INVENTORY MANAGEMENT STRATEGIES PROPENSITY TOWARD SUPPLY CHAIN MANAGEMENT IN THE AEROSPACE INDUSTRY IN MALAYSIA. THE MODERATING EFFECT OF FINANCIAL RISK CONSIDERATION.

By

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DOCTOR OF PHILOSOPHY

UNIVERSITI UTARA MALAYSIA

September 2017

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Thesis submitted to
Othman Yeop Abdullah Graduate School of Business,
Universiti Utara Malaysia

In fulfillment of the requirement for the degree of
DOCTOR OF PHILOSOPHY
September 2017

Pusat Pengajian Pengurusan Perniagaan
(School of Business Management)

Kolej Perniagaan
(College of Business)

Universiti Utara Malaysia

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Program Pengajian *(Programme of Study)*	:	Doctor of Philosophy
Nama Penyelia/Penyelia-penyelia *(Name of Supervisor/Supervisors)*	:	Prof. Dr. Mohd. Sobri Minai Tandatangan
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ABSTRACT

This thesis examined the relationship between inventory management strategies (IMS) and supply chain management (SCM) performance in the aerospace industry, an advanced and high technology industry that is characterized by a high working capital with potential huge losses if something goes wrong. The IMS dimensions of stock holding, safety stock, storage policy and inventory risk were tested against the SCM performance dimensions of on-time delivery (OTD), balance score card (BSC), inventory turn and factors related to inventory-financial risks. The quantitative research methodology was opted for this study. Data collection was performed from January to May 2016, involving 81 respondents related to the aerospace industry in Malaysia. This accounted for 40.5% of the population in the country. The Statistical Package for the Social Sciences (SPSS) was used to assist in the analysis. The findings indicated that only two dimensions of the IMS are used as predictors for the SCM performance. It also revealed that every dimension of the SCM performance is significant with only one dimension of the IMS. The most important dimension of SCM performance is the inventory risk dimension. Contrary to the initial expectation, storage policy is found to be insignificant for the theoretical relationship in this industry and the financial risk factor is found to be a weak moderator in the proposed relationship. The findings also suggested the need to examine financial risk consideration as the independent variable when examining the SCM performance in the aerospace industry. Moreover, these findings can be considered unique as they offer different contributing dimensions to the SCM performance and these should be the eye- opener to the organizations that have different attributes, in particular the high technology industry that involves high working capital.

Keywords: Inventory management strategies, supply chain management, financial risk, organization performance, on-time delivery, aerospace industry.

ABSTRAK

Tesis ini mengkaji hubungan antara strategi pengurusan inventori (IMS) dan pengurusan rantaian bekalan (SCM) dalam industri aeroangkasa, industri teknologi lanjutan dan tinggi. Hal ini dicirikan oleh modal kerja yang tinggi dengan potensi kerugian yang besar sekiranya berlaku sesuatu yang salah. Dimensi IMS melibatkan pegangan stok, stok keselamatan, dasar penyimpanan dan risiko inventori yang diuji terhadap dimensi prestasi SCM pada masa penghantaran (OTD), kad skor imbangan (BSC), giliran inventori dan faktor yang berkaitan dengan risiko inventori-kewangan. Kajian ini menggunakan metodologi penyelidikan kuantitatif. Pengumpulan data dilakukan dari Januari hingga Mei 2016 yang melibatkan 81 orang responden yang berkaitan dengan industri aeroangkasa di Malaysia. Jumlah ini mengambil kira 40.5% populasi penduduk di negara ini. Pakej Statistik untuk Sains Sosial (SPSS) digunakan untuk membantu dalam analisis. Penemuan menunjukkan bahawa hanya dua dimensi IMS digunakan sebagai peramal bagi prestasi SCM. Selain itu, ini juga mendedahkan bahawa setiap dimensi prestasi SCM adalah signifikan. Dimensi IMS yang paling penting dalam prestasi SCM adalah dimensi risiko inventori. Ini berbeza dengan jangkaan awal, iaitu dasar penyimpanan didapati tidak signifikan untuk hubungan teoritis dalam industri ini. Di samping itu, faktor risiko kewangan didapati menjadi moderator lemah dalam hubungan yang dicadangkan. Penemuan ini juga mencadangkan keperluan untuk meneliti pertimbangan risiko kewangan sebagai pemboleh ubah bebas ketika mengkaji prestasi SCM dalam industri aeroangkasa. Selain itu, penemuan ini boleh dianggap sebagai unik kerana menemukan dimensi yang menyumbang kepada prestasi SCM yang berbeza dan ini harus menjadi pembuka mata kepada organisasi yang mempunyai atribut yang berbeza. Ini khususnya bagi industri teknologi tinggi yang melibatkan modal kerja yang tinggi.

Kata kunci: Strategi pengurusan inventori, sengurusan rantaian pembekalan, risiko pkewangan, prestasi organisasi, pengiriman pada Masa, industri aeroangkasa.

