope of the research. In addition, the significance of the study as well as the limitations pertaining to this research are also stated.

Chapter 2

The second chapter offers an in-depth review of literature for this research primarily from journal articles as well as analysing past studies conducted on the factors influencing franchise failures. Additionally, the theoretical framework model for the research will be examined.

Chapter 3

This chapter highlights the research methodology utilized to collect data so as to respond to the research questions and testing the hypothesis. This section also describes the research design, sample size, method as well as the research instrument that will be used to administer this study.

Chapter 4

This chapter involves analyzing the data collected using IBM SPSS v22, and the main findings for this study will be described. To analyse the research data and the proposed hypothesis, factor analysis, descriptive analysis, inferential analysis and reliability tests will be utilized.

Chapter 5

The final chapter of the research will discuss the results attained in Chapter 4 and according to those results, managerial recommendations for the study are provided. Besides, the study's academic and industrial contribution is then analysed. Lastly, this chapter concludes with the researcher's personal reflection and an overall conclusion of this research.

CHAPTER 2 LITERATURE REVIEW

2.0 Overview

This research has significant amount of research on the how internet of things will have an impact on supply chain management processes. The emphasis of this study will include the theories and concepts of Business Management of supply chain management, SC integration, Industry 4.0 of Internet of Things with its impact and the Research Framework.

2.1 Supply Chain Management

As defined by Ivanov, Tsipoulanidi, and Schönberger (2017) Supply chain management is a process of cross department and cross enterprise integration to distribute materials and information flows to be transformed and used as supply chain resources in an efficient way to the entire value chain as a process from attaining out raw materials from suppliers, transforming it to products and delivering to customers. Supported by Ayaviri, Estrada and Karina, (2017) it is the network in a process that involves the supply and distribution of goods and services from the supplier to the final consumer (customer) as shown in Fig 4. It includes all movement of raw materials from obtaining, storage, work in progress, transforming to finished and good to the point of consumption (Johnson, 2016). SC is an effective tool for gaining a competitive advantage which makes a greater contribution to business such as SMEs when considered its benefits and practices (Thoo et al., 2017). The major role in supply chain to firms, is it ensure efficient flow of goods, services and information so as to provide the right product at the right quantity, right quality, right cost, and right time at the right customers (Li and Li, 2017).

Supply chain management manages and oversees SC process to make sure it is operating as efficient as possible. McCarthy et al., (2016) mentioned that to achieve the objectives and common goal of the organization, the involved supply chain parties need to collaborate and coordinate together by extending their relationships so as they can form the supply chain.

These parties in the supply chain process includes the suppliers, manufacturers, warehouses, transporters, wholesalers, retailers, and customers. In an organization supply chain operations are managed and integrate their processes with various functional areas within the organisation and other organizations supply chain (Christopher, 2016). However, the supply chain design depends on the customer's needs and the roles of different units involved (Chopra and Meindl, 2016).

SME are obliged to manage the movement of materials in and out of their business more effectively (Ataseven and Nair, 2017). This makes companies and supply chain today compete as competitive advantages on the fundamentals of time and quality. Today, companies who deliver with no delay a free-defected product to customers is no longer a competitive advantage but however it is a requirement in the market (Turkulainen et al., 2017). Customers are demanding products with no damage, to be delivered fast and on time. Therefore, to be achieved these factors require a closer coordination and relationship with all participants of the SC.

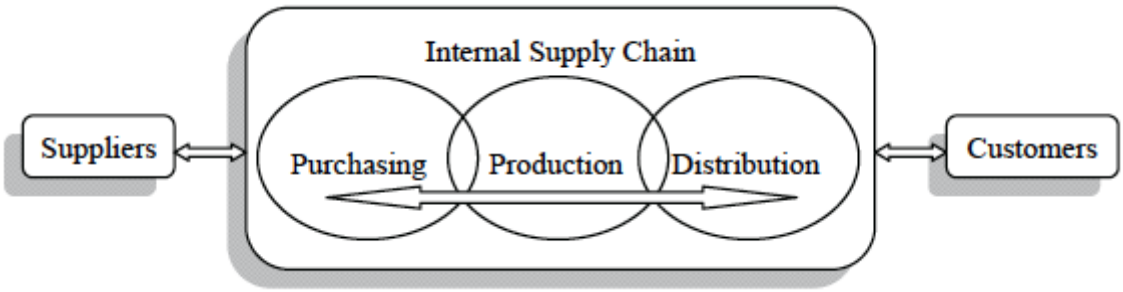


Figure 4: A business supply chain model Source: (Chen and Paulraj, 2004)

2.2 Supply Chain Integration

The objective of SCM is to integrate business processes within an organizations SC (Pakurár et al., 2019). The business processes are the tasks and functions that execute the business goals to meet a business outcome (Brocke and Rosemann, 2015). SCI is a strategy that works to align and coordinate SC relationships to improve SC processes through sharing information (Ataseven and Nair, 2017). According to Vanpoucke et al. (2017) SCI is said to have significant impact on SC performance of a business. Integration is an element of a business internal and external operations aimed to cultivate supply chain efficiencies (Krishnapriya and Baral, 2014).

SCI acts as a collaborative inter business management of strategic and operational levels of activities within a business in which corresponds to material and information flows that starts from suppliers to the final consumer (Turkulainen et al., 2017). Ataseven and Nair, (2017) stated that this model examines the delivery of effectiveness and efficiency that can be achieved across the supply chain to enhance SC performance. The main goal of the integration is to coordinate the SC activities to bring out effective in the SC process and achieve cost efficiency while creating value for the customer (Chang et al., 2016). According to Huo, (2015) the SCI is divided two components of internal and external integration, further by external integration is allocated into two parts of customer integration and supplier integration as shown in Fig 4.

Internal integration is cross functional processes within the organization that coordinate and act as function to achieve greater SC performance, while external integration is the process integration of managing suppliers and customers (Yu, 2015). These integrations facilitate real-time information sharing within the SC to enhance performance as per business operations (Ciccullo et al., 2018).

2.3 Internet of Things

Internet of Things is a system of communication technology that interconnects physical objects to initiate action for planning, management and decision making (Patel and Patel, 2016). It is the ability of network devices which purpose is to interact and communicate by sharing the data with machines, objects, people, products, environments and infrastructures (Sharma and Tiwari, 2018). IoT connects devices to the internet, it enables huge amount of data from many places to be collected and create visibility across operations (Vass, Shee and Miah., 2018). It allows information to be sent and received remotely and mobile with less human involvement (Asghar, Kumar and Patra 2015). It has the accessibility to act as sensor on an environment by collecting real time data and sent to the programmed location (Mohandas and Aravindhar 2017).

According to Shafique (2018), IoT is the next wave of ICT in which shares information on real time basis. However based on Borgia (2014), IoT is viewed as the same as ICT due to sharing information on real time basis. The infrastructure of IoT is based is based on a wide range of technologies such as radio frequency identification (RFID), Bluetooth, Sensors, Wi-Fi and cloud computing(Mostafa, 2019). The integration of the emerging digitization of IoT into existing ICT systems can be considered distinctive due to the autonomous, intelligence and extensive applications (Vass, Shee and Miah, 2018).Mohammed and Ahmed, (2017) stated that IoT enables companies with tasks scheduling, predictive maintenance and data concurrency from the use of dynamic priority scheduling algorithm. IoT facilitates autonomous exchange of useful information with embedded different technologies of smart devices with a real-time look (Farooq et al., 2015). IoT is a pick up steam to businesses by automating their processes, offering transparency, reduce costs, improves service delivery and reduces waste (Kim, 2017).

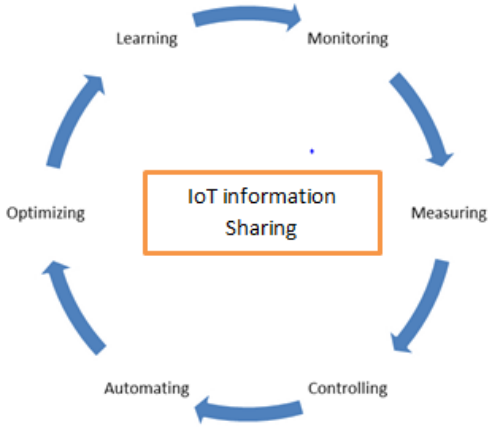


Figure 5: IoT Information sharing process in an organization

2.4 Organisational capability theory

Organization capability theory is the perspective on the company's ability to manage resources (Prajogo et al., 2016). This theory directly or indirectly affects business capacity to gain performance outcomes and creates value that gives competitive advantages. OC explains integration as a process capability in which affects a business performance of internal and external capabilities, internal capabilities is internal communication and process integration, whereas an external capability is the external communication and linkage between partners such as suppliers and customers (Huo, 2015). A business organizational capability should always have the ability to meet customer demand. SC capability obliges a business to integrate its flows of information and materials with its internal and external capabilities (Narasalagi and Shivashankar, 2015).

IoT as a resource does not have the capacity by itself to enhance an organization performance (Reyna et al., 2018). However, with a merged process of business processes and a well-integrated IoT infrastructure it will develop significant capabilities for operations to stimulate performance with workflow coordination and optimisation of cost and resources (Vass, Shee and Miah, 2018). As a result, IoT is an additional resource to the business processes to bring out competitive advantages to the industry. According to Parida et al.

(2016) IoT will improve a business integration capability to influence performance from OC theory as internal capabilities will directly influence external integration capabilities to enhance performance.

2.5 Small and Medium Enterprises (SMEs) in Malaysia

Small and Medium Enterprises (SMEs) are defined and constituted by their revenue and the number of employees (Jaharuddin, Mansor and Yaakob, 2016). Every country respectively has certain criteria standard to consider small and medium enterprises (Musa and Chinniah, 2016). SMEs are defined when a firm deem if it meets either one of the two specified qualifying criteria of revenue and the number of full time employees (AbdulRazak, Abdullah and Esroy, 2018). SMEs are very important contributions to most countries economy's in the world and it is an undebatable fact (Yusoff et al., 2018). Supported by Musa and Chinniah (2016) SMEs are considered as a vital component source and a backbone of the country's economic development. In Malaysia SMEs are defined as shown in Table 2 below.

<table>
<tr><th rowspan="2">Size</th><th colspan="2">Micro</th><th colspan="2">Small</th><th colspan="2">Medium</th></tr>
<tr><th>Sales turnover</th><th>Employees</th><th>Sales turnover</th><th>Employees</th><th>Sales turnover</th><th>Employees</th></tr>
<tr><td>Manufacturing</td><td rowspan="2">Less than RM 300,000</td><td rowspan="2">Less than 5 employees</td><td>RM 300,000 or less than 15 Million</td><td>5 to less than 75 employees</td><td>RM 15 Million to not exceeding 50 Million</td><td>75 to not exceeding 200 employees</td></tr>
<tr><td>Services & Others</td><td>RM 300,000 or less than 3 Million</td><td>5 to less than 30 employees</td><td>RM 3 Million to not exceeding 20 Million</td><td>30 to not exceeding 75 employees</td></tr>
</table>

Table 2: Definition of Malaysian SMEs Source: SMECorp (2019)

In Malaysia they have been an increasingly important role since the late 1990s (Chin and Lim, 2018). They are the dominant forms of firms establishments in Malaysia of 98.5% SMEs in which 76.5% are micro enterprises, 21.2% are small sized enterprises and 2.3% are medium sized enterprises out of 907,065 business establishments (SMECorp, 2019). Moreover, Malaysian SMEs are divided into 5 industrial sectors of Manufacturing, Services, Construction, Agriculture and Mining & Quarrying, in which the number of SMEs by each sector is shown in Table 3 below.

Sectors	**Number of SMEs**
Service	809,126
Manufacturing	47,698
Construction	39,158
Agriculture	10,218
Mining &Quarrying	865

Table 3: Malaysian SMEs by sectors Source: SMECorp (2019)

Malaysian SMEs contributes 36% of the GDP and 65% of the employment (World Bank, 2016). Malaysia SMEs are now the suppliers for multi-national companies (MNCs) in the global chain and are expected to contribute to contribute 41% to the country's GDP by 2020 (Musa and Chinniah, 2016). According to Economic Census of 2016, Klang Valley includes states of Kuala Lumpur and Selangor in which has more than 300 thousand of SMEs which contributes about 34.5% of the total SMEs establishments in Malaysia, hence it is well-thought-out to be one of the important area by having a large number of SMEs in Malaysia (SMECorp, 2019).

2.6 Supply Chain Performance

As defined by Kumar et al., (2018) Supply chain performance is a set of business management goals practiced in a firm that results from efficient integration with suppliers, manufacturers, distributors and customers for the means of improving long-term business performance of their supply chain. SC performance is an effective tool for gaining a competitive advantage which makes a greater contribution to business such as SMEs when considered its benefits and practices (Thoo et al., 2017). The major role in SC performance to SMEs is it ensures efficient flow of goods, services and information so as to provide the right product at the right quantity, right quality, right cost, and right time at the right customers (Li and Li, 2017). According to Haseeb and Ali (2019), latest technologies of ICT were seen as an important tool to manage business operations and contribute significantly towards SC performance.

SC performance is facilitated through operations business processes and strategic redesigns to enable and attain operational SC performance improvements (Ferreti and Schiavone, 2016). According to Rezaei, Shirazi and Karimi (2017) SC performance requires coordinated processes that will facilitate real time information by controlling and monitoring business activities to enhance efficiency. According to Botes, Niemann and Kotze (2017) supply chain performance has been recognized as a key source towards real competition in the market. Supply chain performance leads to improvements in business performance towards overall business efficiencies (Taghipour et al., 2015).

2.7 Supply Chain Performance in Malaysia

The drive of Malaysian SMEs is depending on supply chain to achieve the target GDP contribution to the economy (SMEcorp, 2019). Malaysian SMEs needs sustainable supply chain so as to stay ahead of competition in order to support and drive the economy to (Jaharuddin, Mansor and Yaakob, 2016). Supported by Olugu et al., (2017) SMEs in Malaysia believe that efficient supply chain integration results to sustainable supply chain. Malaysian SMEs play a vital role towards the growth of Malaysian economy (Abdullah, Yaakub and Subhan, 2016). According to to Radzi, Nor and Ali (2017) small firms in Malaysia depend on supply chain and its partners to gain and sustain competitive advantage towards performance. As the engines of Malaysian economy they need to adopt efficiencies in order to improve their performance by achieving operational excellence to achieve supply chain performance (Wahab, Ismail and Muhayiddin, 2016).

However, they face a real challenge in delivering the right product and service at the lowest possible cost of the most opportune time to the right customer leading to inability to fulfil customer needs (Abdullah, Subhan and Yaakub, 2015). According to Hudin et al., (2017) the challenges that SMEs face Mare due to the risks that business face in their supply chain in which are controllable and some are uncontrollable. Several industries in Malaysian SMEs were found to have low performance due to lower overall SC practices (Haseeb and Ali, 2019).From a study that was investigated by Sukati et al., (2018) it was found that Malaysian firms depends on better supply chain practices to gain competitive advantages of their businesses. However, Malaysian firms face operational problems that are caused by supply chain that causes inefficiencies to coordinate the products flow towards delay in order to satisfy the customer's needs (Hassan, Zaharudin and Yunus, 2015). According to Jaharuddin, Mansor and Yaakob (2016) SMEs gain competitive advantages from supply chain management in long-term competitiveness in the market for their survival and growth, however consumers' choices are increasing.

2.8 Impact of IoT in Supply Chain Performance

Global Industry will be affected by digitalization through the forms of ICT such as IoT towards supply chain management in bringing operational efficiencies and competitiveness (Tu 2018; Li & Li 2017; Breedam, 2016). By establishing advanced technologies, companies will be able to improve their information flows in SC operations (Li and Li 2017). According to Haseeb and Ali (2019), latest technologies of ICT were seen as an important tool to manage business operations and contribute significantly towards SC performance. Supported by Zaidi (2017) IoT is seen as a factor in bringing tremendous benefits in increasing revenue through supply chain. IoT is a tool to provide end-to-end SC visibility that will improve SC monitoring and planning by changing operational environment to improve competitiveness (Tu, 2018). IoT in SC will allow a better responsiveness in real time of decision making, location of assets and logistics. With IoT technology, such as RFID will reduce information acquisition costs, decrease inventory shrinkage, diminish stock outs, avoids additional stocks and improves data accuracy (Wu et al. 2016). Mohandas and Aravindhar (2017) stated, as IoT being a growing interest to the industry, it is expected to have an impact on businesses to transform to digital world.

Wu et al. (2016) stated that smart SC is the new way of interconnecting business process and system by extending SC widely to IoT components to enbale a systematic smart SC implementation. However, Ben-Daya et al. (2017) supported IoT orientation on smart SC as IoT being a network of connecting physical objects to digitally connect within SC process to monitor, sense and interact within a business and its SC by enabling agility, information sharing, visibility and tracking that will facilitate coordination, timely planning and control of SC processes. Therefore, IoT will capture information and interact with other devices to contribute intelligence through real time data at a negligible operational cost for organization to generate value on supply chain processes (Li, 2017). IoT will improve SC processes on adapting and prioritizing digital opportunities that will increase SC performance by planning and monitoring on demand forecasting, inventory reduction cost, tracking products and creating an intelligent transportation system (Mostafa, Hamdy and Alawady, 2018).

The impact of IoT in SC process will enhance an organizations performance across the entire supply chain by achieving cost efficiency and logistics effectiveness while creating value to customers (Vass, Shee and Miah, 2018). According to Mostafa, Hamdy and Alawady, (2018) the impact IoT in supply chain will help to reduce bullwhip effect. Firms will perceive benefits from IoT to supply chain as it facilitates real-time supply chain management, improvement of business intelligence, reduction of data distortion and reduced delays in data collection (Haddud et al., 2017).