ACKNOWLEDGEMENTS

Learning is a lifelong process and this is very true when I relate to my PhD encounters. Looking back about five years ago when I make the first move, registering for this PhD course with University Utara Malaysia, Sintok, Kedah, it has been a very exciting moment for me. I realized very soon that this is a journey and this was mentioned on numerous occasions by my supervisors, Professor Dr Mohd Sobri Bin Minai and Associate Professor Dr Ali Yusob Md Zain. The PhD journey is a long process and to achieve this, one has to go through the process personally. Here, I would like to thank Universiti Utara Malaysia for giving me this opportunity.

Getting continuous guidance from my supervisors was never easy and travelling 3-4 hours almost every weekend for the past last three years were definitely challenging. Each session of discussion, in fact, pushes me closer to the finishing line and this would not have happened without the continued encouragement from them. Therefore, I would like to register my highest appreciation, respect and thanks to my supervisors. Without them, this will definitely not be possible.

Apart from above, my apologies to my family for staying away from them most of the time during this PhD process and working on the research and the thesis. I am indebted to my loving wife, Madam Chung Yin May who has been very supportive and understanding. My love and greatest gratitude to my father, Mr Khor Buck Seah and my mum, Madam Kuan Soi Moy too. Not forgetting both my children, Khor Wen Jian and Khor Wen Hui, who always laughed at me and indirectly throwing the challenge at me to complete this journey.

Towards the end of the process, I must also record my gratitude to Dr. Maha Mohammed Yusr for her valuable assistance. Last but not least, I would like to thank everyone that was involved in my research work, including those participated in the survey, lecturers and students working with me to publish journals, staff from various departments in UUM and of course the examiners of this study.

TABLE OF CONTENTS

CHAPTER THREE – RESEARCH METHODOLOGY

CHAPTER 4 - DATA ANALYSIS AND FINDINGS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ACM	Asian Composite Manufacturing (ACM) Sdn Bhd (now known as Aerospace Composite of Malaysia)
AOG	Aircraft on ground
APICS	American Production and Inventory Control Society
ASEAN	Association of Southeast Asian Nations
ATP	Analytic network processor
BSC	Balance Score Card
CIA	Central Intelligence Agency
CPU	Central processing unit
CTRM	Composite Technology Research Malaysia
DOM	Distribution Management
EM	Expectation Maximisation
EOQ	Economic order quantity
ERP	Enterprise Requirement Planning
FG	Finished Goods
FMEA	Failure mode effect analysis
FR	Financial Risk
FRF	Financial Risk Factors
GDP	Gross Domestic Product
GM	General Motors Company
HIRARC	Hazard identification, risk assessment and risk control
IFR	Inventory Financial Risk

IMS	Inventory management strategy
Incoterm	International Commercial Terms
INT	Inventory Turn
IO	Inventory optimization
IT	Information Technology
JIT	Just In Time
KMO	The Kaiser Meyer-Olkin
MIGHT	Malaysian Industry-Government Group for High Technology
MOQ	Minimum order quantity
MRO	Maintenance, repair and overhaul
MRP	Material Requirement Planning or Manufacturing Resource Planning
MV-FRSCM	Moderating Variable – Supply Chain Management risk
MVSCMCost	Moderating Variable – Supply chain management cost
OEM	Priginal equipment manufacturer
OTD	On-time delivery
RBA	Risk benefit analysis
S&OP	Sales and Operation Planning
SAE	Society of Automotive Engineers
SCM	Supply chain management
SCOR	Supply Chain Operational Reference
SIOP	Sales, Inventory & Operations Planning
SKU	Stock keeping unit
SMEC	Small Medium Enterprise Corporation

SME	Subject matter expert
SOP	Standard operating procedures
SPSS	Statistical Package for the Social Sciences
TOC	Theory of constraints
TPS	Toyota Production System
USD	United States Dollar
VMI	Vendor managed inventory
WHO	World Health Organization
WIP	Work-in-progress

CHAPTER ONE

RESEARCH BACKGROUND

1.1 Introduction

Today, the industry sector in Malaysia is the main contributor to the national gross domestic product (GDP) and, has contributed 40.6% of which is envisioned to continue to lead the country economic development (CIA World Factbook, 2014). This similar trend also existed in most countries in the world, especially in Asia, for examples, 45.6% in 2010 in Thailand, 31.3% in 2010 in the Philippines and 47.1% in 2008 in Indonesia (Economy Watch, 2015). For other sectors in Malaysia, the agriculture sector contributes 11.2% and the service sector contributes 48.1% (CIA World Factbook, 2014). With the statistics, it shows that a large percentage of the respective country's GDP is contributed from the industry sector.

Thus, it can be said that the contribution of the manufacturing sector to the national GDP is significant for the growth of the national development and therefore, the government needs to constantly monitor and focus on the progress. In South East Asia, the Asian countries are progressively competing with each other to attract foreign investments while also providing guidance and incentives for the local enterprise to start their manufacturing facility. To encourage further investment among the locals to venture into the export market and having their products sold overseas, the governments offer attractive financing to local companies, to create more employment opportunities, enable greater income in the country and increase the GDP.

The manufacturing sector has always been associated as an industry with their product line type. From the product perspective, the development includes and ranges from daily domestic consumption items to high technology items, such as the high semiconductor technology industry. Recently, a few of the companies in Malaysia have started to venture into the aerospace industry. This specific and highly specified technology industry is considered a very rare and unique industry not only in Asia but also most nations globally. Status wise, countries venturing into the aerospace industry like Malaysia are able to reflect their technological advancement and their industry status in other countries. However, the newly set-up manufacturing facilities in Malaysia related to aerospace have not been able to meet the delivery requirements stipulated by their customers. The performance of order fulfilment is far below average and therefore, on-time delivery rating need serious focus and attention in order not to have orders cancellation from their customers.

The aerospace can definitely be considered as a prestigious industry sector as not all countries are presently capable of securing the industry within their borders. Setting up of the factory itself is very complex, costly in terms of investment and requires highly advanced technology and equipment. The industry also demands for highly skill sets of workforce for both, white collars and blue collars, to run the business and the equipment respectively, which is unique if compared to other industries. Setting an aerospace manufacturing facility outside of their original countries is never an easy task, for example, the strict requirements and regulations accommodated by the Malaysian aerospace companies in obtaining the approval and agreement of both giant clients of the commercial

airplane suppliers namely, The Boeing Company and Airbus Corporation. It is important to note that The Boeing Company originated from United States of America while Airbus Corporation is from Europe.

In the past, around 1950s-1960s the primary strategy of manufacturing is in mass production and the focus is on the reduction of the unit cost of the product. During such period, the trend of focus is on low mixed and high volume. The manufacturing processes were straight forward and continuous improvement would focus on the processes and cost of the same products. There was little focus on product variety and therefore, less work on the process flexibility. However, with the customer preference, taste and demand trend shows a changed in the decade thereafter, coupled with increasing competitions, the manufacturing strategy has and is still slowly changing to stay relevant and competitive, especially with the influence of globalization, improvements in the mode of transportations as well as the advancement in the world of technology in communication. Manufacturers can now communicate and ship their products across the globe efficiently, to reach a wider market and reaching new customers from different regions, even continents. Running a business is now easier with the rapid development of technology in communication, but handling the business itself is becoming more complex, especially in terms of payments and contracts.

With the increasing rate of globalization and the complexity in addition to the business challenges, supply chain management has evolved and many of the past events vividly demonstrated that a disruption affecting the entity anywhere in the supply chain can have

a direct effect on the company's performance and ability to continue its normal operation, like shipping its finished goods to the market or merely, providing its services to the customers. The domino effects of such disruption in the supply chains have been exacerbated in the last decade as mentioned by Christopher and Lee (2001). The recovery process and period will take time and simultaneously, manufacturing scheduling will be affected during the period and if the time taken is too long, supply chain management performance will be impacted too. This will affect the company reputation towards the end.

Among the factors contributing to the supply chain management performance is inventory management (Jones & Riley, 1985), where the inventory and inventory control are the most important components in the supply chain management performance (Dooley, 2015). It is important to stress that Dooley (2015) highlighted the importance of inventory management strategy affecting the supply chain management performance. Anna (2013) suggests future researcher to explore and build up an understanding of inventory management of costs and distribution approaches and include inventory policies. Having sufficient inventory at the right level in the right location to support the manufacturing (Berling, 2005) and fulfiling customer expectation is crucial and definitely a prerequisite to an effective supply chain management and hence, reflecting positively on the company performance in terms of product or service delivery performance as well as profitability (Jones & Riley, 1985). Such pre-requisite, either from customers or internal company's objective, could pose as a challenge mainly due the mismatch between the supply and demand which is very common in any businesses.

As such, it is known fact that inventory determines the service level and the fulfilment of customer expectations in terms of delivery (Muller, 2003), and has a major role in the ultimate performance of supply chain management. However, it is equally important to note that inventory is also a cost to the business and hence, can be treated as an asset or a liability (Dimitrious, 2008). Inventory itself is the single largest investment in the business operation (Ballou 2000). Moreover, Ballou (2000) believes that it can influence the financial standing of the organization. The main costs normally related to inventory management are the inventory holding costs and back-order penalty costs.

Both, supply chain management performance and inventory management strategy are affected greatly by the technological advancement (Gerard & Marshall, 2000). They suggested that technology advancement has brought tremendous breakthrough to the improvements to supply chain management as information can be obtained on a real time basis across the globe and communication is so much easier and convenient compared to before. This is the current changing environment affecting the businesses (Minai, 2016) and will have an impact on the supply chain management performance and the way inventory management strategy are being addressed. A good example to emphasize is the importance of inventory (Berling, 2005) is through observing inventory management in the healthcare sector, as depletion of inventory, mainly medications, is totally and definitely not acceptable and likewise similar in the aerospace sector.