IoT as a digital enabler through information flow integration between internal and external supply chain partners will improve SC synchronising information flows to stimulate information sharing and processing to affect higher integration capabilities (Kim, 2017). IoT in SC with the interaction of suppliers and customers, it will help firms to manage inventory levels and production planning efficiently (Shafique et al., 2018). Internal and external integration are dependent on each other as both can facilitate and have the capabilities to improve in business performance (Huo, 2015). According to Vass, Shee and Miah (2018) IoT can facilitate a better integration towards supply chain performance through internal (cross-functional operations) and external (i.e. suppliers and customers) process integration to bring out a better business performance and supply chain performance.

Internal Integration and IoT

Internal integration is referred as the cross-functional intra-firm information sharing and collaboration through synchronised and interconnected systems and processes (Schoenherr and Swink 2012). Internal integration assists cross functional collaboration within the business internal operations such as finance, operations, logistics, sales and marketing operations to attain supply chain objectives (Ataseven and Nair 2017). The collaborative processes within the business functional departments facilitate operational, real-time information sharing, tactical and strategic cross- functional collaboration of supply chain activities across business functions so as to enhance performance and competitive advantages (Yu, 2015).

Past studies has indicated that IoT has a positive effect and relationship with internal integration as it is well explained in the literature (Shafique et al., 2018; Vass, Shee and Miah, 2018). Internal integration affects a business overall operation performance within the company's internal, process, and product integration from information and communication technologies (Li, 2015). Internal integration with IT enable technologies (i.e. IoT) will facilitates real time cross functional information sharing within the business activities to achieve superior performance (Yu, 2015; Borus, Janssen and Herder, 2019). II coordinates various business functions to enhance its overall supply chain performance through flexibility performance together with logistics, customer service and suppliers operational performance (Ataseven and Nair, 2017). IoT can facilitate all businesses functional departments to transmit critical data, share and access (Dang et al., 2019). IoT will enable smart devices to make planning, scheduling and smart decisions to more efficient supply chain operations based on real-time information (Ben-Daya et al. 2017). As a result, IoT will help to gather data for smart solutions and monitor in internal business operations such as inventory flow, warehouse automated supplying order for restocking, shelf rotation, surveillance and remote device management (Suresh et al. 2014; Abdel-Basset, Manogaran and Mohamed, 2018).

The effect of technological on internal integration is also supported by organizational theory (García-Sánchez, García-Morales and Martín-Rojas, 2018). Supported by Huo (2015) organisational capability theory aids in supporting internal integration through advancement of technology can enhance performance. According to Vass, Shee and Miah (2018) strategic tactical and operational information sharing through IoT within a firm maximises value of the entire supply and are the facilitators of internal integration.

Hypothesis: *IoT has a positive effect on internal integration towards supply chain performance in Malaysian SME's.*

External Integration and IoT

External integration consists of two integration of supplier and customer integration, where by it improves SC synchronising information flows to stimulate information sharing and processing between the SC partners to affect higher integration capabilities (Kim, 2017).

Supplier Integration and IoT

Supplier integration is referred as coordination and information sharing with suppliers that provide the firm with insights into suppliers' processes, capabilities and constraints, ultimately enabling more effective planning and forecasting, product and process design, and transaction management (Schoenherr and Swink, 2012). It enables a business to integrate with its suppliers within internal processes and external demand (Ataseven and Nair, 2017). A firm will cooperate with its suppliers by collaborating inter-firm practices and procedures to meet customer demand (Flynn, Koufteros and Lu, 2016). Supplier integration will help suppliers to predict rapid change in firms demand and understand by anticipate the needs of the firms (Shafique et al., 2018).

Past studies have indicated that IoT has a positive effect and relationship with supplier integration as it is well explained in the literature (Shafique et al., 2018; Vass, Shee and Miah, 2018). In accordance with organisational capability theory, IoT as a main capability has the ability to positively impact supplier integration (Vass, Shee and Miah, 2018). IoT will facilitate external integration with its suppliers through connecting information systems such as ERP with supply chain processes (Mahmud, 2017; Chen, 2015). The implementation of IoT in supply chain will help facilitate effective communication and cooperation between a firm and its suppliers (Burmester et al., 2017). This will allow firms to control, plan and have visibility of goods as they move along the supply chain in a cost effective ways (Verdouw et al. 2016). Effective coordination between suppliers and the organization through real time information sharing that leads to effective planning and forecasting to help eliminating the SC problems (Flynn, Koufteros and Lu, 2016).

IT technologies facilitate integrated data to offer real-time visibility of products movement along the SC of suppliers in increasing operational efficiency (Yu et al. 2015). The real time information about the supplier will be virtualized to firms to track down detailed information such as vehicle number, location, invoice and destination (Kumar et al., 2017). Firms can use IoT to have a greater flexibility in selecting supplier and service provider by achieving optimization with greater trust and security (Nagy, 2018). SI will help suppliers to predict rapid change in firms demand and understand by anticipate the needs of the firms (Shafique et al., 2018). The integration of supplier and the firm will enhance operational lead time and be cost efficient (Vass, Shee and Miah, 2018). Hence, IoT will create a long term positive relationships between the integration by showing transparency, enabling advanced quality planning and controlling while tracking and tracing products (Verdouw et al., 2016; Zhou, Chong and Ngai, 2015).

Hypothesis: *IoT has a positive effect on supplier integration towards supply chain performance in Malaysian SME's.*

Customer integration and IoT

Customer integration is referred as collaborative information sharing efforts with customers that provide strategic insights into market expectations and opportunities to the firm to enable efficient and effective response to customer requirements (Schoenherr and Swink, 2012). CI enables a firm to coordinate and collaborate business activities in response with customers' demands (Ataseven and Nair, 2017). According to Flynn et al. (2016) CI facilitate a firm to integrate with its customer through cooperative processes to structure inter-firm practices, procedures and strategies to satisfy customer requirements.

Past studies have indicated that IoT has a positive effect and relationship with customer integration as it is well explained in the literature (Shafique et al., 2018; Vass, Shee and Miah, 2018). In accordance with organisational capability theory, IoT as a main capability has the ability to positively impact CI (Vass, Shee and Miah, 2018). IoT allows external integration with customers in bringing SC performance (Nagy, 2018). CI with internet

enabled technologies will assist information sharing and collaboration between customer and the business with the means of maximizing the value towards supply chain performance and meeting customer demands (Ataseven and Nair, 2017; Kumar et al., 2017).

According to Ben-Daya et al. (2017) IoT will allow quality control and real-time visibility of merchandises as they move along the supply chain to be delivered to customers. Supported by through product delivery process, IoT will track down products movement in the SC in delivery to the customer (Li et al., 2017). IoT in SC with the interaction of customers, it will help firms to manage inventory levels and production planning efficiently (Li and Li, 2017). Supported by Bok (2016) IoT will benefit firms through better inventory management, real-time stock movement, real-time in-store promotions, inventory location and smart customer service. As a result, customer integrations with IoT will enable organizations to integrate its processes to meet the customer needs and demands (Shafique et al., 2018). Through quality-controlled logistics with IoT, the SC movement of product delivery process will be reported and tracked in a real time (Ben-Daya et al. 2017). Customers' demands will be met through matching ideological preferences of the customers demand as there will be collaborative information sharing (Ataseven and Nair, 2017). This will maximize customer value and satisfaction in the whole supply chain management process from effective and efficient execution of customer requirements (Yu, 2015).

Customer integration with IoT will enable a firm to meet customers' demands through product customization (Tjahjono et al., 2017). Supported by Shafique et al., (2018) firms will have customer information in planning and understanding their needs. CI will allow firms to have customer's information according to their needs that will help that be competitive in the market and gain market share (Kalem et al., 2016). As stated by Tjahjono et al., (2017) CI will enable firms to maintaining and gaining market share by showing transparency to their customers regarding real time information exchange such as response time, product availability, shipment tracking and customer experience. According to Kumar et al., (2017) the integration of customers will enhance SC performance and build a good relationship with the customers.

***Hypothesis**: IoT has a positive effect on customer integration towards supply chain performance in Malaysian SME's.*

2.9 Grounded Theories

Resources-Based View (RBV) Theory

Resources-Based View Theory (RBV) is simply defined as a strategically model in identifying the competitive advantage of a business with both valuable tangible and intangible resources (Ramon-Jeronimo, Florez-Lopez and Araujo-Pinzon, 2019). According to Gaya and Struwig (2016) RBV suggests that, the ultimate source of gaining a competitive advantage is from the internal resources a firm possess. Supported by Mweru and Muya (2016) RBV's primary determinants of its performance of a firm to sustain competitive advantages are from the internal capabilities of its own resources. The resources used by a firm to determine its performance in RBV includes all assets, organizational processes, information, firms attributes, etc. in which is controlled by a firm to implement strategies that will conceive efficiency and effectiveness (Miyamoto, 2017). The RBV model emphases on using the available resources to create strategic opportunities for gaining competitive advantage and the organizational development (Balashova and Gromova, 2016).

The concept of ICT can be developed by resource based theory (RBV) to associate organizational capability ICT and business performance (Bharadwaj, 2000). As according to Dong et al. (2009) discusses that technological resource by itself does not create ICT value creation, what creates value is their adaptation within supply chain processes. In competitive advantages scenarios, ICT capabilities influence organization diverse operational capabilities (Parida, Oghazi and Cedergren, 2016). As stated by Cabrera (2017) firms no longer need to obtain competitive advantage but however they need to obtain sustainable competitive advantages. RBV model can be used by any type different organizations or sector in which has great potential to identify its competitive advantage to enhance its performance (Moya and Reyes, 2018). The model has the capabilities to mobilize production and sanctions in increasing production with minimal investments (Balashova and Gromova, 2016). This

approach allows firms to achieve their set out goals and objectives and maintaining positive performance (Sims, Powell, & Vidgen, 2016).

2.10 Conceptual Framework

The research framework proposes that IoT in Supply chain will have three hypotheses which are internal integration, supplier integration and customer integration.

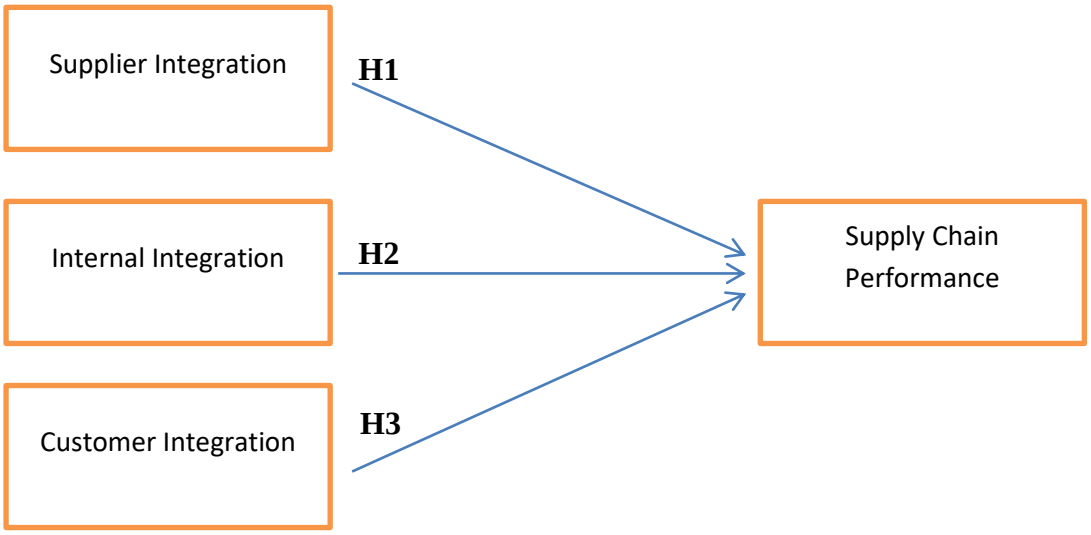


Figure 6: Research Framework Model (Vass, Shee and Miah, 2018).

H1: *IoT has a positive effect on supplier integration towards supply chain performance in Malaysian SME's.*

H2: *IoT has a positive effect on internal integration towards supply chain performance in Malaysian SME's.*

H3: *IoT has a positive effect on customer integration towards supply chain performance in Malaysian SME's.*

CHAPTER 3 RESEARCH METHODOLOGY

3.0 Overview

This research is a detailed image to determine different ways to reflect with this study and the research procedure that will present factual research analysis and information accumulation analysis method. This research study will determine the relationship between the three independent variables related to this study (i.e. Internal Integration, Supplier Integration and Customer Integration with the dependent variable (i.e. Supply Chain Performance in Malaysian SMEs in Klang Valley, Malaysia). The structure of this chapter will focus on a deep description of the research design, sampling design, measuring table, research instrument, statistical tools used in data collection, target population, determining of sample size, sampling method, methods of analysis and data gathering. However in the end, a summary of the whole research design will be included together with preliminary description for the next chapter.

3.1.0 Research Design

Research design is a master plan that identifies methods and procedures for gathering and analysing required information to (Babin, Carr, Griffin, Quinlan, and Zikmund et. al., 2015). However, according to Babin, Carr, Griffin, and Zikmund et. al. (2013) there is no any great research design for any study, on the other hand, a good research design should be able to identify the methods and procedures for data collection and data analysis process. Research design is a verification of the study in which explains the relationship between the variables (Bryman and Bell, 2015; Pandey and Pandey , 2015).

This research study is quantitative based in which will be using and following descriptive research design. According to Nassaji (2015) the objective of descriptive study is to explain the research title and its components using quantitative methods of data collection to rationalize the accuracy and reliability of the research. The research design will test the hypothesis examine the hypothesis of the findings as a relation of the chosen variables to

justify and interpret the variables towards the statement of the study. It is a conceptual guide to demonstrate how this research will be conducted.

The research will be conducted by questionnaires asked to participants reflecting the agenda of the research study. The questionnaires will be divided into sections in which will reflect each of the hypothesis variables, thus it will fill up the research gap reflected from the research agenda. As mentioned by Sekaran and Bougie (2016) if the research data are collected from secondary data, it is considered as no interference, while if the data are collected from questionnaire without influencing and interfering the participants work, the extent of interference is minimal. According to Bougie and Sekaran (2016**)**, if the data in a research are collected from secondary data, then, there is no interference; while if the data that are collected through questionnaire without influencing the respondents` work, then, the extent of interference is minimum. The research setting can be classified as non-contrived since it is not going to manipulate or interfere the researcher's environment (Arezzini, Bosco and Retico *et. al*. 2017).

3.2.0 Sampling Design

A sample design is a guide used before any of the data to be gathered to determine the sample size from a given population (Pandey and Pandey, 2015). According to Babin et. al. (2013) the sampling procedure comprises any tests that involve a small number of variables that encounters the whole population to sum up conclusions for the entire population. Moreover as mentioned by Babin et. al. (2015), the sample belongs to a larger population assigned for analysis and observation and is intended to enable the researcher to approximate some unknown population characteristics to (Babin et. al., 2015). Sample test design may be non-probability or probability, as every variable included in the test has a probability to be involved in a sample but however non-probability does not need to be calculated by the researcher.

3.2.1 Population of the Study

According to Babin et. al. (2013) the population of the study includes a complete group of people, businesses and etc. that has some set of characteristics to determine a population. The targeted population of this research are Malaysian SMEs in general. Based on recent statistical information from the Malaysian SME Corporation (SMECorp, 2019) mentions that there are 907,065 SMEs established in Malaysia, in which Klang valley includes 312,937 SMEs.

3.2.2 Sampling Method

The sampling method comprehensively is separated to two categories of techniques of sampling, which is probability and non-probability, as the earlier needs to access the whole population and provides an equal opportunity for each individual to be chosen while the latter is used when there is no access to the entire population and participants have no equivalent chance of being selected (Creswell, 2014; Zikmund et. al., 2013). Moreover, researchers use sampling for ideological reasons because applied business activities usually have budgets and time constraints; however, in most situations there are various other reasons for sampling, including cost reduction, reduction of labour requirements and rapid collection of critical information (Babin et. al., 2013). Furthermore, Babin et. al. (2015) added that, if sampling are sufficient and accurate and the population is small to accurately demonstrate the characteristics of interest, only a small sample is required. Samples tend to strongly represent the population when the population components are extremely homogeneous. The sampling method used for this study is therefore non-probability sampling, whereby the comfort sampling procedure will be followed precisely. This research study of the sampling method is non-probability convenient sampling due to the questionnaires of this study can be given to friends and can be passed on to other friends, however, there is time limit constraints as the time given to meet the deadline is only 10 weeks (Rahi, 2017).

3.2.3 Sample Size

Based on Krejcie and Morgan (1970) the sample size is defined as a count of the number of sample units to be calculated or analysis under any of the statistical settings or the findings to be used in an investigation, so as to confirm there are sufficient examples to allow the research to have sufficient power for statistical significance. Appropriate sample size is essential to make sure errors are minimalized for the reason that large sample size raises statistical power (Creswell, 2014). Based on the online sample size calculator as shown in Fig 7 and Krejcie and Morgan, the ideal sample size should be 267 of this research, for the target population of 312,937 at 95% confidence interval with an acceptable margin of error of 6%, however Gray (2014) mentioned that a recommended sample size can be within 80 to 350 for a quantitative research. The researcher will be rounding of the sample size to 265, as Batista, Filho, Marino et. al. (2013) suggests that when the sample size 250, it can be considered statistically significant.

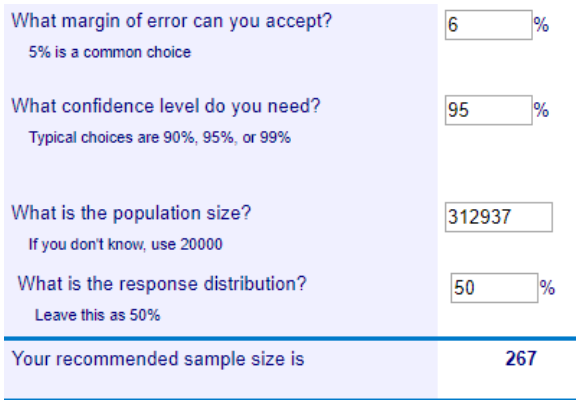


Figure 7: Sample Size calculator Source (Raosoft, 2014)

3.2.4 Unit of Analysis

Unit of analysis alludes as the main item to be considered during the research in which can be an organization or individual **(**Bougie and Sekaran, 2016). For the particular research, the unit of analysis is organization since the researcher is considering SMEs in Malaysia. However, on the other hand Cooper and Schindler (2014) mentioned that several employees are intricated in many ways towards the conduct study, as the mentioned employees/personnel

oblige as representatives for organizations, however, the unit of analysis is considered as the organization since the fact under study still focuses on organization.

3.3 Questionnaire Design

Questionnaire is referred as a way of designing applicable questions and format that will be used to gather information from the proposed respondents (Rahi, 2017). Supported by to Babin et. al. (2013) mentioned questionnaire as a list of structured questions designed by the researcher to scientifically analyse and evaluate the response of the respondents. According to Taherdoost, (2016) questionnaires are best known to be suitable and known source to be widely used to collect information form people among the various research methods and can be used in conjunction with other techniques, additionally he mentioned that well-designed questionnaires tend to be highly organized to allow similar types of data to be obtained from a large number of people in the same way and to be systematically and quantitatively reviewed and analyzed. Relevance and reliability are known as the basic standards that a questionnaire should follow if it is to achieve a researcher's purpose in a sensible way that the questionnaire is deemed to be relevant if no unnecessary information is collected and if the information required to solve the business problem is obtained, while accuracy will reflect the information is reliable and valid (Babin et. al., 2015).

3.3.1 Likert Scale

According to Batterton and Phalanx (2017) Likert scale was created by Rensis Likert in which is extremely popular for measuring attitude as the method is simple to manage, it is also a measure of attitudes aimed at enabling participants to specify how strongly they disagree/agree with sensibly created statements ranging from very negative to very positive to attitudinal object. Based on Babin et. al. (2015) participants usually pick from five alternatives that are, strongly disagree, disagree, uncertain, agree and strongly agree; however, the alternatives' number could range from three to nine.

3.3.2 Questionnaire Design Table

No.	Items	No.	Sources/References
1.	Company Profile	4	Aldianto and Kristandy (2015), Alon et. al. (2015), Bourkheili (2015), Boulanger et. al. (2015), Lee (2016), Roslan (2015), Schneider (2012)
2.	Supply Chain Performance in Malaysian SME in Klang Valley, Malaysia	5	Li and Li (2017), Haseeb and Ali (2019), Zaidi (2017), Tu (2018), Wu et al. (2016), Vass, Shee and Miah (2018)
3.	Supplier Integration	5	Flynn, Koufteros and Lu (2016), Shafique et al., (2018), Vanpoucke et al. (2017), Burmester et al. (2017), Vass, Shee and Miah (2018), Kumar et al. (2017), Verdouw et al. (2016)
4.	Internal Integration	5	Ataseven and Nair (2017), Brous, Janssen and Herder (2019), Shafique et al. (2018), Yu (2015), Dang et al. (2019), Vass, Shee and Miah (2018), García-Sánchez, García-Morales and Martín-Rojas (2018)
5.	Customer Integration	5	Ataseven and Nair (2017), Kumar et al. (2017), Vass, Shee and Miah (2018), Nagy (2018), (Li et al., 2017), Bok (2016), Tjahjono et al.,(2017), (Kalem et al., 2016)

Table 4: Questionnaire Design

This table shows the questionnaire design of the questions pertaining to the research in which is divided into 5 sections. First section is the company profile which consists of 4 questions to define the characteristics of the size. Second section is the Dependent Variable (DV) and Independent Variable (IV) in which the questions are constructed in likert scale to reflect the factors towards the impact of IoT in Supply Chain.

3.4 Measuring instrument

3.4.1 Pilot Testing

According to Bougie and Sekaran (2016) pilot testing is defined as a small preliminary study used to measure time, adverse events, costs, practicality and sample size impact to decide whether the completion of the entire study will be acceptable and reasonably valid before the completion of the entire study. It refers to a smaller version of 10-20% of the sample size of a full-scale research conducted in the preparation towards a complete study to ensure that the survey participants not only understand the questions but also understand them in a similar way (Dikko, 2016). According to Bolarinwa (2015) if the questionnaire items are appropriate the questionnaire will ensure reliability and relevancy whereby the respondents had gave a comprehend and exact answers, however, if not reliable the questionnaire will be improved. Dikko (2016) added that it checks the need to refine the variables and measurement items and variables as well as checking for to check for validity.

3.4.2 Preliminary Test

According to Dikko (2016), the preliminary test is used to determine the validity and reliability of the data collected selected for a particular research, including all respondents, unlike the pilot test. As stated with Ugulu, (2013) reliability and factor analysis will be carried out again as the data set is to be established and ensure of the validity and reliability will be provided.

3.4.3 Factor Analysis

Factor analysis is referred as a statistical tool that helps in identifying the underlying factors to explain dimensions related in large data variability. It is used to assess whether the variables used in the analysis are important and appropriate to the study and whether they can be used as an estimation factor (Hair *et al*, 2014). As stated by Rahn (2017) evaluation of the factor analysis is used to assess whether the variables used in the experiment are valid and acceptable for analysis and whether they can be used as an estimate factor. Kaiser-Meyer-Olkin (KMO) and Bartlett's test is a test of the sampling adequacy of each parameter in the model, whereas, the lower the ratio, the more appropriate the data is, the desired value greater than (>) 0.6 the sample is will be acceptable (Pearce and Yong, 2013). As stated by Samuels (2016) if a factor loading of a variable is less than 0.6, the item of that particular variable should be eliminated as it is considered weak and unable to measure the factor, moreover, the eigenvalues determines the factor variable of an observed variable. Rahn (2017) claimed that any variable with an eigenvalue value ≥1 represents more variability than a single measured variance, by specifying whether a factor should be included or separated into two or whether it tests similar or different constructs.

Range	Acceptance
Below 0.5	Unacceptable
0.5 – 0.599	Miserable
0.6 – 0.699	Mediocre
0.7 – 0.799	Middling
0.8 and above	Meritorious

Table 5:MSA values guidelines Source: Hair et al. (2014)

3.4.4 Reliability Test

According to Cho and Kim (2014) Cronbach's alpha is a metric used to assess a scale or test item's accuracy and internal consistency, the measurement of any calculation applies to the extent to which it is a reliable indicator of a measure and Cronbach's alpha is a way to evaluate the intensity of that consistency. As stated by Richardson and Yu (2015), Good consistency is crucial, because low reliability will obscure the objective results of intervention, which can have serious consequences for the conclusions reached, and hence the inevitable advancement of interference. A study to be acceptable in terms of accuracy, the alpha must be greater than or equal to 0.7; internal consistency shall be deemed excellent if the alpha value reaches 0.9 (Cho and Kim, 2014). However, as Richardson and Yu (2015) mentioned that, factor analysis is done first and then reliability, since the analysis will verify variables that are acceptable and relevant, then only measurement of their reliability can be done.

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unaccepted

Table 6: Cronbach's alpha value Source: Hair et al. (2014)

3.4.5 Hypotheses Testing

It is a statistical analysis test that measures a random sampling of the sample size being analysed (Trafimow and MacDonald, 2016). It tests the inference of the variables if it is true and weather to reject or accept the null hypothesis (Zikmund *et. al*., 2013). However, hypotheses' testing to be tested in the research includes the tests of Multiple Regression, Beta

Coefficient, Multi-Collinearity and One-way ANOVA is also tested. According to Yockey (2011) the purpose of testing hypotheses is to analyze the relationship between two or more variables and to evaluate the assumptions of a logical approach so as to accept or reject research hypotheses. The relationship between the dependent variable (DV) and independent variables (IV) is being tested by Multiple Regression analysis. As stated by Sekaran and Bougie (2016) R squared (R^2) is the value in which defines the model's fitness, so to be considered fit, R squared must be more than 0.5 and if the model is below 0.5 the model is considered not fit. The difference between two or more independent groups 'means values of the models significance is determined by One way Annova. As stated by Sekaran and Bougie (2016) the p-value of the significance and correlation of the variable should be less than 0.05. The impact strength of each independent variable on the dependent variable is determined by the value of the beta coefficient. Furthermore, according to Sekaran and Bougie (2016) higher beta coefficient values suggest a higher independent variable effect on the dependent variable.

3.5 Chapter Conclusion

As for this chapter three, it provides a comprehensive detailed description of the research study design adopted for this study in which the sampling design includes the population, sample size, sampling procedure, tool and instrument for data collection (i.e. questionnaire) and the measurements to be applied. The questionnaire is anticipated to give adequate and sufficient information to the scholar of the data to test hypotheses through data analysis techniques. The results of the data analysis will be discussed in chapter 4.

CHAPTER 4: RESEARCH FINDINGS AND ANALYSIS

4.0 Overview

This chapter outlines the overview of the research methodology on the data analysis and the findings that pertains the research study. The synopsis of the sections after collection of the sample data includes the pilot test and preliminary test that where analyzed using SPSS software to outline the validity, reliability, hypotheses testing using multiple regression and one-way anova of the collected data to accept or reject the formulated research hypotheses. Lastly, the chapter follows all the preceding units illustrated in Table 7 as the organization of Chapter 4.

CHAPTER SECTION	DESCRIPTION
4.0 Overview	This chapter outlines the overview of the research methodology on the data analysis and the findings that pertains the research study.
4.1 Background of Data Analysis	This section will discuss the details of the research background for data analysis.
4.2 Data Screening and Response Rate	This section explains the measure of the response rate (RR) of the feedback from the respondents.
4.3 Pilot Test	This section analyses a small scale of the preliminary to justify the feasibility, validity and reliability of the full scale research.
4.4 Descriptive Statistics (Company Profile)	This section analyses the characteristics of the respondent's company profile characteristics.
4.5 Validity and Reliability Test	This section analyses the validity and reliability of the data obtained from the respondents used for research.
4.6 Normality Test	This section analyses the normality test of the data obtained from the respondents.
4.7 Regression Analysis	This section analyses the regression analysis of the data obtained from the respondents used for research.
4.8 Chapter Summary	This section concludes all the findings in this chapter.

Table 7: Organization of Chapter 4

4.1 Background of data analysis

From the sample size discussed in the previous chapter four, 265 individuals operating in SMEs in Klang Valley were approached to participate in thus research survey. The questionnaire distributed were designed through Google Forms and distributed through social media and hard copy questionnaire. The participants were also approached in face and were provided with hard copy and an iPad to participate in the study. The reason behind this is to facilitate both the process of data collection and the analysis of data. Lastly, 265 participants gathered were considered to be sufficient to carry out quantitative research as Batista et. al. (2013) mentioned that it is deemed statistically significant when a sample size exceeds 250. Furthermore, the participants in this study were SMEs individuals operating in SME Industry in Klang Valley and they were selected using the method of random sampling. The purpose of this research study is to determine if there is a significant relationship that lies between the dependent variables (i.e. Supply Chain Performance) and the independent variable (i.e. Supplier Integration, Internal Integration and Customer Integration).

The 265 responses obtained from the online survey were analyzed using IBM-SPSS (V22.0) software program. Furthermore, numbers of tests consisting of descriptive analysis and frequency tests were carried out for the data analysis to analyze the findings of this study. However, numerous other tests were also implemented to assess the validity and the reliability of the data, factor analysis, linear regression and anova. Normality tests were also carried out to determine the acceptance or rejection of the proposed research hypotheses.

4.2 Data Screening and Response Rate

To start the data analysis and testing's, it is important to do the data screening to evaluate the response rate (RR) of the respondents' feedback as indicated by Hair et. al. (2010). The table 8 below displays the sample response rate of the questionnaires. All 265 respondents in this study submitted their response and it appeared that no redundant and unnecessary answers were found to be discarded from the sample. As Locke, Schleck, and Ziegenfuss et. al. (2013)

stated that, the general rule for discarding data of respondents from the overall response is that the response rate should not reach 10%. Therefore, for this study, 265 responses have been finalized. According to the equation below, the RR is determined and a response rate (RR) of 100% was determined by the overall survey as shown in the table below.

Equation: Response Rate (RR) = $\frac{\text{Number of feedbacks reverted}}{\text{No.of people appraoched for the survey}}$

QUESTIONNAIRES	**RATE**
Distributed Questionnaires	265
Received Questionnaires	265
Unusable Questionnaire	0
Sample Response Rate	$\frac{265}{265}$ x 100 = 100%

Table 8: Sample Response Rate of the Respondents

4.3 Pilot test

A 10% sample size should be obtained and reviewed for the pilot test before continuing with full data collection for full study evaluation. For the pilot test of this research, a sample of 30 respondents were selected and determined based on the 265 sample size of the full study. Factor analysis and reliability test will be conducted to determine the analysis of the pilot study before proceeding to the preliminary tests.

4.3.1 Factor analysis

Factor analysis was carried out on the dependent variable and separately on each independent variable as shown in Table 9 and Table 10 below.

Variable	Item	Factor loading
Dependent variable	SP1	0.755
Supply Chain Performance	SP2	0.911
	SP3	0.871
	SP4	0.817
	SP5	0.891

KMO: 0.809
Barlett's Test of Sphericity : Approx. Chi-Square 166.634, df : 10, Sig.: 0.000

Table 9: Factor Analysis Result for dependent variable (DV) - Pilot test

According to Table 9, the result outcome for dependent variable supply chain performance is showing that KMO value is 0.809, the value represents more than the rule of thumb of 0.6 according to MSA value explained in the previous chapter 3. This result of the test is acceptable and this means that there is relevancy of dependent variable in this study, hence the we can proceed with the dependent variable in this research study.

Variable - Independent Variables	Item	Factor loading
Supplier Integration	SI1	0.611
	SI2	0.706
	SI3	0.760
	SI4	0.565
	SI5	0.800
Internal Integration	II1	0.809
	II2	0.738
	II3	0.920
	II4	0.786
	II5	0.821
Customer Integration	CI1	0.862
	CI2	0.779
	CI3	0.794
	CI4	0.814
	CI5	0.860

KMO: 0.881
Barlett's Test of Sphericity : Approx. Chi-Square 574.986, df : 105, Sig.: 0.000

Table 10: Factor Analysis Result for independent variables (IV) – Pilot test

According to Table 10, the result outcome for independent variables indicates that the KMO of the overall independent variables is 0.881, in which is above 0.6 of the rule of thumb and the acceptance level indicates a Middling range, hence, hence the we can proceed with the independent variable in this research study.

4.3.2 Reliability Test

After the factor analysis, the reliability test must be carried out separately on dependent varia ble and independent variables to check the internal consistency of the measurements (Sekaran and Bougie, 2016). As shown in Table 11, the outcome of the reliability test shows that Cronbach's alpha (α) coefficient is above 0.9 for the dependent variable in which is 0.950 which indicates excellent internal consistency. As for the independent variable Cronbach's alpha (α) coefficient are also above 0.9 in which also indicates excellent internal consistency. All reliabilities of the variables satisfied the required minimum reliability evaluation of the rule of thumb 0.60, and therefore the model can be said to be acceptable for further study analysis.

Variable	Item	Cronbach's Alpha
Dependent Variable		
Supply Chain Performance	5 items	0.950
Independent Variables		
Supplier Integration	5 items	0.923
Internal Integration	5 items	0.966
Customer Integration	5 items	0.962

Table 11: Reliability Test Result – Pilot test

4.4 Descriptive Statistics (Company Profile Characteristics)

For this study, descriptive statistics analysis included data collected from 265 respondents operating in SMEs in Klang Valley. The questionnaire survey consisted of 23 questions that were divided into three sections. The first section of the questionnaire included the company profile characteristics of the SMEs, encompassing 3 items. The second section embodied the dependant variable (i.e. Supply Chain Performance in SMEs in Klang Valley) which contained 5 questions. The rest of the sections of the questionnaire survey represented four independent variables (i.e. Supplier Integration, Internal Integration and Customer Integration) with each variable contained 5 question items, in total represented 15 items.

The descriptive statistics are used to show the analysis of the mode, mean and standard deviat ion. The participant's response of the research survey will pertain to the variable questions to indicate the general idea of the score given. The descriptive statistics analysis in this study was analysed using IBM-SPSS (V22.0). The participants were requested to choose the most appropriate answers based on the questions.

4.4.1 Operational Industry Sector Wise Analysis

The operational industry sector analysis is one the company profile characteristics of the participants explaining in what sector is their business operating. As shown in Table 12 and Fig 8 below, out of the 265 SMEs, 168 SMEs operate in service sector with an overall percentage of 63.4%, whereas 30.9% operate in manufacturing sector which includes 82 SMEs. Similarly, 4.5% operate in construction sector accommodating 12 SMEs and 1.1% in agriculture sector accommodating 3 SMEs.

What Industry group does your business belongs to?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agriculture	3	1.1	1.1	1.1
	Construction	12	4.5	4.5	5.7
	Manufacturing	82	30.9	30.9	36.6
	Service	168	63.4	63.4	100.0
	Total	265	100.0	100.0	

Table 12: SMEs operational industry sector

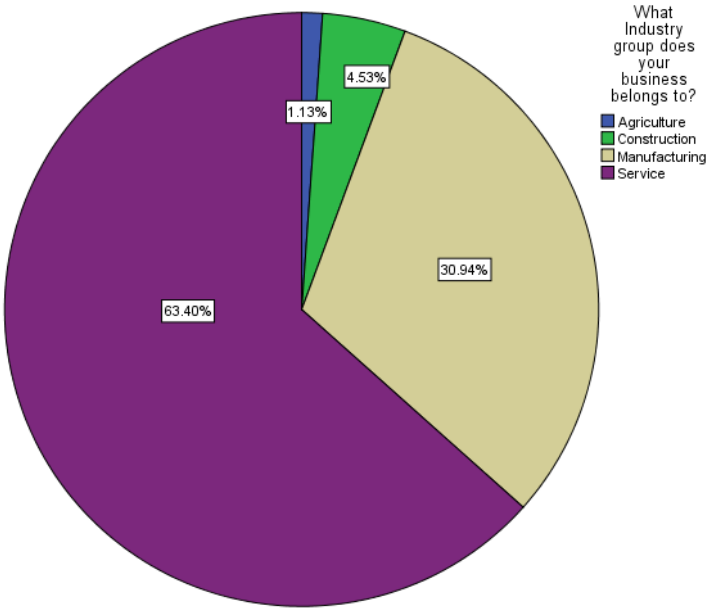


Figure 8: SMEs operational industry sector

4.4.2 Duration Wise Analysis

The duration wise analysis is the second part of the company profile characteristics of the participants explaining how long has their business been operating. As shown in Table 13 and Fig 9, out of the 265 SMEs, 85 have been operating for 11 – 15 years with an overall percentage of 32.1%, whereas 29.1% has been in operations for 6 -10 years. Likewise, 16.6% and 12.1% of SMEs has been operating for 1 – 5 years and 16 – 20 years respectively. Furthermore, 27 SMEs have been operating for more than 20 years are only 10.2%.