Another case that could be observed is the inventory problem faced by the US electronics and telecoms industry in the last decade (Engardio, 2001) which affected the industry badly

and motivated the concept of original equipment manufacturer (OEM) to outsource their manufacturing to Asia, mainly China, to capitalise the lower labour expenses. In such scale of transfer, the business model for the company may need to change and the future way to conduct the business may be different too. The physical distribution will for sure be different from the existing. All these changes will affect the supply chain management. Another important example is the surfacing diseases in Nigeria in 2011, which could be prevented by the availability of vaccines or by treating with available medicines by the World Health Organization (WHO) in a timely basis. Delays can cause problems and some problems are more critical from another. This again explains the importance of having an inventory management (Berling, 2005) to support the operation and as it involved processes, this will be covered in the scope of supply chain management.

The issues highlighted above indicates the importance of examining the relationship between inventory management strategy and supply chain management performance (Felea, 2008) within the context of high technology industry. The proper attention on these issues would ensure higher quality products by meeting the delivery schedules and with expected or minimum cost, thus, giving participating organizations the mutual financial advantages. Having the appropriate inventory management strategies at the various levels of the supply chain is crucial for effective distribution from the various warehouses (Anna, 2013). She stressed that a correct inventory management is necessary to ensure adequate stock levels and emphasized that inventory management strategies such as regular stock-taking, inventory reconciliation, first-expired-first-out practices and traceability of batches are beneficial for manufacturers (Muller, 2003).

1.2 Research Background

The key motivation for this research is about the validity and the criticality of inventory management strategy (IMS) as the indicator of the supply chain management (SCM) performance within the context of aerospace industry, a high technology industry that place important consideration on the both functions. Within this industry, the SCM performance has a direct impact on delivery performance, which is a most crucial measurement in ensuring customer satisfaction. Poor delivery performance can affect the relationship between suppliers and customers to the extend of losing the business entirely.

The vulnerability of the supply chain in the aerospace manufacturing sector is a present concern as it covers end to end process (Queseda et al., 2008). As supply chain management is covering both the internal as well as the external factors and parties to the whole processes, this research will help to discover the uniqueness as well as the norm for doing business in the aerospace arena.

The aerospace and airline industry is considered as the upper group of high technology industry. It is a unique industry that naturally requires specialization due to the strict requirement imposed by the respective country's aviation body (an example is the Federal Departmentment of Aviation, United States of America). Until recent decades, this industry was primarily led by developed countries such as the United States of America and Europe. However, due to high competitiveness within the industry and to improve their supply chains in terms of cost benefits, both giant airplane manufacturers have started working

with suppliers outside of their respective countries and move into Asian countries to remain their competitive edge as well as to maintain their individual market shares.

However, changes in the industry are predicted with the emergence of the third, newly potential manufacturer, China, which may swing into operation very soon for the commercial airplanes. As China is a significant market share in both, as manufacturers and customer, the reduction in orders from China will bring significant changes to both manufacturers long term planning. In the transfer of work, they have extended their supply chain outside of their home country and are taking hits on the delivery or in this case, shipping lead time as well as other exposures related to such move.

The transportation of parts by overnight trucking which was possible in the past is no longer available now and paying for airfreight will be too expensive. Shipping the parts by ocean freight will cost time, which is about forty days from Asia to United States of America and such duration does not only delay fulfilmentent process, but also created an inventory in transit which used to be fairly low in the past. The tradeoff for lower wages is now exchanged for other factors which are new and the need to constantly review the supply chain management is necessary.

In the case of Malaysia, the aerospace industry is categorized as a new field which the country has included in the national blueprint. However, the evidence from the Malaysian aerospace sector are not being easily traceable. With the understanding that this industry involved high technology knowledge and transfer, potentially different outputs can be

expected. Malaysia started embarking in this manufacturing industry by inviting top corporations in the industry, such as Boeing and Airbus to relocate and establish factories to produce parts or components in the country.

In 1997, the Malaysia aerospace blueprint was introduced to project Malaysia and the ASEAN in general (see diagram 1.1), as a major aerospace player by the year 2015 (MIGHT 2015). However, this vision may be extended beyond 2015 due to delays in some of the implementation as quoted by the former Malaysia's Prime Minister, Dr Mahathir Mohammad. He said that this vision needs to be extended as the quality is still not meeting the requirements and order fulfilment still needs serious attention and improvement.