How long has your business been operating?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 - 5 years	44	16.6	16.6	16.6
	11 - 15 years	85	32.1	32.1	48.7
	16 - 20 years	32	12.1	12.1	60.8
	6 - 10 years	77	29.1	29.1	89.8
	More than 20 years	27	10.2	10.2	100.0
	Total	265	100.0	100.0	

Table 13: SMEs operation duration

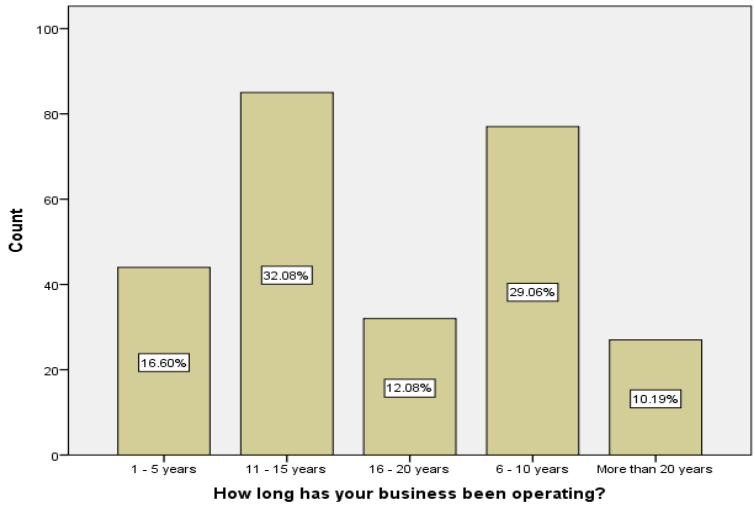


Figure 9: SMEs operation duration

4.4.3 Industry Size Analysis

The industry size analysis is the third part of the company profile characteristics of the participants explaining on how many people are employed in the organization in determining what size is their organization operating in. As illustrated in Fig 10, 168 SMEs are small size SMEs, 63 SMEs are Micro size and 34 are Medium size SMEs.

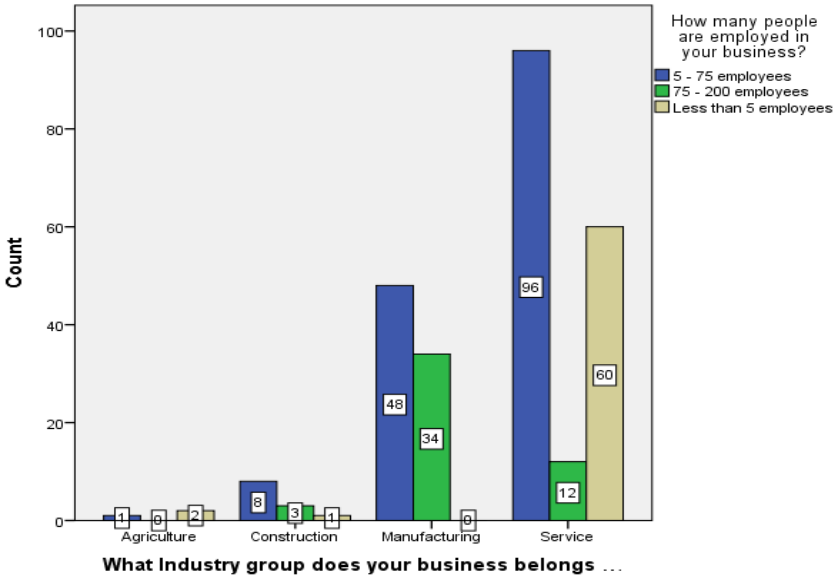


Figure 10: SMEs industry size

4.5 Validity and Reliability Test

From the data analysis, the most important things to measure with regards is the reliability and the validity of the data as it test the consistency and internal stability of the measuring instrument and therefore Cronbach Alpha (α) is utilized to test the reliability coefficient. According to Cronk (2016) Cronbach Alpha is a coefficient of reliability that basically states the total correlation between the variable items set. Furthermore Sekaran and Bougie (2016) mentioned that a better reliability coefficient has to be near to 1.0, if the values are greater than 0.80 it is considered stronger, if the values array to 0.70 they are considered good and if the values are closer or less than 0.60 they can be considered tolerable. Hence, it is better to assume that the reliability coefficient closer to 1.0 is highly reliable and consistent

4.5.1 Convergent Validity Test

There are two ways to analyse the validity of the data, firstly is through the KMO and Bartlett Test to check the data appropriateness of the adequacy for the test. As shown in Table 14 and table 15 the KMO test's value is KMO = 0.868 for the dependent variable and for the independent variable is KMO = 0.953. The values are higher than 0.8 which can be indicated

stronger. The Bartlett's Test of Sphericity indicates that the variable is significant to the model (p = 0.000) for both the dependent variable and independent variable is below the α value of (0.05). Therefore, the result from the data can be said to be fit for factor analysis.

Variable	Item	Factor loading
Dependent variable	SP1	0.715
Supply Chain Performance	SP2	0.860
	SP3	0.753
	SP4	0.764
	SP5	0.810

KMO: 0.868
Barlett's Test of Sphericity : Approx. Chi-Square 1078.411, df : 10, Sig.: 0.000

Table 14: Dependent variable KMO and Bartlett's Test

Variable - Independent Variables	Item	Factor loading
Supplier Integration	SI1	0.798
	SI2	0.713
	SI3	0.780
	SI4	0.624
	SI5	0.626
Internal Integration	II1	0.721
	II2	0.719
	II3	0.677
	II4	0.745
	II5	0.712
Customer Integration	CI1	0.734
	CI2	0.510
	CI3	0.625
	CI4	0.715
	CI5	0.695

KMO: 0.953
Barlett's Test of Sphericity : Approx. Chi-Square 3150.785, df : 105, Sig.: 0.000

Table 15: Independent variable KMO and Bartlett's Test

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.235	61.566	61.566	9.235	61.566	61.566
2	1.159	7.729	69.295	1.159	7.729	69.295
3	.654	4.357	73.652			
4	.569	3.796	77.448			
5	.511	3.406	80.854			
6	.444	2.961	83.815			
7	.375	2.498	86.314			
8	.345	2.299	88.612			
9	.341	2.274	90.886			
10	.304	2.027	92.912			
11	.247	1.647	94.560			
12	.228	1.520	96.080			
13	.216	1.442	97.522			
14	.211	1.404	98.926			
15	.161	1.074	100.000			

Extraction Method: Principal Component Analysis.

Table 16: Total variance of the variable

Secondly from the eigenvalue table as shown in table 16, it shows that there are 15 components derived from factor analysis. The first component from the table shows that it has the highest eigenvalue, this is due to the first component been accounting the most variance. The cumulative percentage on the second components indicates that the first two components accumulate up to 69.295% of the total variance.

4.5.2 Reliability Test

McDonald (2014) mentioned that the reliability of the dependent variable (DV) and independent variables (IVs) should be established based on the factor loading in the validity process. From the data, cronbach alpha is used to check for reliability, from table 17, the reliability alpha α value of the DV is 0.927, while the IVs were also determined as the α value were 0.898, 0.916 and 0.903 correspondingly. Hence, it can be said that the variable items

related to the study are reliable and are within the acceptable range. The summary of the factor analysis values of the cronbach Alpha values are illustrated in table 17.

Variable	Item	Cronbach's Alpha
Dependent Variable		
Supply Chain Performance	5 items	0.927
Independent Variables		
Supplier Integration	5 items	0.898
Internal Integration	5 items	0.916
Customer Integration	5 items	0.903

Table 17: Reliability test of the variable

4.6 Normality Test

As mentioned by Hair et. al. (2010) that when the normality test is carried out through the IBM-SPSS statistical software it analyses the normality of the data collected. As the data collected is raw, it is therefore vital to check the normality of the data. The skewness and kurtosis is observed through the normality test, as it provides the statistical values and standard deviation of the study variables. The ideal range of the values should be between -3 to + 3 ($-3 < X < +3$) for both skewness and kurtosis as shown in the table 18 below.

As the table 18 illustrates the normality test of the variable items, both the dependent variable and independent variable are all are within the scope range of ($-3 < X < +3$) for the skewness and kurtosis. It can therefore be assumed that all the data in this study are normally distributed and the model is well fit to test the research study proposed hypotheses.

Variable	Item	Skewness	Kurtosis
Dependent Variable			
Supply Chain Performance	SP1	-1.425	-1.472
	SP2	-1.507	2.210
	SP3	-1.367	1.962
	SP4	-1.418	1.343
	SP5	-1.544	1.910
Independent Variables			
Supplier Integration	SI1	-1.115	0.897
	SI2	-1.023	0.576
	SI3	-1.438	1.653
	SI4	-1.120	0.645
	SI5	-0.939	0.194
Internal Integration	II1	-1.341	2.012
	II2	-1.461	2.028
	II3	-1.457	2.033
	II4	-1.277	1.249
	II5	-1.439	1.790
Customer Integration	CI1	-1.597	2.330
	CI2	-1.188	1.162
	CI3	-1.348	1.541
	CI4	-1.671	2.121
	CI5	-1.566	1.948

Table 18: Normality test of the variable

4.7 Regression Analysis

Multiple regression is conducted to evaluate if there is a relationship between the variables and if the model can describe the research hypothesis (Bougie and Sekaran, 2013). As stated by Hair et. al. (2013), if the r square (r^2) value is considered low if its 0.25, if the r square (r^2) is 0.5 it is considered medium and if the r square (r^2) is 0.75 it is considered high. Some research studies however mentioned that if the r square (r^2) is 0.75 it is considered high (Bougie and Sekaran, 2013; Zikmund et. al., 2013).

4.7.1 The Relationship between SI and SP

Hypothesis 1: IoT has a positive effect on Supplier Integration towards Supply Chain Performance in Malaysian SME's.

$H_o = \beta SI = \beta SP = 0$

$H1 = \beta \neq \beta$

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.718[a]	.515	.514	3.104

a. Predictors: (Constant), SI

Table 19: Model summary of Hypothesis 1

As illustrated in table 19 the r square (r^2) value stipulates that 51.5% of the variance (r^2 = 0.515) in Supply Chain Performance in Klang Valley (SP) can be shown by Supplier Integration (SI) and the rest 48.5% of the variation attributes to other factors.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2693.708	1	2693.708	279.659	.000[b]
	Residual	2533.251	263	9.632		
	Total	5226.958	264			

a. Dependent Variable: SP

b. Predictors: (Constant), SI

Table 20: Annova table of Hypothesis 1

As illustrated in table 20, the significant value of the p-value α shows that it is less than 0.05 (<0.05) (P- value = 0.000) and we can therefore presume that this model is significant and conclude that these variables have a significant relationship between Supplier Integration to Supply Chain Performance.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.195	.951		5.464	.000
	SI	.763	.046	.718	16.723	.000

a. Dependent Variable: SP

Table 21: Coefficient table of Hypothesis 1

As illustrated in table 21 based on the calculated significant value of the p-value (B = .763, p= .000) we can suggest that a higher level of supplier integration is associated with a higher level of supply chain performance. Hence, we shall reject H_o and conclude there is a significant relationship between Supplier Integration with Supply Chain Performance in Klang Valley. Therefore, we can derive the equation on this linear model as illustrated below:

Equation: Linear Regression (Supplier Integration and Supply Chain Performance)

By applying values in linear regression equation:

$$\boldsymbol{Y = \beta_o + \beta 1\ \chi}$$

Supply Chain Performance = 5.195 + 0.763 (Supplier Integration)

The equation explains that an increase of each of the 1 unit in Supplier Integration, Supply Chain Performance increases by 0.763 (refer to Table 21).

4.7.2 The Relationship between II and SP

Hypothesis 1: IoT has a positive effect on Internal Integration towards Supply Chain Performance in Malaysian SME's.

$H_o = \beta II = \beta SP = 0$

$H1 = \beta \neq \beta$

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.782[a]	.611	.609	2.781

a. Predictors: (Constant), II

Table 22: Model summary of Hypothesis 2

As illustrated in table 22 the r square (r^2) value stipulates that 61.1% of the variance (r^2 = 0.611) in Supply Chain Performance in Klang Valley (SP) can be shown by Internal Integration (II) and the rest 38.9% of the variation attributes to other factors.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3193.274	1	3193.274	412.960	.000[b]
	Residual	2033.685	263	7.733		
	Total	5226.958	264			

a. Dependent Variable: SP

b. Predictors: (Constant), II

Table 23: Annova table of Hypothesis 2

As illustrated in table 23, the significant value of the p-value α shows that it is less than 0.05 (<0.05) (P- value = 0.000) and we can therefore presume that this model is significant and conclude that these variables have a significant relationship between Internal Integration to Supply Chain Performance.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.943	.845		4.663	.000
	II	.816	.040	.782	20.321	.000

a. Dependent Variable: SP

Table 24: Coefficient table of Hypothesis 2

As illustrated in table 24 based on the calculated significant value of the p-value (B = .816, p= .000) we can suggest that a higher level of internal integration is associated with a higher level of supply chain performance. Hence, we shall reject H_o and conclude there is a significant relationship between Internal Integration with Supply Chain Performance in Klang Valley. Therefore, we can derive the equation on this linear model as illustrated below:

Equation: Linear Regression (Internal Integration and Supply Chain Performance)

By applying values in linear regression equation:

$$\boldsymbol{Y = \beta_o + \beta 1\ \chi}$$

Supply Chain Performance = 3.943 + 0.816 (Internal Integration)

The equation explains that an increase of each of the 1 unit in Internal Integration, Supply Chain Performance increases by 0.816 (refer to Table 24).

4.7.3 The Relationship between CI and SP

Hypothesis 1: IoT has a positive effect on Customer Integration towards Supply Chain Performance in Malaysian SME's.

$H_o = \beta CI = \beta SP = 0$

$H1 = \beta \neq \beta$

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.835[a]	.698	.697	2.450

a. Predictors: (Constant), CI

Table 25: Model summary of Hypothesis 3

As illustrated in table 25 the r square (r^2) value stipulates that 69.8% of the variance (r^2 = 0.698) in Supply Chain Performance in Klang Valley (SP) can be shown by Customer Integration (CI) and the rest 30.2% of the variation attributes to other factors.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3647.877	1	3647.877	607.563	.000[b]
	Residual	1579.082	263	6.004		
	Total	5226.958	264			

a. Dependent Variable: SP

b. Predictors: (Constant), CI

Table 26: Annova table of Hypothesis 3

As illustrated in table 26, the significant value of the p-value α shows that it is less than 0.05 (<0.05) (P- value = 0.000) and we can therefore presume that this model is significant and conclude that these variables have a significant relationship between Customer Integration to Supply Chain Performance.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.018	.736		4.102	.000
	CI	.647	.026	.835	24.649	.000

a. Dependent Variable: SP

Table 27: Coefficient table of Hypothesis 3

As illustrated in table 27 based on the calculated significant value of the p-value (B = .647, p= .000) we can suggest that a higher level of customer integration is associated with a higher level of supply chain performance. Hence, we shall reject H_o and conclude there is a significant relationship between Customer Integration with Supply Chain Performance in Klang Valley. Therefore, we can derive the equation on this linear model as illustrated below:

Equation: Linear Regression (Customer Integration and Supply Chain Performance)

By applying values in linear regression equation:

$$\boldsymbol{Y = \beta_o + \beta 1\ \chi}$$

Supply Chain Performance = 3.018 + 0.647 (Customer Integration)

The equation explains that an increase of each of the 1 unit in Customer Integration, Supply Chain Performance increases by 0.647 (refer to Table 27).

4.8 Chapter Summary

From the analysis of the tests and discussions described above, we can say that the chapter has determined that Supply Chain Model of SMEs among respondents in this study. The research study has also determined that IoT is a factor to be considered that can influence Supply Chain Performance. It can be noted that such factors of Supplier Integration, Internal Integration and Customer Integration are the factors that can influence Supply Chain Performance in Klang Valley. The research study also shows that 51.5% variance of Supplier Integration, 61.1% variance of Internal Integration and 69.8% variance of Customer Integration influence Supply Chain Performance respectively. Lastly, the research also indicated that all the relationships of the research three proposed hypotheses are significant and can influence supply chain performance in Klang Valley. The table 28 below shows a summary of the hypotheses results.

HYPOTHESIS	DESCRIPTION	RESULT
H1	There is a significant relationship between Supplier Integration and Supply Chain Performance	**Supported** P-value (0.000) < 0.05
H2	There is a significant relationship between Internal Integration and Supply Chain Performance	**Supported** P-value (0.000) < 0.05
H3	There is a significant relationship between Customer Integration and Supply Chain Performance	**Supported** P-value (0.000) < 0.05

Table 28: Summary of Hypothesis result

CHAPTER 5 DISCUSSION, CONCLUSION AND RECOMMENDATION

This chapter will cover the summary of chapter 1 to 4 at will core focus on the discussion, conclusion and recommendation. The chapter will first provide a summary of the research questions that reflects the research objectives and the literature review. It will then analyse the research conceptual framework based from the research. The research will highlight the key findings that reflect the factors of Supplier Integration (SI), Internal Integration (II) and Customer Integration (CI) towards Supply Chain Performance (SP). Moreover, it will specify the future research recommendations and contributions of the study. Lastly, the chapter will point out personal researcher's considerations and the study conclusion.