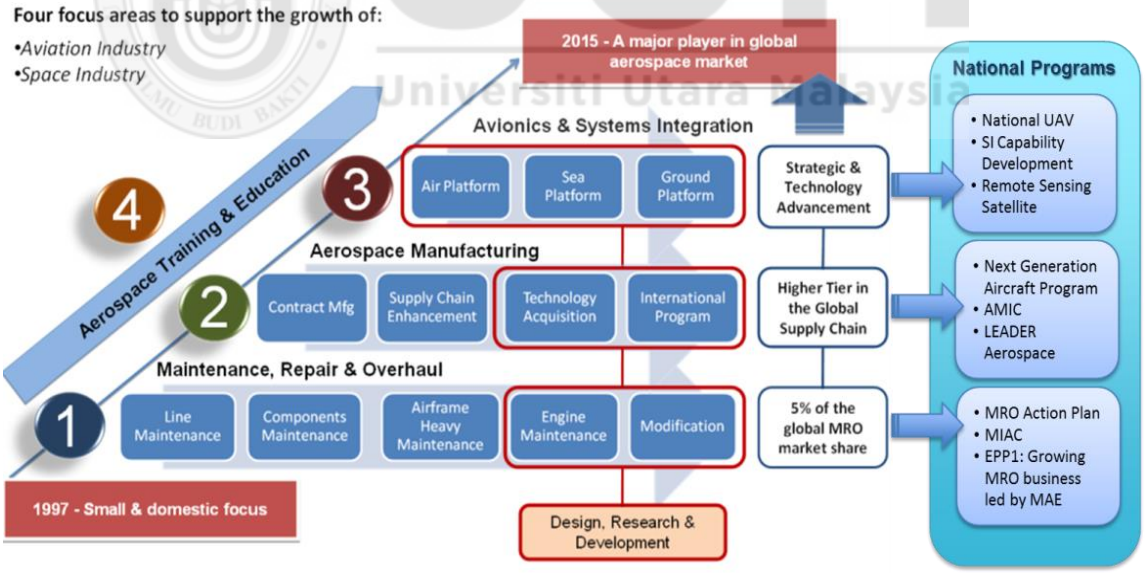


Figure 1.1
MIGHT Focus Areas to Support Growth As Major Player.
Source: MIGHT, 2015

On 20 November 1990, Composite Technology Research Malaysia (CTRM) Sdn Bhd was incorporated, with Ministry of Finance incorporated as its principal shareholder, and setting up of the factory in Malacca. They received the initial work from Airbus and soon, the organization grew more than three times in terms of factory floor space as well as the shipment volume. The growth has been partly contributed by the strong commitments from Malaysia government through the purchasing of airplanes produced by Airbus Corporation. To further convince Malaysia's commitment in the aerospace industry, CTRM even set-up the research and development department to prove that they are serious in supporting Airbus Corporation and the industry in their future development works.

However, the fulfilment is still a challenge for CTRM and with the expected volume increase in the near future, the issues and challenges in their supply chain, mainly in terms of supplies and order fulfilment, can be compounded over the years. The ability to meet the delivery is a great concern at the early stage for most companies (Long, 2016) and this could be due to quality or materials availability. Getting the quality right will always be the priority for CTRM and all the suppliers for aerospace.

In 2001 Asian Composite Manufacturing Sdn Bhd (ACM) was established at Bukit Kayu Hitam, Kedah. ACM was a tier 2 supplier to The Boeing Company, with headquarter based in the United States of America. After 3 years in operation, they became tier 1 for some programs and started to ship directly to The Boeing Company. The difference between the both is that tier 1 supplier ships direct to The Boeing Company whereas tier 2 is the supplier

shipping to another sub-contracted company (Tier 1) that will then supply to The Boeing Company directly.

ACM produces the composite panels for the airplane's wing structures and tail structures for a variety type of aeroplane. In terms of shareholders, ACM started equally as a joint venture with two from Malaysia and two from the United States of America. As the business progresses forward, the two shareholders from Malaysia sold their shares and decided to focus on their core business. This could also due to the fact that there is a lack of knowledge and exposures in managing an organization involving in aerospace. The remaining two shareholders from United Stated of America ended up buying the rest of the shares and decided to have 50:50 equity in the company. Now the company is 100% foreign owned.

It is important to note that both of these factories deal with high technology composite manufacturing processes for aerospace and are also involved in a vast high technology transfer of knowledge and facilities including the unique, specialize and highly develop equipments. Their main products are components or panels for the main structures of the airplane example the wing and tail of the aeroplane. CTRM is involved in more varieties and therefore, handle a wider range of products compare to ACM. The parts manufactured by both organizations in Malaysia for the airplanes companies are subjected to similar, very stringent quality products control, thus ensuring safety of the airplane, passengers and cargo on flight without any compromise to quality and is guided by SAE Aerospace Quality Standards.

Pertaining to product quality, it is being cited and emphasized as one of the main focus as well a concern of the aerospace industry. The airplane components being produced must meet the stringent qualities and need to undergo thorough quality inspections and quality control for each of the processes before the parts can be assembled, and finally the airplane itself. The sub-contract companies or factories and their suppliers for the two major airplane companies, which include ACM and CTRM, must ensure that their components are meeting the requirements set by their clients and comply with all the necessary specifications. In addition, the products must also meet the standard operating procedures (SOP) of the respective manufacturing facilities internally as this is the usual documents that will be audited.

According to the quality management in the aerospace companies, the director or senior manager responsible for quality (for example, Mr Steve Morrison who was then the Director of Quality of Spirit Aero System - Steve, 2014), need to ensure that after the airplane companies validate and approve their suppliers, the suppliers must maintain and willing to share their standard operating procedures, the work instructions as well as all the records which must be accurate and available for audit based on the aerospace requirements and specifications. Therefore, it is mandatory and crucial to meet the specifications, requirements and delivery as have been spelled out by their clients who are either the airplane companies themselves or their tier-one suppliers. The records must be kept in order for the purpose of traceability and future audit. This information is not available as a printed document and remains to be investigated and thus, motivates for the study.