CHAPTER SECTION	DESCRIPTION
5.0 Chapter Overview	This section will provide a summary of the sections in this chapter.
5.1 Research Questions and Research Methodology	This section will recap the research questions based on the data analysis used on research methods.
5.2 Conceptual Framework	This section will revaluate the conceptual framework based on the findings of the study and the results.
5.3 Discussion of the Key Findings	This section will highlight and discuss the key research findings based on the analysis done in previous chapter.
5.4 Future Recommendations	This section will specify the future research recommendations.
5.5 Contribution of Study	This section will cover and discuss the study contributions to future researchers, government and the industry.
5.6 Personal Reflection	This section will point out personal researcher's thoughts, considerations and opinions from the research.
5.7 Conclusion	This section will sum up, summarize and give a conclusion of the overall study.

Table 29: Chapter 5 outline

5.1 Research Questions and Research Methodology

This research study aimed to determine the significant relationship between Supplier Integration, Internal Integration and Customer Integration with Supply Chain Performance of SMEs in Klang Valley, Malaysia. Three research questions were construed according to the research objectives to determine the influence in enhancing supply chain performance of SMEs in Klang Valley, Malaysia.

The main tools used to propose and determine the research hypotheses of the study are from the research questions. Listed below are the research questions derived for this study:

RQ1: Does internal integration influence supply chain performance in Malaysian SMEs

RQ2: Does supplier integration influence supply chain performance in Malaysian SMEs

RQ3: Does customer integration influence supply chain performance in Malaysian SMEs

REASEARCH QUESTIONS	**RESEARCH METHOD**	**DATA ANALYSIS**
RQ1: Does internal integration influence supply chain performance in Malaysian SMEs	Quantitative	Statistical tool used: Descriptive analysis, reliability test, validity test, KMO Bartlett's test and factor analysis test.
RQ2: Does supplier integration influence supply chain performance in Malaysian SMEs	Quantitative	Statistical tool used: Descriptive analysis, reliability test, validity test, KMO Bartlett's test and factor analysis test.
RQ3: Does customer integration influence supply chain performance in Malaysian SMEs	Quantitative	Statistical tool used: Descriptive analysis, reliability test, validity test, KMO Bartlett's test and factor analysis test.
RQ1, RQ2, RQ3 and RQ4	Quantitative	Statistical tool used: Mean values, Annova analysis, Coefficient analysis and Regression analysis.

Table 30: Research Questions, Research Methodology and Data Analysis design

5.2 Conceptual Framework

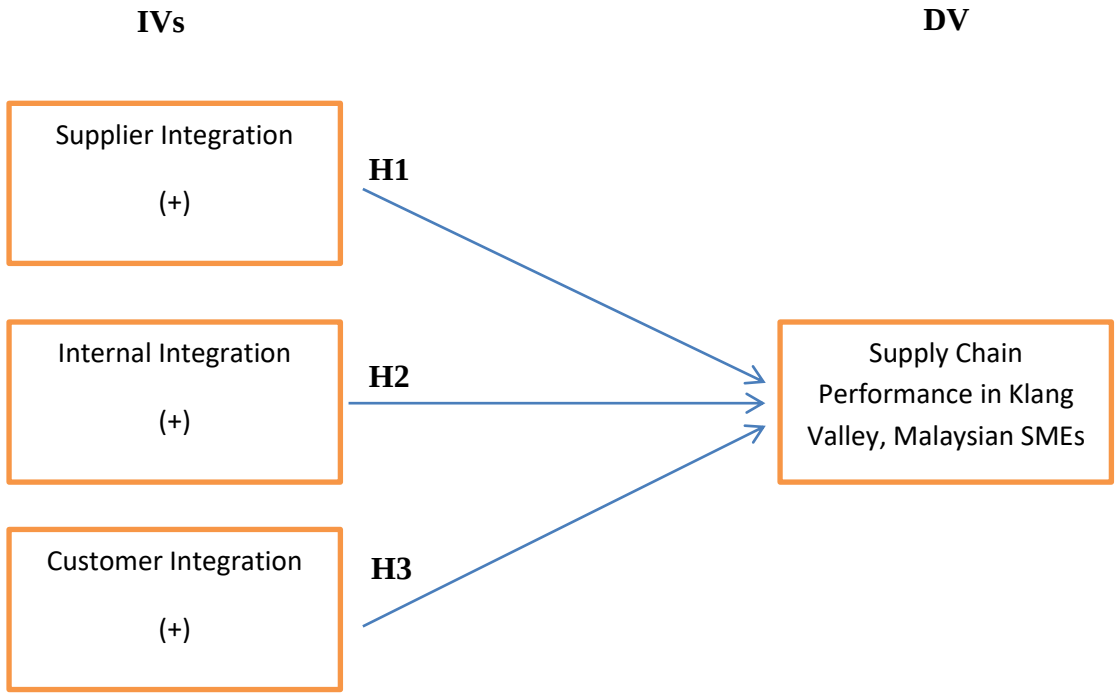


Figure 11: Conceptual Framework result of the Study

5.3 Discussion of the Key Findings

5.3.1 Findings on the relationship between Supplier Integration and Supply Chain Performance

Based on the research from the analysis done above between the relationship between supplier integration and supply chain performance, it can be determined that supplier integration has a positive relationship with supply chain performance. As shown in table 20, Supplier Integration has shown a high mean value based on the data among the items in the questionnaire. The hypothesis model of supplier integration and supply chain performance has shown a significant relationship as illustrated in table 21, as each of 1 unit increase in supplier integration, supply chain performance has high influence. Moreover, as shown in table 20 the determined p-value has evidently proven that there is a significant relationship of the hypothesis between supplier integration and supply chain performance and hence, we shall reject H_0 and conclude that there is significant relationship.

According to the literature discussions, the findings of the analysis of this research are supported with Vass, Shee and Miah (2018) who stated that the adoption of IoT with supplier integration will enhance supply chain performance, as the integration of supplier and the firm will enhance operational lead time and be cost efficient. As according to Shafique et al., (2018), who mentioned that supplier integration will help the firms and suppliers to predict rapid change in firms demand and understand by anticipate the needs of the firms. Hence, this will create a long term positive relationships between organizations and suppliers by showing transparency, enabling advanced quality planning and controlling while tracking and tracing products.

With the result from the hypotheses of supplier integration and supply chain performance, the ability of organizational capabilities will enable firms to gain performance outcomes and creates value that gives competitive advantages from integration of the process capability in which affects a business performance of internal and external capabilities. Moreover, as stated by Balashova and Gromova (2016), the RBV model will support organization to use IoT as a resource to create strategic opportunities for gaining competitive advantage and the organizational development from the integration of IoT in the process of supplier integration and supply chain performance. Therefore, from the key findings of our research study and the literature, we can conclude that there is a positive relationship between supplier integration and supply chain performance of SMEs in Kang Valley, Malaysia.

5.3.2 Findings on the relationship between Internal Integration and Supply Chain Performance

Based on the research from the analysis done above between the relationship between internal integration and supply chain performance, it can be determined that internal integration has a positive relationship with supply chain performance. As shown in table 23, Internal Integration has shown a high mean value based on the data among the items in the questionnaire. The hypothesis model of internal integration and supply chain performance has shown a significant relationship as illustrated in table 24, as each of 1 unit increase in internal integration, supply chain performance has high influence. Moreover, as shown in table 23 the determined p-value has evidently proven that there is a significant relationship of the hypothesis between internal integration and supply chain performance and hence, we shall reject H_0 and conclude that there is significant relationship.

According to the literature discussions, the findings of the analysis of this research are supported with Brous, Janssen and Herder (2019) and Shafique et al., 2018 whom mentioned that internal integration affects a business overall operation performance within the company's internal, process, and product integration from information and communication technologies in facilitating real time cross functional information sharing within the business to achieve supply chain performance. As with Ben-Daya et al. (2017), IoT will enable smart devices to make planning, scheduling and smart decisions to more efficient supply chain operations based on real-time information. Moreover, strategic, tactical and operational information sharing through IoT within a firm, it will maximise the value of the entire supply chain in achieving supply chain performance.

With the result from the hypotheses of internal integration and supply chain performance, the ability of organizational capabilities will enable firms to gain performance outcomes and creates value that gives competitive advantages from integration of the process capability in which affects a business performance of internal and external capabilities. Moreover, as stated by Balashova and Gromova (2016), the RBV model will support organization to use IoT as a resource to create strategic opportunities for gaining competitive advantage and the

organizational development from the integration of IoT in the process of internal integration and supply chain performance. Therefore, from the key findings of our research study and the literature, we can conclude that there is a positive relationship between internal integration and supply chain performance of SMEs in Kang Valley, Malaysia.

5.3.3 Findings on the relationship between Customer Integration and Supply Chain Performance

Based on the research from the analysis done above between the relationship between customer integration and supply chain performance, it can be determined that customer integration has a positive relationship with supply chain performance. As shown in table 26 Customer Integration has shown a high mean value based on the data among the items in the questionnaire. The hypothesis model of customer integration and supply chain performance has shown a significant relationship as illustrated in table 27, as each of 1 unit increase in customer integration, supply chain performance has high influence. Moreover, as shown in table 26, the determined p-value has evidently proven that there is a significant relationship of the hypothesis between customer integration and supply chain performance and hence, we shall reject H_0 and conclude that there is significant relationship.

According to the literature discussions, the findings of the analysis of this research are supported with Vass, Shee and Miah (2018) and Shafique et al., (2018) whom mentioned that customer integration with IoT will enable a firm to gain competitive advantages through supply chain performance by enabling a firm to meet customers' demands through product customization in which firms will have customer information in planning and understanding their needs. Moreover supported with Kalem et al., (2016) stated that customer integration will allow firms to have customer's information according to their needs that will help that be competitive in the market and gain market share. As per the highlight of the study we could say that customer integration will help firms to understand customer needs, in store operations, promotions, improving deliveries and prevent stock outs.

With the result from the hypotheses of customer integration and supply chain performance, the ability of organizational capabilities will enable firms to gain performance outcomes and creates value that gives competitive advantages from integration of the process capability in which affects a business performance of internal and external capabilities. Moreover, as stated by Balashova and Gromova (2016), the RBV model will support organization to use IoT as a resource to create strategic opportunities for gaining competitive advantage and the organizational development from the integration of IoT in the process of customer integration and supply chain performance. Therefore, from the key findings of our research study and the literature, we can conclude that there is a positive relationship between customer integration and supply chain performance of SMEs in Kang Valley, Malaysia.

5.4 Future Recommendations

The researcher proposes some suggestions for future studies, according to the key results and findings of the research study. The recommendation on the impact of internet of things in supply chain for future studies includes the following:

It would be sufficient enough to increase the number of sample size to attain more accurate information since the current sample size solely fits the current study. As for the future studies to be conducted within the scope of Malaysia there should be more time frame given to conduct the study within the scope so as to cover a large audience as this study had less time frame constraints. Moreover, the scope of the research should be expanded to a wider population in Malaysia, as this would help to gain and expand the comparative insights within the scope with effective and reliable data to be obtained.

The research study should also focus to carryout qualitative research that will comprise of interviews to get more precise understanding on the relationship of internet of things on supply chain towards supply chain performance. Moreover, mixed methods could also be used to capture information and data that will be more reliable and effective towards the impact of internet of things on supply chain towards supply chain performance.

5.5 Contribution of Study

This research will contribute significantly to different members both theoretically and practically. To academicians, it will help them to better understand the impact of IoT in SCM that validates a positive effect to SME's. It will help future researchers and entrepreneurs on the knowledge of the importance of IoT in SCM. It will help academicians to access the study as a reference that will add value for future research purposes.

For the Industry, it will benefit business owners by improving their business practices, performance and growth by enhancing their knowledge on the effects of IoT in SCM. The study will establish feasibility analysis and positive effects for industry players to analyse and adopt IoT in their supply chain as it will be assisting them. It will help supply chain and operation managers to improve in their supply chain performance while enhancing the business capabilities.

For government and policy makers, it will help them in providing the insights of the technological digitalization impacted in SME's to improve their business performance that will bring long term success to the economy in which is majorly contributing to the country's economy such as GDP. The research will give suggestion from the analysis on the investment of IoT to be integrated in the business process to add value and bring competitive advantages to the industry as the policy makers will help to adjust on the laws and regulations of business trade and labour purposes.

5.6 Conclusion

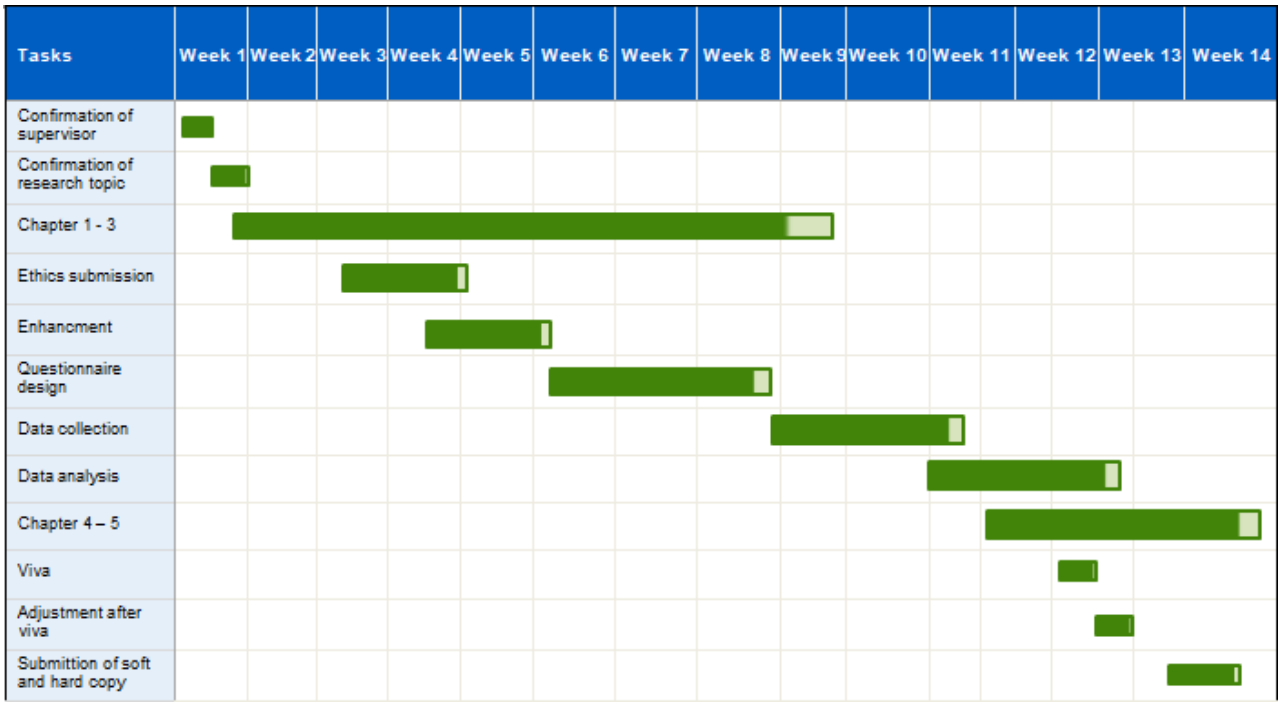
In conclusion, in this research study, it has highlighted several research findings that clearly explain the impact of IoT on supply chain of SMEs to enhance supply chain performance in Klang Valley, Malaysia. By identifying the relationship of the hypotheses of the variables of supplier integration, internal integration, customer integration towards supply chain performance. Based on the analysis of the independent and dependent variable test, key results showed that there is a significant relationship between all the variables in the research study. However, through the extensive literature review explained, it can be said that the impact of the emerging technology forms of digitalization of IoT, we can conclude that IoT can impact a business with capabilities on sustainable competitive advantage to improve its supply chain. As indicated in several literatures such as of Shafique et al., (2018) and Vass, Shee and Miah, (2018) that the effect of IoT in supply chain will enhance supply chain operations towards performance. Therefore, Malaysian SMEs should recognize the impact of IoT to influence a business and supply chain performance towards growth. The effect in supply chain performance will administer a business to grow. As a result from the positive effect of supply chain performance, Malaysian SMEs mutually will increase in its growth and contribute primary towards GDP growth. Hence, this research will fill up the gap towards the impact of IoT in Malaysian SMEs in supply chain performance.

5.7 Personal Reflection

Through completing this research study, i was aware of the importance of understanding the impact of IoT on supply chain in enhancing supply chain performance. The study has engaged me to learn on conducting and researching quantitative methods of research in numerous ways such as writing of the project and its requirements, followed by selecting research topics, developing conceptual framework, deriving research questions, research objectives and research hypotheses. I as the researcher, also gained in using, understanding, analysis and interpreting SPSS Software through conducting the research study. The researcher found fewer literatures while conducting the research study on the impact of IoT on the supply chain in enhancing supply chain performance, but there have been many literatures in different contexts. The researcher had a better understanding of the theories and applications explained in this research after completing the study.

Special thanks to Mr Francis and Dr Sharifah for giving a lot of insight and guidance to me at every step, as i was guided in every angle for improvement and adjustments to complete the project with high quality with the limited time given. I as the researcher can conclude that the entire research was a learning experience that felt valuable to broaden my knowledge.

6.0 GANTT CHART



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8.0 APPENDIX

8.1 Sample Questionnaire Survey

THE IMPACT OF INTERNET OF THINGS (IOT) ON SUPPLY CHAIN OF SME'S IN KLANG VALLEY, MALAYSIA

Dear Sir or Madam,

Thank you for agreeing to respond to this questionnaire; I am a student of INTI International University, Nilai and is required to conduct a research on the topic of "The impact of Internet of Things (IoT) on supply chain of SME's in Klang Valley, Malaysia" as a requirement to complete of my degree of Master in Business Administration (MBA).