Cruciality is more evidence as the component parts quality assurance comes from many angles, where it is normally closely monitored, for example, the testing and in-process equipments must be calibrated regularly and skill of the workers matrix updated from time to time. One of the areas that also needs to be closely monitored is the supply chain management performance due to the many complexities and this is crucial as supply chain management covers the end to end of the process right from suppliers for delivery to customers including the internal production processes. The complexities are further complicated with increasing globalization.

In order to have a cost effective and quality product, the quality of components as well as the handling process are important criteria and have been a focus to many high technology firms. This is no exception to the manufacturing facilities involving in the aerospace sector. Acknowledging that the quality is a priority for the aerospace industry and it is subjected to the constant changing environment as well as the high expectation from their customers, the area of supply chain management will need paramount attention. To this end, it is argued that the effectiveness of supply chain management is needed to ensure the processes are robust, agile in nature and competitive in the aerospace industry.

1.3 Research Problem Statement

The challenges and issues encountered in the supply chain management (SCM) performance have been discussed in various articles, for example Dooley (2015) and Chiang (2005) suggests that SCM performance as the crucial issue in ensuring the factory performance and goals, whereas, Chopra & Meindl (2001) has singled out SCM as a key

indicator of company performance, in meeting the customers' expectation in term of quality and delivery. SCM normally exists where the situation is complex and there is a serious need to manage the process internally as well as externally to ensure organizational objectives are met.

Apart from processes, management of suppliers is also a key to this study as most of the suppliers are still based at the airplane companies' home country (Paulraj & Chen, 2007). This indicates that the studies regarding SCM performance are important as the outcome on SCM performance has a direct impact to the company performance which is detrimental to the company's success. At the end of their article, Paulraj and Chen (2007) pinpointed that the indication on furthering or continuing studies on the SCM is necessary.

Effective SCM performance impacts the company performances directly and must be treated with the highest attention (Ermy, 2015). Moreover, due to the limitation in supply as well as the complexities of the products in the aerospace industry, there is definitely a need for an effective SCM. Reviewing the literature on inventory management strategies (IMS) to support the SCM performance, many organizations have worked with one and another on the IMS on the basis of inventories being treated as assets or liabilities to the organization (Dimitrious, 2008) and thus, have a direct impact to the organization's profit and loss performance. Many of these strategies are to mitigate the challenges faced by an organization on getting the right inventory level at the right time to the right location. Resolving the inventory issues reduces the supply chain challenges in meeting the order fulfilment obligation (Aviv, 1998).

Hence, for the aerospace industry, the challenge is different compared to the other industries and having the right inventory level and at the right time is simply not sufficient. There are more material's requirements or customer's requirements in the industry and these have resulted with higher chances of inventories becoming a liability. Moreover, as the inventories determine the customer's service level and fulfilment of customer's expectations, it has a major role in the performance of SCM and can be the single biggest investment in the business operation (Ballou, 2000). He mentioned that in most cases, it can even influence the financial standing of the organization.

The aerospace industry is unique compared with other industries. The high cost of products and with almost zero tolerance in errors, the delivery performance to order fulfilment need to be on time. Customers do not tolerate any early or late delivery from the shipment date stipulated. Leaders from the newly set-up companies in Malaysia argue why some dimensions of the inventory management strategies do not fit into the relationship. And, in the absence of inventory, supply chain management and the related processes should affect the overall on-time delivery (OTD), however, contradict insights are proposed in the aerospace industry.

Whilst literature has highlighted a number of components affecting the SCM performances, Fredendall, (2016) and Ballou (2000) claim that the basic and most important factor that determines the success and failure is the availability of inventory. Dimitrious (2008) suggests that the IMS can provide the solution in lowering the rejection rate by the customers. For Cynthia, *et al,* (2006), the challenge of having the right level of inventory

at the right time is different in different industries. From here, it can be concluded that the formulas in IMS differs in accordance to industries. Thus, it is suggested here that the same goes for the variables representing the IMS. This is the initial identified research gaps in this study where there is no similar study done within the aerospace industry, particularly in Malaysia.

It is claimed here that IMS has a different impact on SCM performance in the aerospace industry and having knowledge regarding IMS and SCM performance in this industry provides expansion to the body of knowledge (Emmy, 2015). It can be observed that the IMS in the aerospace industry has unique criteria, different from the other industries, for examples, sole supplier and extremely long lead time, that the study of the IMS and SCM performance of this industry is critical as it could produce different outcomes compared to the other studies.

In explaining the context and the importance of this study, in relation to the aerospace industry that faces greater challenges with high and turbulent changes to the extend that it requires immediate attention, as the penalty for not meeting the customer requirement and the delivery expectation is very damaging, the next paragraphs cover the relevant issues.

Start with the issue of a very severe penalty cost as most of the particular subject is binding and is stated in the supplier's contract, there is this unequal lead time between what has been agreed with customers and the continuous lengthening of lead time by the raw materials suppliers in the aerospace sector where the suppliers can run out of capacity due

to the steep growth in demand in the aerospace industry. Such situation in the lead-time created challenges to the tier-1 (direct supply to airplane companies) and tier-2 suppliers (supply to tier-1). For example, the airplane companies practice just-in-time approach for their inventory and their production is a moving-line concepts. Any delays in any of the parts will eventually stop the line and result in delay of delivery, which is again not tolerated in the aerospace industry due to heavy compensation to their customers.