The aim of this study is to identify and determine the impact of Internet of Things (IoT) on supply chain of SME's in Klang Valley, Malaysia.

The questions in this survey are designed for the requirement of my project. The questionnaire will just take about five or ten minutes of your time and your name will not be recorded or disclosed in any manner throughout the project and the report. The data collection is done by the researcher personally. The participant should be above 18 years old. Third parties are not allowed to access the data and the data will be stored via encryption method with password. The answers will not be released to others for viewing.

Without your cooperation and support, this research cannot be accomplished. Please take your time to participate in this survey. It is completely up to you whether or not you decide to take part in this study.

Researcher: Ally H Baalwy
INTI International University
Thank you.

If you agree to participate to this survey, please tick "agree"
☐ Agree

Part A: Company Profile

Instruction: please tick (✓) at the appropriate box.

1. in what Industry group does your business belongs to?

☐ Services

☐ Manufacturing

☐ Agriculture

☐ Construction

☐ Mining & Quarrying

☐ Others: _____

2. How long has your business been operating?

☐ 1 – 5 years ☐ 6 – 10 years ☐ 11 – 15 years ☐ 16 – 20 years ☐ 20 years and above

3. How many people are employed?

☐ Less than 5 employees

☐ 5 - 75 employees

☐ 75 - 200 employees

Part B: Supply Chain Performance in Malaysian SME in Klang Valley, Malaysia

Please indicate your level of agreement according to the 5 points Likert scale:
Instruction: Please tick (√) in the box with relevant information

Factor	#	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Supply Chain Performance	1	IoT will improve product quality.	1	2	3	4	5
	2	IoT will improve supply chain delivery reliability.	1	2	3	4	5
	3	IoT will improve perfect order fulfilment (deliveries with no errors).	1	2	3	4	5
	4	IoT will improve supply chain flexibility (react to product changes).	1	2	3	4	5
	5	IoT will provide real time information by controlling and monitoring supply chain activities to enhance efficiency.	1	2	3	4	5

Part C: Supplier Integration

Please indicate your level of agreement according to the 5 points Likert scale:
Instruction: Please tick (√) in the box with relevant information

Factor	#	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Supplier Integration	1	Improve information exchange with our suppliers	1	2	3	4	5
	2	Establish a quick ordering of inventory from our suppliers	1	2	3	4	5
	3	Share real-time demand forecasts with our suppliers	1	2	3	4	5
	4	Help our suppliers improve their processes to better meet our needs	1	2	3	4	5
	5	Improve procurement processes for logistics partners to deliver orders just in time	1	2	3	4	5

Part D: Internal Integration

Please indicate your level of agreement according to the 5 points Likert scale:
Instruction: Please tick (√) in the box with relevant information

Factor	#	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Internal Integration	1	Improve real-time communication and linkage among all internal business functions.	1	2	3	4	5
	2	Improve inventory management in collaboration with cross functional teams	1	2	3	4	5
	3	Make and adopt demand forecasts in collaboration with cross functional teams.	1	2	3	4	5
	4	Improve replenishment of shop floor shelves.	1	2	3	4	5
	5	Reduce stock outs in the shop floor shelves.	1	2	3	4	5

Part E: Customer Integration

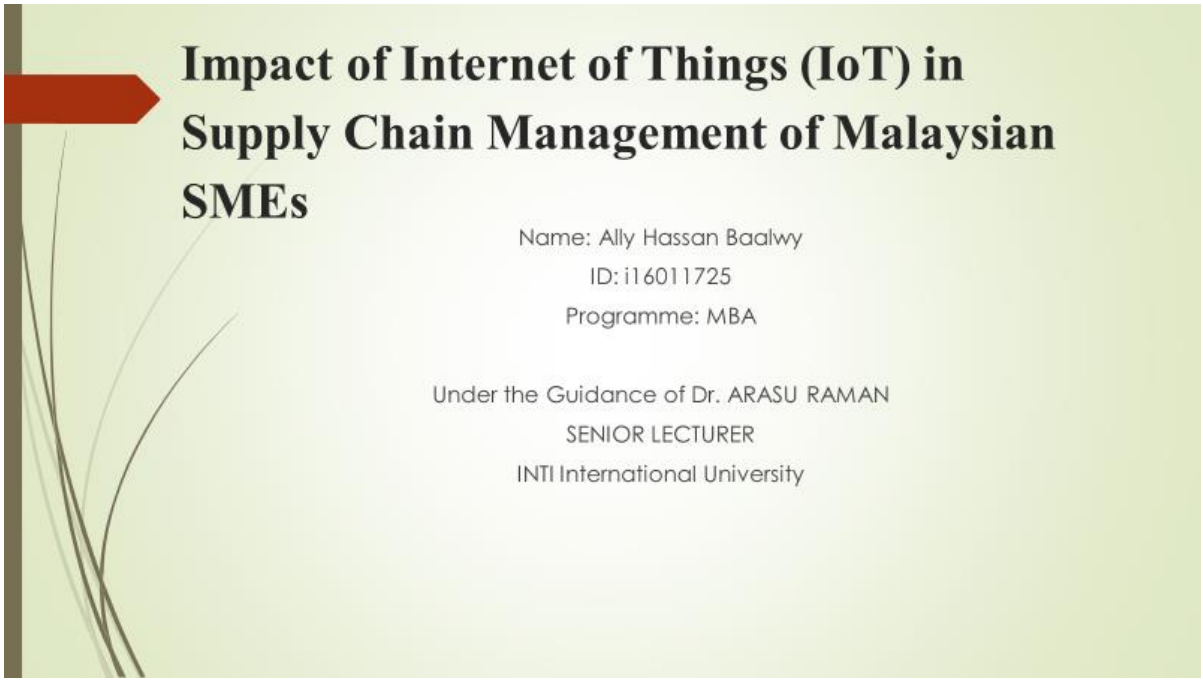
Please indicate your level of agreement according to the 5 points Likert scale:
Instruction: Please tick (√) in the box with relevant information

Factor3	#	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Customer integration	1	Improve communication with our customers on products and promotions	1	2	3	4	5
	2	Make and adopt demand forecasts with a real-time understanding of market trends	1	2	3	4	5
	3	Improve the customer shopping experience/time/ordering/customising processes	1	2	3	4	5
	4	Improve quality control and real-time visibility of products	1	2	3	4	5
	5	Improve checkout/dispatch/delivery	1	2	3	4	5

		process of goods					

Thank you very much for reading this information and giving consideration to taking part in this study.

8.2 PowerPoint Slides



Introduction

- **Background**

Digitization is happening all over the world including business transformation of its management and operations. The supply chain management is going through transformation of driven development of innovation. Through integration of technologies into the business, businesses will enhance their productivity while cutting costs and increase customer satisfaction from efficient supply chain management. IoT is changing business operations methods to automation process of smart technology. The IoT has a great potential contribution to supply chain management.

- **Problem Statement**

-Supply chain management has always presented a big challenge in SME by numerous factors such as decision making, order fulfilment of delivery, on-site real-time information, inventory management, automating processes inefficient handling of stock, logistic mismanagement, improper handling of data.

-Many businesses have not translated the benefit of IoT technology in their firms as they are not ready being utilised (Liu, Prajogo and Oke, 2016).

-There are no enough studies on managerial aspects on IoT as a solution to improvise supply chain management (Vass, Shee and Miah, 2018).

-Therefore, this makes it challenging for Malaysian SMEs to make informed decisions on the adoption and implementation of IoT to business processes

-Malaysian SMEs failure are due to effective supply chain management, logistics and high cost of distribution (Abdullah, Yaakub and Subhan, 2016).

Research Questions

1. Are Malaysian SME's aware of IoT as an aid in improving their business performance?
2. Do they think the importance of IoT as a tool to improve their supply chain?
3. Have Malaysia's SME's adopted IoT in their business operations?
4. What challenges will they face in adopting IoT in their business process towards supply chain?

Research Objective

1. To access the importance of IoT in supply chain management to enhance supply chain performance.
2. To strengthen IoT adoption in supply chain while enhancing supply chain and business performance.
3. To make suggestions to the usefulness of IoT in supply chain management.
4. To examine the effect of Malaysian SME's in adopting IoT in their business process.

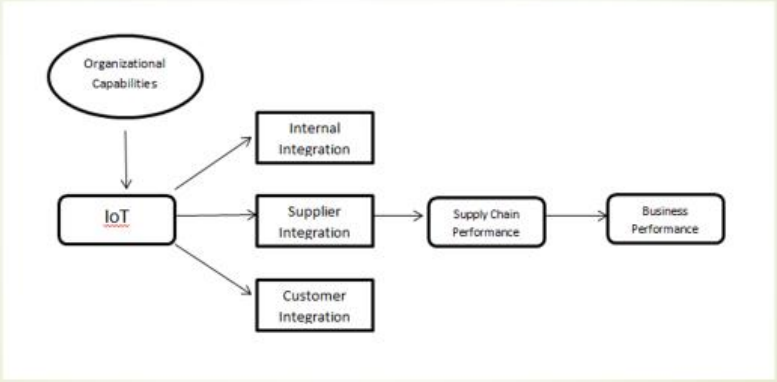
Significance of Research

- Academic - It will help future researchers and entrepreneurs on the knowledge of the importance of IoT in supply chain management. It will help academicians to access the study as a reference that will add value.
- Government - It will help SME's business owners to improve their business performance that will bring long term success in which will majorly contribute to the country's economy such as GDP.
- Industry- It will benefit business owners by improving their business performance and growth by enhancing their knowledge on the effects of IoT in supply chain management

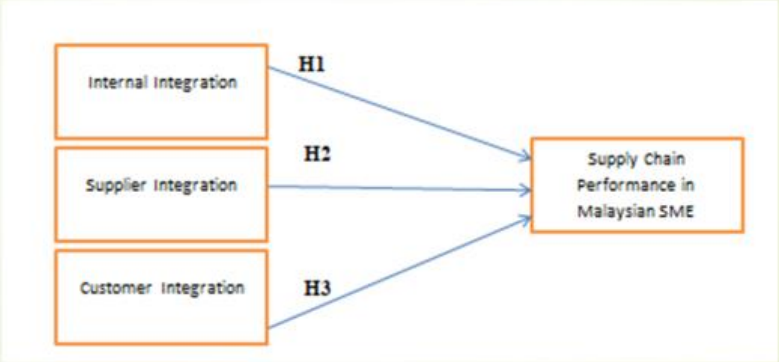
Literature Review

Year	Journal Details, with title, Vol, Issue, Page no	Author/Researcher	Title of the Work	Outcome of the Study
2017	Springer Nature	Ivanov, Tsipoulanidi, and Schönberger	Global Supply Chain and Operations Management	It is a network of resource and information involved in moving a product or service from supplier to customer.
2019	Mdpi Journals Sustainability,11(5), pp.1-20	Pakurár et al.,	The Impact of Supply Chain Integration and Internal Control on Financial Performance in the Jordanian Banking Sector.	Improve product quality and supply chain delivery reliability.
2018	Australasian Journal of Information Systems, 22(1), pp.1-25.	Vass et al.,	The effect of "Internet of Things" on supply chain integration and performance: An organisational capability perspective	IoT connects devices to the internet, it enables huge amount of data from many places to be collected and create visibility across operations.
2018	International Research Journal of Engineering and Technology (IRJET), 5(2), pp.1376-1372.	Sharma and Tiwari	Internet of things application, challenges and future scope	To monitor, track and trace supply chain entities and resources through auto captured data
2017	International Journal of Organizational Innovation, 9(3), p. 71B.	Li and Li	Internet of things drives supply chain innovation: A research framework.	IoT helps to control supply chain processes remotely.
2017	International Journal of Production Research, pp. 1-24.	Ben-Daya et al.,	Internet of things and supply chain management: a literature review	To provide real-time information to optimise supply chain activities
2016	The International Journal of Logistics Management, 27(2), pp. 395-417.	Wu et al.,	Smart supply chain management: a review and implications for future research	To strengthen inter and intra organisational information sharing within the supply chain.
2017	International Journal of Organizational Innovation, 9(3).	Li	Internet of Things drives supply chain innovation: a research framework.	Share real-time demand forecasts with our suppliers and accurately plan and adopt the procurement process in collaboration with our suppliers.
2018	Australasian Journal of Information Systems, 22(1), pp.1-25.	Vass, Shee and Miah	The effect of "Internet of Things" on supply chain integration and performance: An organisational capability perspective.	Improve the integration of data among internal functions and improve real-time communication and linkage among all internal functions.

Research Theoretical Model



Research Framework



Hypothesis

- ***H1:*** *IoT has a positive effect on internal integration towards supply chain performance in Malaysian SME's.*
- ***H2:*** *IoT has a positive effect on supplier integration towards supply chain performance in Malaysian SME's.*
- ***H3:*** *IoT has a positive effect on customer integration towards supply chain performance in Malaysian SME's.*

Research Methodology

Organization to study

Small and Medium Enterprises in West Malaysia

Research Design

Quantitative method targeted to Managers and Supply chain/ Operational Managers

Population and Sample

Random representative of 196 managers to be drawn from the population of 28,334,000 West Malaysia population with margin error of 7%

Data collection method

The respondents are random

Online questionnaire

The respondent are managers of SME's in West Malaysia

Research Methodology

Analysis of the Results / Statistical Analysis

This study will adopt descriptive and inferential statistical analysis

Descriptive Analysis

This study will consist 3-5 simple items on demographic information from the respondents such as gender, job designation, department and etc.

Inferential Analysis

Pearson correlation, F test two sample, T test two sample and Annova will be used in testing research hypothesis

FINAL MBA PRESENTATION

TITLE:The impact of Internet of Things (IoT) on supply chain of SMEs in Klang Valley, Malaysia

Name: Ally H Baalwy
Student ID: I16011725
Under the Guidance of:
Mr. Francis Wong Fock Keong

Agenda

- Introduction
- Problem Statement
- Research Gap
- Significance of Study
- Research Questions, Objectives and Hypothesis
- Conceptual Framework
- Literature Review
- Research Methods
- Pilot Tests
- Preliminary Tests
- Recommendation and Conclusion

Introduction

In recent years, **real competition is no longer between firms**, but however it has been between **firms supply chain**, as firms have valued supply chain as a critical source of competition (Al-Tarawneh and Al-Shourah, 2018). The **supply chain management** is going through transformation of driven **development of innovation,** as **digitization** is happening all over the world (Agrawal and Narain, 2018).

The purpose of this study is to consider the **impact of IoT in supply chain management** to the business industry of SMEs in Malaysia. Moreover, to determine efficient ways **SMEs can benefit** through integrating IoT on their SC in their business processes.

However, there are **limited researches** in accessing the impact of IoT in Supply Chain in SMEs .Therefore, this study needs to be conducted **to understand the impact of IoT in Supply chain of Malaysian SMEs** (Zaidi, 2017).

Problem Statement

- **Malaysian SMEs** are mostly **driven** through **supply chain**, however, they have **worsened their performance in recent years** due to **supply chain inefficiencies** (Yusoff et al., 2018). The supply chain inefficiencies are due to **inefficient order fulfilment, late deliveries , lack of on-site real-time information, poor inventory management** and etc (Phase and Mhetre, 2018).

- Many businesses have **not translated** the **benefit** of IoT technology in their supply chain (Liu, Prajogo and Oke, 2016). There are **limited researches** in translating the benefit if IoT in supply chain (Vass, Shee and Miah, 2018).

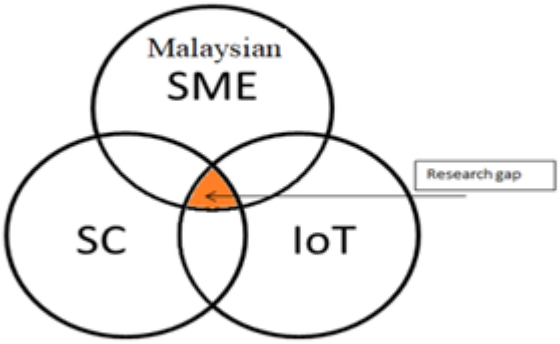
- Malaysian SMEs **have not** adopted IoT in their supply chain. **No study** is conducted to empirically assess the impact of emerging IoT adoption on supply chain management integration in Malaysia SME's.

Source: (SMECorp, 2018)

Source: (Dosm, 2019)

Research Gap

- There is a research gap on how Malaysian SMEs can adopt IoT in their supply chain to enhance performance.



- This research aims to fill the gap on how Malaysian SMEs can adopt IoT in their supply chain.

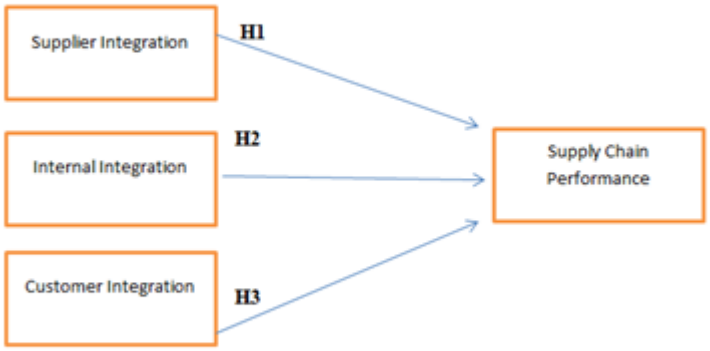
Significance of the study

- The research will be expanding supply chain model
- Test efficiency of supply chain in venturing context in Malaysia
- The research combines two theories to get more comprehensive research – 1. Organizational Capability Theory
  2. Resource Based Theory

Research Objectives, Research Questions and Hypotheses

Research Objectives	Research Questions	Hypotheses
RO1: There is a positive relationship between supplier integration and supply chain performance	RQ1: Does supplier integration influence supply chain performance in Malaysian SMEs	H1: IoT has a positive effect on supplier integration towards supply chain performance in Malaysian SMEs
RO2: There is a positive relationship between internal integration and supply chain performance	RQ2: Does internal integration influence supply chain performance in Malaysian SMEs	H2: IoT has a positive effect on internal integration towards supply chain performance in Malaysian SMEs
RO3: There is a positive relationship between customer integration and supply chain performance	RQ3: Does customer integration influence supply chain performance in Malaysian SMEs	H3: IoT has a positive effect on customer integration towards supply chain performance in Malaysian SMEs

Conceptual Framework



Source: (Vass, Shee and Miah, 2018)

Literature Review

Author's SURNAME(s) & Year	Journal Title	DV	IV	Outcome
Yahob and Jusoh (2016)	The effect of supply chain linkage on micro and small enterprises' performance	x		Influence of supply chain performance
Ben-Daya, Hassini and Bahroun (2017)	Internet of things and supply chain management: a literature review	x		Adoption of innovation to enhance supply chain performance
Zaidi (2017)	The IoT Readiness of SMEs in Malaysia: Are they Worthwhile for Investigation?	x		IoT benefit towards SMEs in Malaysia
Ali and Haseeb (2019)	Radio frequency identification (RFID) technology as a strategic tool towards higher performance of supply chain operations in textile and apparel industry of Malaysia	x	x	Technological tools in aiding higher performance of supply chain
Vaz, Shee and Miah (2018)	Internet of Things for improving supply chain performance	x	x	Influence of IoT integration in Supply chain
Haddud, DeSouza, Khare and Lee (2017)	Examining potential benefits and challenges associated with the Internet of Things integration in supply chains		x	
Shafique, Rashid, Bajwa, Kazmi, Khurshid and Tahir (2018)	Effect of IoT Capabilities and Energy Consumption behavior on Green Supply Chain Integration		x	
Ramakrishnan and Ma (2018)	Adaptive Supply Chain Systems: IoT Based Conceptual Framework		x	

Research Methods

	Details	Citations
Purpose of Study	Descriptive research	Lewis, Saunders and Thornhill (2015)
Type of Investigation	Quantitative Correlations Design	Bougie and Sekaran (2016)
Extent of researcher interference	Minimal	Bougie and Sekaran (2016)
Study Setting	Non-contrived	Bougie and Sekaran (2016)
Time Horizon	Cross-sectional	Lewis, Saunders and Thornhill (2015)
Unit of Analysis	Individual	Bougie and Sekaran (2016)
Target Population	312,937 SMEs	SMECorp (2019)
Sample size	265	Raosoft (2004)
Research Sampling Procedure	Convenience sampling	Bougie and Sekaran (2016)
Data collection	Online Questionnaire and Hard copy Questionnaire	Zikmund *et al.*, (2013)

Summary of Proposed Questionnaire Items

Section	Variable	Items	Source
A	Company Profile	3	Aldinato and Kristandy (2015), Alon et. Al (2015)
B (Dependent Variables)	Supply Chain Performance in Malaysian SMEs	5	Li and Li (2017), Haseeb and Ali (2019), Zaidi (2017), Tu (2018), Wu et al. (2016), Vass, Shee and Miah (2018)
C (Independent Variables)	Supplier Integration	5	Flynn, Koufteros and Lu (2016), Shafique et al., (2018), Vanpoucke et al. (2017), Burmester et al. (2017), Vass, Shee and Miah (2018), Kumar et al. (2017), Verdouw et al. (2016)
	Internal Integration	5	Ataseven and Nair (2017), Brous, Janssen and Herder (2019), Shafique et al. (2018), Yu (2015), Dang et al. (2019), Vass, Shee and Miah (2018), García-Sánchez, García-Morales and Martín-Rojas (2018)
	Customer Integration	5	Ataseven and Nair (2017), Kumar et al. (2017), Vass, Shee and Miah (2018), Nagy (2018), (Li et al., 2017), Bok (2016), Tjahjono et al., (2017), (Kalem et al., 2016)

Pilot Test

Factor Analysis- Validity Test

Variable	Item	Factor loading
Dependent variable	SP1	0.755
Supply Chain Performance	SP2	0.911
	SP3	0.871
	SP4	0.817
	SP5	0.891

KMO: 0.809
Barkit's Test of Sphericity : Approx. Chi-Square 166.634, df : 10, Sig.: 0.000

Variable - Independent Variables	Item	Factor loading
Supplier Integration	SI1	0.611
	SI2	0.706
	SI3	0.760
	SI4	0.565
	SI5	0.800
Internal Integration	II1	0.809
	II2	0.738
	II3	0.920
	II4	0.786
	II5	0.821
Customer Integration	CI1	0.862
	CI2	0.779
	CI3	0.794
	CI4	0.814
	CI5	0.860

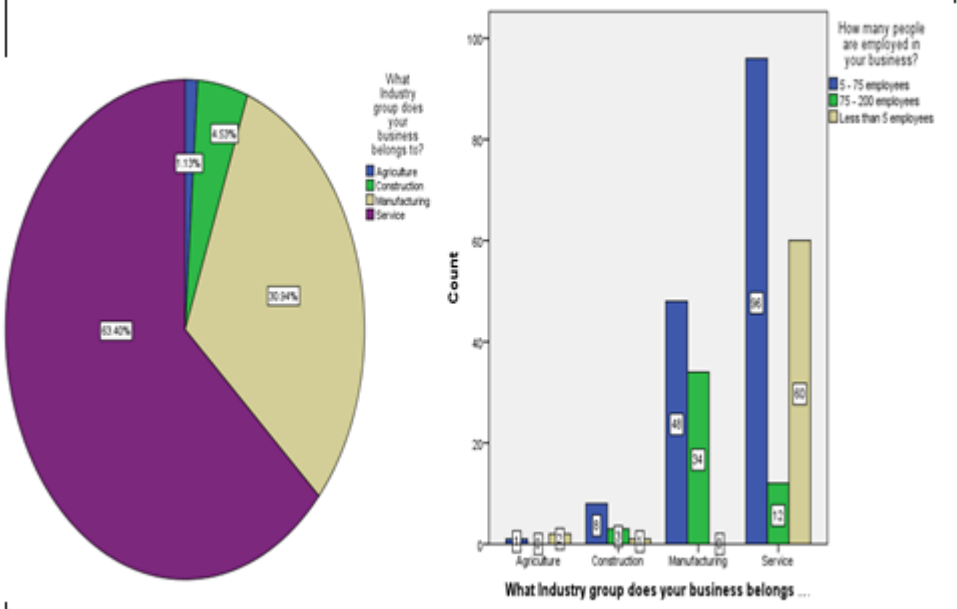
KMO: 0.881
Barkett's Test of Sphericity : Approx. Chi-Square 574.986, df : 105, Sig.: 0.000

Pilot Test

Reliability Test

Variable	Item	Cronbach's Alpha
Dependent Variable		
Supply Chain Performance	5 items	0.950
Independent Variables		
Supplier Integration	5 items	0.923
Internal Integration	5 items	0.966
Customer Integration	5 items	0.962

Preliminary Test - Company Profile



Factor Analysis- Validity Test

Variable	Item	Factor loading
Dependent variable	SP1	0.715
Supply Chain Performance	SP2	0.860
	SP3	0.753
	SP4	0.764
	SP5	0.810

KMO: 0.868
Barlett's Test of Sphericity : Approx. Chi-Square 1078.411, df : 10, Sig.: 0.000

Variable - Independent Variables	Item	Factor loading
Supplier Integration	SI1	0.798
	SI2	0.713
	SI3	0.780
	SI4	0.624
	SI5	0.626
Internal Integration	II1	0.721
	II2	0.719
	II3	0.677
	II4	0.745
	II5	0.712
Customer Integration	CI1	0.734
	CI2	0.510
	CI3	0.625
	CI4	0.715
	CI5	0.695

KMO: 0.953
Barlett's Test of Sphericity : Approx. Chi-Square 3150.785, df : 105, Sig.: 0.000

Reliability Test

Variable	Item	Cronbach's Alpha
Dependent Variable		
Supply Chain Performance	5 items	0.927
Independent Variables		
Supplier Integration	5 items	0.898
Internal Integration	5 items	0.916
Customer Integration	5 items	0.903

Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.718[a]	.515	.514	3.104

a. Predictors: (Constant), SI

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2693.708	1	2693.708	279.659	.000[b]
	Residual	2533.251	263	9.632		
	Total	5226.958	264			

a. Dependent Variable: SP

b. Predictors: (Constant), SI

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.195	.951		5.464	.000
	SI	.763	.046	.718	16.723	.000

a. Dependent Variable: SP

Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.782[a]	.611	.609	2.781

a. Predictors: (Constant), II

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3193.274	1	3193.274	412.960	.000[b]
	Residual	2033.685	263	7.733		
	Total	5226.958	264			

a. Dependent Variable: SP

b. Predictors: (Constant), II

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.943	.845		4.663	.000
	II	.816	.040	.782	20.321	.000

a. Dependent Variable: SP

Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.835[a]	.698	.697	2.450

a. Predictors: (Constant), CI

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3647.877	1	3647.877	607.563	.000[b]
	Residual	1579.082	263	6.004		
	Total	5226.958	264			

a. Dependent Variable: SP

b. Predictors: (Constant), CI

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.018	.736		4.102	.000
	CI	.647	.026	.835	24.649	.000

a. Dependent Variable: SP

Regression Analysis

Supply Chain Performance = 5.195 + 0.763 (Supplier Integration)

Supply Chain Performance = 3.943 + 0.816 (Internal Integration)

Supply Chain Performance = 3.018 + 0.647 (Customer Integration)

Key Results

HYPOTHESIS	DESCRIPTION	RESULT
H1	There is a significant relation between Supplier Integration and Supply Chain Performance	**Supported** P-value < 0.05 (P =0.000)
H2	There is a significant relation between Internal Integration and Supply Chain Performance	**Supported** P-value < 0.05 (P =0.000)
H3	There is a significant relation between Customer Integration and Supply Chain Performance	**Supported** P-value < 0.05 (P =0.000)

Recommendations, Conclusion and Limitations

- The Hypotheses has shown positive relationship
- SMEs should adopt IoT in the Supply Chain to enhance supply chain performance
- The research contributes in Malaysian context of SMEs as a reference in aiding to enhance supply chain performance

Limitations

- Time constraints, as more time will cover larger audience with in depth research
- Mixed approach will be suitable
- Geographical constraints

8.3 SPSS Tables

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.809
Bartlett's Test of Sphericity	Approx. Chi-Square	166.634
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
SP1	1.000	.755
SP2	1.000	.911
SP3	1.000	.871
SP4	1.000	.817
SP5	1.000	.891

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.244	84.883	84.883	4.244	84.883	84.883
2	.334	6.679	91.562			
3	.270	5.399	96.962			
4	.106	2.124	99.085			
5	.046	.915	100.000			

Extraction Method: Principal Component Analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.881
Bartlett's Test of Sphericity	Approx. Chi-Square	574.986
	df	105
	Sig.	.000

Communalities

	Initial	Extraction
SI1	1.000	.611
SI2	1.000	.706
SI3	1.000	.760
SI4	1.000	.565
SI5	1.000	.800
II1	1.000	.809
II2	1.000	.738
II3	1.000	.920
II4	1.000	.786
II5	1.000	.821
CI1	1.000	.862
CI2	1.000	.779
CI3	1.000	.794
CI4	1.000	.814
CI5	1.000	.860

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.624	77.496	77.496	11.624	77.496	77.496
2	.889	5.929	83.425			
3	.578	3.855	87.281			
4	.467	3.112	90.392			
5	.290	1.935	92.327			
6	.280	1.867	94.194			
7	.225	1.498	95.692			
8	.153	1.021	96.713			
9	.125	.835	97.548			
10	.110	.733	98.280			
11	.084	.563	98.844			
12	.069	.460	99.303			
13	.053	.355	99.658			
14	.038	.255	99.913			
15	.013	.087	100.000			

Extraction Method: Principal Component Analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.868
Bartlett's Test of Sphericity	Approx. Chi-Square	1078.411
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
SP1	1.000	.715
SP2	1.000	.860
SP3	1.000	.753
SP4	1.000	.764
SP5	1.000	.810

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.901	78.025	78.025	3.901	78.025	78.025
2	.415	8.302	86.326			
3	.323	6.467	92.794			
4	.220	4.392	97.186			
5	.141	2.814	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
SP1	.845
SP2	.927
SP3	.868
SP4	.874
SP5	.900

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.953
Bartlett's Test of Sphericity	Approx. Chi-Square	3150.758
	df	105
	Sig.	.000

Communalities

	Initial	Extraction
SI1	1.000	.798
SI2	1.000	.713
SI3	1.000	.780
SI4	1.000	.624
SI5	1.000	.626
II1	1.000	.721
II2	1.000	.719
II3	1.000	.677
II4	1.000	.745
II5	1.000	.712
CI1	1.000	.734
CI2	1.000	.510
CI3	1.000	.625
CI4	1.000	.715
CI5	1.000	.695

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.235	61.566	61.566	9.235	61.566	61.566
2	1.159	7.729	69.295	1.159	7.729	69.295
3	.654	4.357	73.652			
4	.569	3.796	77.448			
5	.511	3.406	80.854			
6	.444	2.961	83.815			
7	.375	2.498	86.314			
8	.345	2.299	88.612			
9	.341	2.274	90.886			
10	.304	2.027	92.912			
11	.247	1.647	94.560			
12	.228	1.520	96.080			
13	.216	1.442	97.522			
14	.211	1.404	98.926			
15	.161	1.074	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
SI1	.757	.475
SI2	.749	.390
SI3	.790	.395
SI4	.709	.349
SI5	.723	.323
II1	.798	-.292
II2	.802	-.274
II3	.786	-.243
II4	.807	-.306
II5	.831	-.147
CI1	.853	-.077
CI2	.706	-.111
CI3	.789	-.055
CI4	.830	-.158
CI5	.822	-.137

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Case Processing Summary

		N	%
Cases	Valid	30	11.3
	Excluded[a]	235	88.7
	Total	265	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.950	5

Case Processing Summary

		N	%
Cases	Valid	30	11.3
	Excluded[a]	235	88.7
	Total	265	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.923	5

Case Processing Summary

		N	%
Cases	Valid	30	11.3
	Excluded[a]	235	88.7
	Total	265	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.966	5

Case Processing Summary

		N	%
Cases	Valid	30	11.3
	Excluded[a]	235	88.7
	Total	265	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.962	5

Case Processing Summary

		N	%
Cases	Valid	265	100.0
	Excluded[a]	0	.0
	Total	265	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.927	5

Case Processing Summary

		N	%
Cases	Valid	265	100.0
	Excluded[a]	0	.0
	Total	265	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.898	5

Case Processing Summary

		N	%
Cases	Valid	265	100.0
	Excluded[a]	0	.0
	Total	265	100.0

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

Case Processing Summary

		N	%
Cases	Valid	265	100.0
	Excluded[a]	0	.0
	Total	265	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.916	5

Case Processing Summary

		N	%
Cases	Valid	265	100.0
	Excluded[a]	0	.0
	Total	265	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.903	5

Statistics

		SP1	SP2	SP3	SP4	SP5
N	Valid	265	265	265	265	265
	Missing	0	0	0	0	0
Skewness		-1.425	-1.507	-1.367	-1.418	-1.544
Std. Error of Skewness		.150	.150	.150	.150	.150
Kurtosis		1.472	2.210	1.962	1.343	1.910
Std. Error of Kurtosis		.298	.298	.298	.298	.298

Statistics

		SI1	SI2	SI3	SI4	SI5	II1	II2	II3	II4	II5	CI1	CI2	CI3	CI4	CI5
N	Valid	265	265	265	265	265	265	265	265	265	265	265	265	265	265	265
	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Skewness		-1.115	-1.023	-1.438	-1.120	-.939	-1.341	-1.461	-1.457	-1.277	-1.439	-1.597	-1.188	-1.348	-1.671	-1.556
Std. Error of Skewness		.150	.150	.150	.150	.150	.150	.150	.150	.150	.150	.150	.150	.150	.150	.150
Kurtosis		.897	.576	1.653	.645	.194	2.012	2.028	2.033	1.249	1.790	2.330	1.162	1.541	2.121	1.948
Std. Error of Kurtosis		.298	.298	.298	.298	.298	.298	.298	.298	.298	.298	.298	.298	.298	.298	.298

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	SI[b]	.	Enter

a. Dependent Variable: SP

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.718[a]	.515	.514	3.104

a. Predictors: (Constant), SI

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2693.708	1	2693.708	279.659	.000[b]
	Residual	2533.251	263	9.632		
	Total	5226.958	264			

a. Dependent Variable: SP

b. Predictors: (Constant), SI

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.195	.951		5.464	.000
	SI	.763	.046	.718	16.723	.000

a. Dependent Variable: SP

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	II[b]	.	Enter

a. Dependent Variable: SP

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.782[a]	.611	.609	2.781

a. Predictors: (Constant), II

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3193.274	1	3193.274	412.960	.000[b]
	Residual	2033.685	263	7.733		
	Total	5226.958	264			

a. Dependent Variable: SP

b. Predictors: (Constant), II

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.943	.845		4.663	.000
	II	.816	.040	.782	20.321	.000

a. Dependent Variable: SP

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	CI[b]	.	Enter

a. Dependent Variable: SP

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.835[a]	.698	.697	2.450

a. Predictors: (Constant), CI

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3647.877	1	3647.877	607.563	.000[b]
	Residual	1579.082	263	6.004		
	Total	5226.958	264			

a. Dependent Variable: SP

b. Predictors: (Constant), CI

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.018	.736		4.102	.000
	CI	.647	.026	.835	24.649	.000

a. Dependent Variable: SP

9.0 IRPP

INITIAL RESEARCH PAPER PROPOSAL (30%)