In many past cases, the industry players are in a constant dilemma as to shortage in raw materials' inventories in respect to increasing orders as happened in 2014-2015 (Emmy, 2015). Furthermore, the customers may expect immediate delivery, which can be as short as less than a week for request which are categorized under "aircraft on ground (AOG)" in contrast to the longest raw material lead-time of 54-weeks, for example Nomex Core, which is a prime material being used in the composite manufacturing, is only available from a sole supplier based in United States of America. Thus, immediate delivery is impossible unless a plan has been made earlier than 54-weeks, which is also not possible as AOG is not predictable. Such situation proves the existence of challenges regarding SCM in the aerospace industry. For example, in the overall industries, the cap on the lead time for items from any manufacturing organization has never exceeded 52 weeks. The SCM performance is very much affected by the availability of inventory and hence, making inventory management strategy as the independent variable to check on the significant changes.

Furthermore, the rejection of parts or components can take place during the receiving inspection, at the production floor or even prior to shipping during the final inspection stage. The requirements are very stringent (Steve, 2014) and even a strand of hair could pose a reason that is more than sufficient for rejection of parts, costing thousands of dollars for the manufacturers. In this context, for example, most of the main raw materials such as the composite materials known as pre-preg and the paints in the aerospace industry are time and temperature sensitive. Even though the materials may be still valid as far as the shelf life is concerned, due to poor storage environmental condition subjected, the materials renderered itself no longer valid for use as their mechanical life or properties deteriorated below the specification permitted by the suppliers. Therefore, the deterioration in quality during shipment or storage may cause the materials to be scrapped. Due to this problem, the shortages of materials found during transit, at the store or even on the production floor, contribute to potential failures in meeting customer's shipment requirements.

Moreover, in this industry, any case of material rejection is considered as a huge challenge as most of the sole components' suppliers are from overseas. In the extreme case, as mentioned above, the item can even have a lead time over 54 weeks, where the suppliers are in the US and the processes taken for delivery are very lengthy due to their limitation in managing inventory. Again, it is emphasized here that the aerospace sector is very much different from the other sectors in the manufacturing industry. The limitation in the supply due to the long lead-time taken to produce components and coupled with the sudden increase in demand, which in extremely common and such case is considered as unexpected demand, explain the long lead time for raw materials purchased. This reflects

the importance of IMS and SCM in this industry and the limitation of knowledge and information in Malaysia becomes the research gap of this study.

Continuing the above discussion, such challenges need to be managed as there is no 100% outcome from whatever system or tools that can assist in the inventory planning. Similarly, there are no tools or methods that can assist to provide 100% accuracy in the forecasting process. Both the quantitative and qualitative methods can only improve the forecasting techniques, but seldom is 100% accurate. Inventories in the warehouses must be managed effectively to avoid shortages. Constant monitoring of the storage conditions for products that requires special condition is an important task for the warehouse personnel.

To this end, it can be argued about the need to investigate the variable related to the relationship between IMS and SCM performance within the context of the aerospace industry. Within the context of IMS, Lance (2012) suggests to look into the variables of (i) stock holding and (ii) safety stock, while (iii) stock policy by Ponte (2017), and Ballou (2017) relates inventory to (iv) inventory risk. For the SCM performance, the variables of (i) on time delivery (OTD) suggested by Sim et al, 2005), (ii) balance score card as a key indicator for SCM performance (Lee et al., 2007 and Balakanan, 2016), (iii) Inventory Turn as mentioned by Kancharla (2016) on financial ratios and Inventory-Financial Risks by Christopher (2017). Such cross relationship between the variables representing both functions are yet to be investigated in the aerospace industry either in Malaysia or other countries and is put forward as the main research problem statement. Next, knowing that the aerospace industry is a high cost industry, the aspect of finance cannot be left out.

In general, most of the manufacturing companies have realized the high cost related to inventory and have taken the necessary actions, including the initiatives to pass the responsibility of holding stocks to their suppliers (Chen, et. al., 2009). They realize that financial risks are unavoidable when relating to inventory holding. In general, all companies need to increase risk management's consciousness in all areas, not only on inventory and also prepare a contingency plan for unexpected situations as stated by Simons (1999). It is recognized that along the value chain, inventory needs to be available physically in each of the processes (Cynthia, *et al.*, 2006) and therefore, it can be concluded that the cost factor is an important variable for inventory holding.

Where cost is present and related, there will definitely be financial risks (Smeltzer & Siferd, 1998). Although, in the traditional industry, the upstream will normally build up higher inventory partly due to the bullwhip effect, but due to the tight control of cost and high exposures in the inventory holding in the business, the finance department for most organizations applies pressures to their relevant departments to reduce the inventory holding in order to avoid possible losses due to scrap or obsolescence (Tang, 2006). Such cases are very obvious in industries such as IT components, fashion and food sectors. Therefore, investigating the relationship between the inventory management strategies and the supply chain management performance (Felea, 2008), coupled with the effect of financial risk is crucial, particularly in the aerospace industry in Malaysia. How inventory management strategy connected to supply chain management performance in determining the success of the process is an orientation of this research study and further work includes accessing the moderating influences on financial risk impact in such relationship.