Student Name & ID No.	Ally Hassan Baalwy
Programme	Master's in business administration (Dual)
Broad Area	Management
Concise Title	Impact of Internet of Things (IoT) in supply chain management of Malaysia's SME's
Problem Definition	According to S. T Rubaneswaran (2017), the Industrial Revolution 4.0 is taking place globally, it has entered Malaysia with a quick rate. This is because the adoption of technology to have an impact in Malaysia's economy that can replace labor and direct human engagement reduction (Liu, Zhou, & Zhou, 2015). Over 97% of the businesses in Malaysia are small and medium sizes. These businesses contributed 36% of the GDP, 65% of the employment in Malaysia. (World Bank, 2016). Therefore, small and medium enterprises (SMEs) are very important to Malaysia. One of the factors to drive the SMEs in Malaysia is through supply chain management. However, Supply chain management has always presented a big challenge in SME as order fulfilment can be delayed by a number of factors which are difficult to predict or control. SME's often face delays as there are a common cause of late deliveries and stock shortages (Phase and Mhetre, 2018). Nevertheless, other challenges of lack of visibility of assets, inefficient handling of stock, logistic mismanagement, improper handling of data and ineffective supply chain risk management contribute to the challenges that businesses often face (Kothari, Jain and Venkteshwar, 2018). Accurately forecasting demand has its limitations and stock levels can be adversely affected

	by many outside inefficiency factors and this gives difficulties to businesses managing inventory in the supply chain. Malaysia SME's will have impact on the adaption of IoT in its organizational roles as information technology becomes a widely embedded across assets, operations and inventories. No study is conducted to empirically assess the impact of emerging IoT adoption on supply chain management integration in Malaysia SME's. However, as a result of technological change, Malaysian economy will face difficulties as its industry is not ready (Rubaneswaran 2017).
Research Questions	- Do SME's aware of IoT as an aid in improving their business performance. - Do they think the importance of IoT as a tool to improve their supply chain - Have Malaysia's SME's adopted IoT in their business operations. - What challenges will they face in adopting IoT in their business process towards supply chain.
Research Objectives	- To access the importance of IoT in supply chain management. - To make suggestions to the usefulness of IoT in supply chain management.
Scope of study	This study of the research will focus on Internet of Things (IoT) in supply chain management of Malaysia's SME's. The research of the study's geographical focus will be in Malaysia in which the sample collection of the data will be from SME's. Small Medium Enterprises in Malaysia will be taken as the unit analysis target of the research. As for research methodology, quantitative method will be used to perform data analysis and interpretation through cross and descriptive statistical analysis in regards for the reader to understand the data

	interpreted.
Significance of the Research	Academic - It will help future researchers and entrepreneurs on the knowledge of the importance of IoT in supply chain management. It will help academicians to access the study as a reference that will add value. Government - It will help SME's business owners to improve their business performance that will bring long term success in which will majorly contribute to the country's economy such as GDP. Industry- It will benefit business owners by improving their business performance and growth by enhancing their knowledge on the effects of IoT in supply chain management.
Literature Review	The revolution of industry 4.0 of IoT through its business activities and assets maximizes the transparency of processes by exploiting the possibilities of digitization and integrates the corporate value chain and the supply chain into a new level of customer value creation (Nagy et al, 2018). According to (Mostafa, Hamdy, Alawady, 2018) IoT can be useful in improving the performance of the whole supply chain and transforming it to be a smart one such as it can be used for monitoring, tracking products, inventory reduction cost, creating an intelligent transportation system and demand forecasting. Technological revolution will help to increase the agility, adaptability and alignment of companies cooperating in a network of supply chain within porter's value chain in order to gain competitive advantage (Nagy et al, 2018). From (Pirvulescu and Peter Enevoldsen, 2019) study it shows that businesses started adapting their strategies and prioritizing digital opportunities in order to increase supply chain performance by ensuring on-time deliveries, reduced inventories, and the ability to quickly detect and adapt to any overcoming threats.

	Hypothesis H1 Internet of Things based improves performance in supply chain processes H2 Internet of Things improves planning in supply chain H3 Internet of Things has positive impact on procurement process in supply chain H4 Internet of Things improves manufacturing process in supply chain. H5 Internet of Things resolves distribution problems in supply chain H6 Internet of Things facilitates management of return goods in supply chain
Research Methodology	This research study will use quantitative method of questionnaires via online surveys, as it is time saving to conduct the research analysis. Research questionnaires will be distributed through google online survey to the targeted respondent in Malaysia. According to RAOSOFT, Malaysia's population is used as a stratified random in which the sampling size should have 385 questionnaires. The data will be collected through online survey of google forms as it will be easier to the participants and the researcher to conduct the study with minimal error. The data will be analyzed by via IBM SPSS 22 in which the researcher is more accustomed with it and will be able to interpret in the means whereby the reader will be able to understand. Confidentiality will be assured from the researcher by making it clear to respondents that privacy and security will be perceived as it is for research purpose only.

10.0 Ethics Forms

University of Hertfordshire UH

SOCIAL SCIENCES, ARTS AND HUMANITIES ECDA

ETHICS APPROVAL NOTIFICATION

TO	Ally Hassan Baalwy
CC	Mr Wong Fock Keong
FROM	Dr Timothy H Parke, Social Sciences, Arts and Humanities ECDA Chairman
DATE	10/10/19

Protocol number: cBUS/PGT/CP/04353

Title of study: The impact of Internet of Things (IoT) on supply chain of SME's in Klang Valley, Malaysia

Your application for ethics approval has been accepted and approved with the following conditions by the ECDA for your School and includes work undertaken for this study by the named additional workers below:

no additional workers named

Conditions of approval specific to your study:

Ethics approval has been granted subject to the following conditions:

Approved conditional on the supervisor's scrutiny of the questionnaire, and on the applicant making the following changes prior to recruitment and data collection:

a) Indicate the age restriction in Form EC6, Question 5 i.e. 18 years and above to be consistent with Form EC1A Question 13
b) Make sure the maximum number of the participants is the same number in both EC6 and EC1A forms, that is 265 individuals.

General conditions of approval:

Ethics approval has been granted subject to the standard conditions below:

Permissions: Any necessary permissions for the use of premises/location and accessing participants for your study must be obtained in writing prior to any data collection commencing. Failure to obtain adequate permissions may be considered a breach of this protocol.

External communications: Ensure you quote the UH protocol number and the name of the approving Committee on all paperwork, including recruitment advertisements/online requests, for this study.

Invasive procedures: If your research involves invasive procedures you are required to complete and submit an EC7 Protocol Monitoring Form, and copies of your completed consent paperwork to this ECDA once your study is complete.

Submission: Students must include this Approval Notification with their submission.

Validity:

This approval is valid:

From: 01/11/19

To: 20/11/19

Please note:

Failure to comply with the conditions of approval will be considered a breach of protocol and may result in disciplinary action which could include academic penalties.
Additional documentation requested as a condition of this approval protocol may be submitted via your supervisor to the Ethics Clerks as it becomes available. All documentation relating to this study, including the information/documents noted in the conditions above, must be available for your supervisor at the time of submitting your work so that they are able to confirm that you have complied with this protocol.

Should you amend any aspect of your research or wish to apply for an extension to your study you will need your supervisor's approval (if you are a student) and must complete and submit form EC2.
Approval applies specifically to the research study/methodology and timings as detailed in your Form EC1A. In cases where the amendments to the original study are deemed to be substantial, a new Form EC1A may need to be completed prior to the study being undertaken.

Failure to report adverse circumstance/s may be considered misconduct.
Should adverse circumstances arise during this study such as physical reaction/harm, mental/emotional harm, intrusion of privacy or breach of confidentiality this must be reported to the approving Committee immediately.

11.0 Log Book

PROJECT PAPER LOG

This is an important document, which is to be handed in with your dissertation. This log will be taken into consideration when awarding the final mark for the dissertation.

Student Name:	**Ally Hassan Baalwy**
Supervisor's Name:	**Mr Francis Wong**
Dissertation Topic: **The Impact of Internet of Things (IoT) on Supply Chain of SMEs in Klang Valley, Malaysia.**	

SECTION A. MONITORING STUDENT DISSERTATION PROCESS

The plan below is to be agreed between the student & supervisor and will be monitored against progress made at each session.

Activity	**Milestone/Deliverable Date 2019**							
Discussing Research Topic	16/09							
Revision of Chapter 1		03/10						
Conceptual Framework		10/10						
Discussion of Chapter 2			17/10					
Review of Chapter 3			24/10					
Discussion of Research Methodology				09/11				
Adjusting the study based on proposal defence feedback				09/11				
Discussion of Chapter 4					22/11			
Discussion on the Findings of the Research						29/11		
Determining the content of Viva presentation							02/12	
Thesis adjustment and finalization								15/12

SECTION B. ETHICS

Ethics form protocol number:- cBUS/PGT/CP/04353

SECTION C. RECORD OF MEETINGS

The expectation is that students will meet their supervisors up to seven times and these meetings should be recorded.

Meeting 1

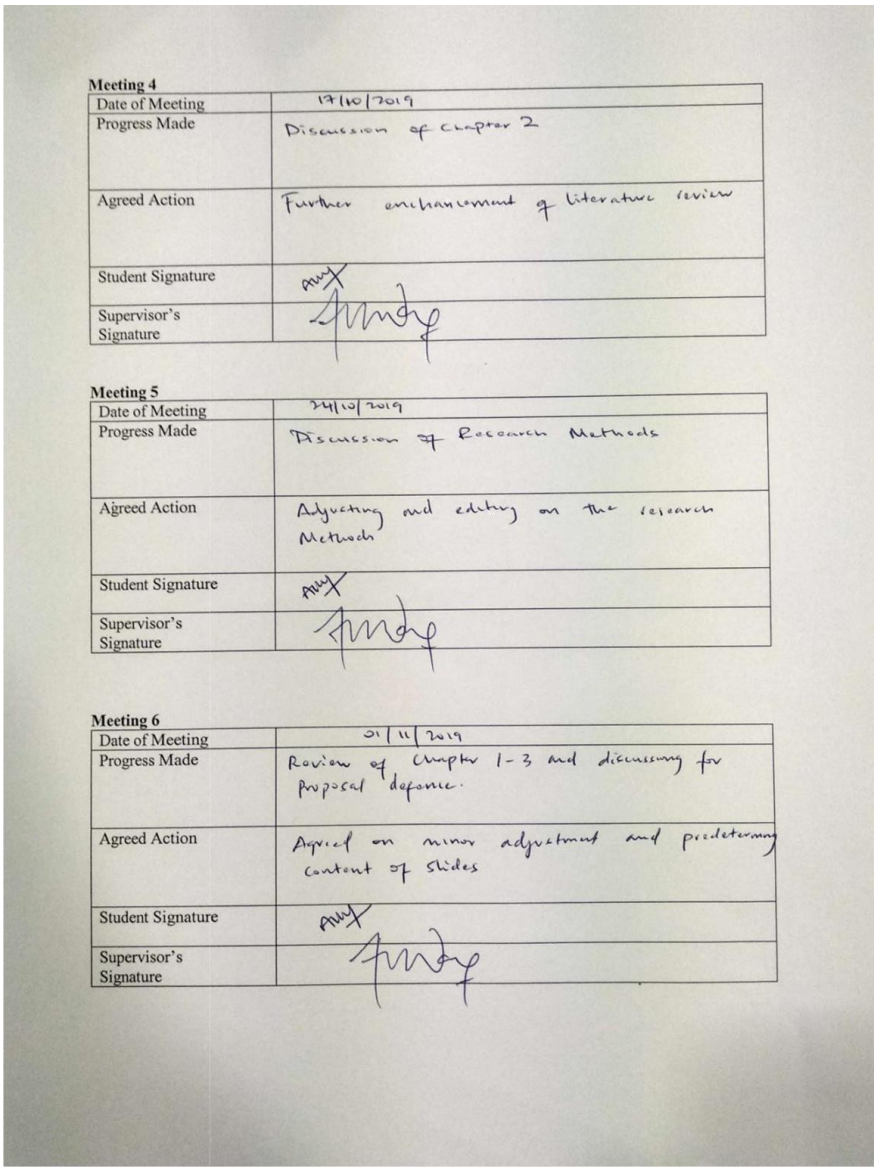
Date of Meeting	16/09/2019
Progress Made	Discussion on the research topic
Agreed Action	Further clarification of research topic
Student Signature	
Supervisor's Signature	

Meeting 2

Date of Meeting	03/10/2019
Progress Made	Revision of chapter 1
Agreed Action	Adjusting problem Statement, Research Objectives and Research Questions
Student Signature	
Supervisor's Signature	

Meeting 3

Date of Meeting	10/10/2019
Progress Made	Conceptual Framework
Agreed Action	Literature on framework of the derivation of the conceptual framework
Student Signature	
Supervisor's Signature	



Meeting 4

Date of Meeting	17/10/2019
Progress Made	Discussion of Chapter 2
Agreed Action	Further enchancement of literature review
Student Signature	
Supervisor's Signature	

Meeting 5

Date of Meeting	24/10/2019
Progress Made	Discussion of Research Methods
Agreed Action	Adjusting and editing on the research Methods
Student Signature	
Supervisor's Signature	

Meeting 6

Date of Meeting	21/11/2019
Progress Made	Review of Chapter 1-3 and discussing for Proposal defense.
Agreed Action	Agreed on minor adjustment and predetermine content of slides
Student Signature	
Supervisor's Signature	

Meeting 7

Date of Meeting	09/11/2019
Progress Made	Discussion on feedback from proposal defence
Agreed Action	Adjusting chapter 1-3 based on feedback.
Student Signature	
Supervisor's Signature	

Meeting 8

Date of Meeting	22/11/2019
Progress Made	Discussion of chapter 4
Agreed Action	The results and findings of research
Student Signature	
Supervisor's Signature	

Meeting 9

Date of Meeting	29/4/2019
Progress Made	Preparation for Final Viva presentation
Agreed Action	Determine the content of the slides based chapter 1-5
Student Signature	
Supervisor's Signature	

Meeting 10

Date of Meeting	02/12/2019
Progress Made	Chapter 1-5
Agreed Action	Discussion on the chapters done previously together with recommendations and conclusion
Student Signature	Ally
Supervisor's Signature	

Section D. Comments on Management of Project

(to be completed at the end of the dissertation process)

Student Comments

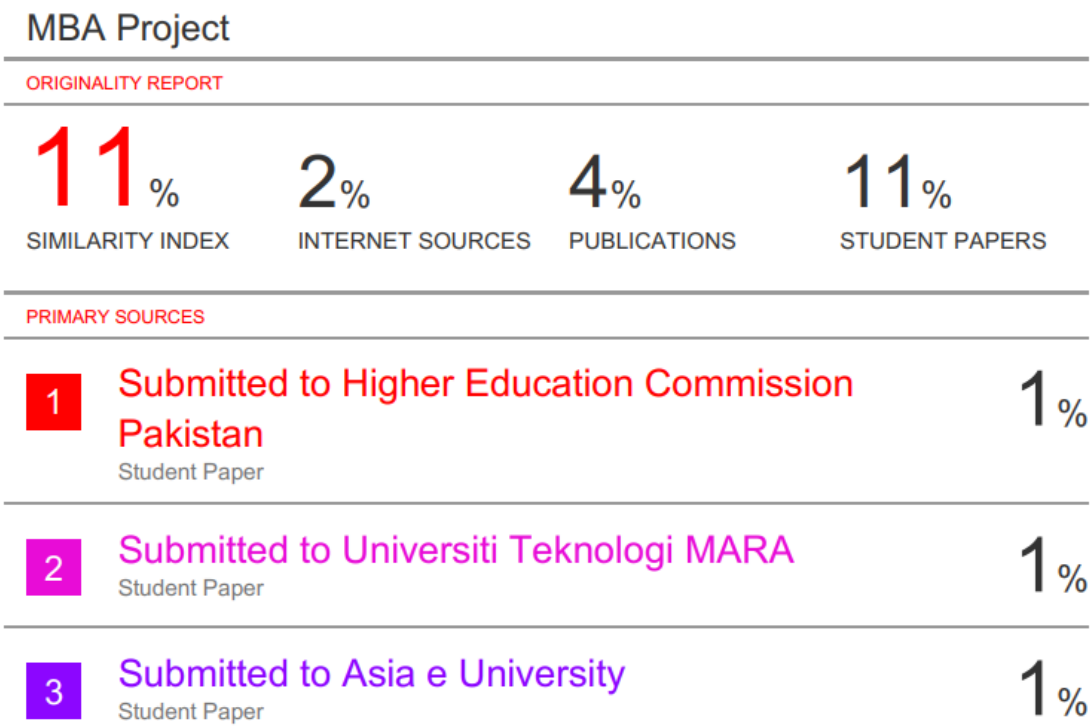
During my MBA research, My Supervisor Mr. Francis had proven me with full help and support together with guidance and improved my skills in research. My Supervisor helped me learn valuable knowledge that would contribute to my future

Supervisor Comments

It has been a great pleasure for me to be Ally Hassan's supervisor. He has shown great commitment and enthusiasm to complete his MBA project on time and with quality.

Signature of Student	Ally	Date	18/12/2019
Signature of Supervisor		Date	18/12/2019
Ethics Confirmed		Date	10/10/2019

12.0 Turnit In Report



MBA Project

ORIGINALITY REPORT

11%	2%	4%	11%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Higher Education Commission Pakistan Student Paper	1%
2	Submitted to Universiti Teknologi MARA Student Paper	1%
3	Submitted to Asia e University Student Paper	1%

MBA Project Assessment Form
First Marker / Supervisor Form

Student ID	
Student Name	

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	Marks %	Signature	Final Agreed Mark
First Marker / Supervisor's name			

Award a mark for each section and an A - C for an overall grade. Please refer to the rubric attach for marking.

Sections:	Subsections:	Comments:
Process	Dissertation Proposal (15%) Reflection (5%) **Marks**: _____ / 20%	
Dissertation management	Management **Marks**: _____ / 10%	

Structure	Logical sequencing Writing style Referencing Presentation **Marks**: _____ / 10%
Method	Methodology Methods of data collection **Marks**: _____ / 15%
Literature	Identification of appropriate/relevant theory Literature employed

	Critical assessment/review Independence of thought/ideas **Marks**: _____ / 20%
Analysis	Analysis of data Discussion Conclusions and recommendations **Marks**: _____ / 25%

Overall comments by Supervisor

Comments by External Examiner