Similarly, adding financial risk as a moderator in the relationship between the inventory management strategy and supply chain management performance can contribute to new knowledges in the area of aerospace in Malaysia. This research is especially important as the aerospace industry is still very new and growing in Malaysia, as well as in most Asian countries.

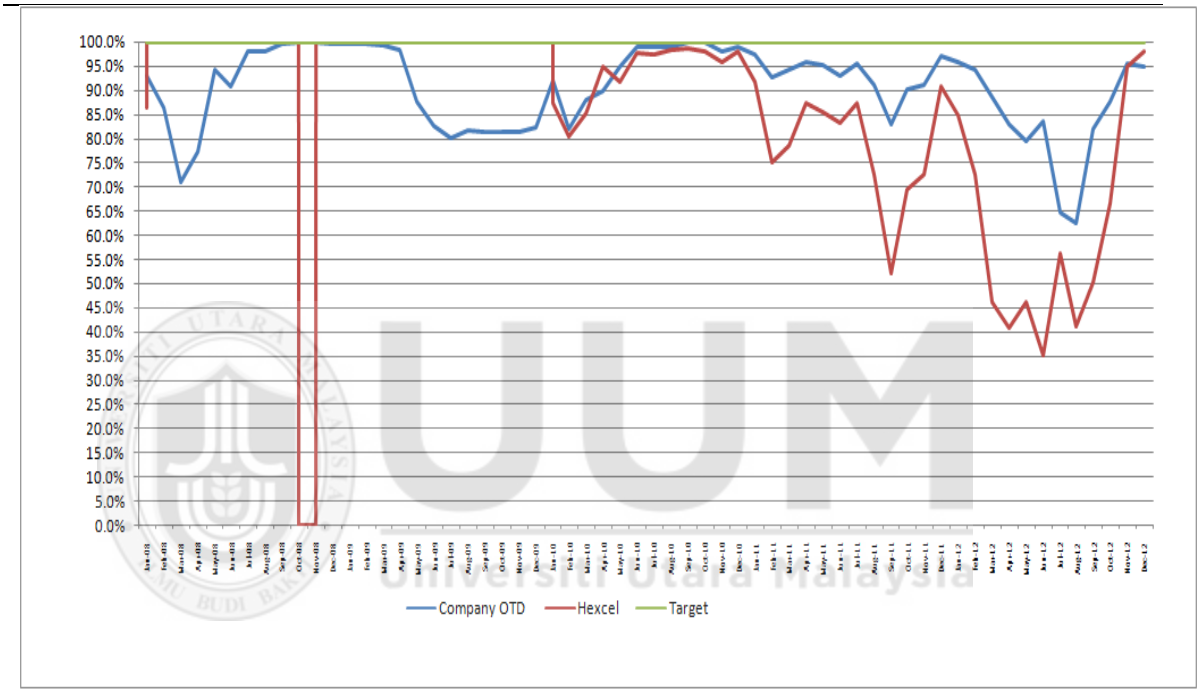


Figure 1.2:
Actual Performance of on time delivery by an aerospace company in Malaysia.
Source: A composite company in Malaysia

Initial insights from one of the company producing composite panels show that having a sufficient fund to support the particular business is critical as the investment is huge and return is small in comparison to many other industries. Therefore, having the strong financial means to support the inventory holding is the key to develop the supply chain performance. Furthermore, due to the stringent storage condition requirements of the raw

materials, companies related to the aerospace industry also must be well prepared for losses due to scrapping of materials or scrapping the completed panels, which can be very costly. Risks of material obsolescence in an operation cannot be avoided due to dramatic fluctuation in the demand from time to time (Souter, 2000).

It is important to study how inventory management strategies are connected or related to the supply chain management performance and the main determinant for the success of the process (Felea, 2008). Thus, it is imperative to test the significance of financial risk affecting the above relationship and its impact as a moderator. This particular research is oriented with a major objective to establish the relationship between inventory management strategies and supply chain management performance, in addition to access the moderating role of financial risks in the above relationship (Kouvelis et al., 2009).

In addition, the inclusion in this study is the financial risk variable as the moderating factor to the relationship between the inventory management strategy and supply chain management performance paves for a new understanding of the type and strength of the relationship under study. Risk is an important field where many are very concerns and adding financial to the risk effect as a moderator in this research will see the compounding effect on the relationship between the inventory management strategies and supply chain management performance.

In the absence of information regarding the link between IMS and SCM performance in the aerospace industry, the perception of key players currently in the industry (the

managers), is the best source of information to explain the relationship as endeavoured in this study.

1.4 Research Questions

For the identified variables of the inventory management strategy (IMS) and the variables of the supply chain management (SCM), the variables that are argued to be effective and significance in the relationship between the IMS and SCM performance are being reviewed. This is an attempt to establish a relationship between the IMS and SCM performance.

Then, the financial risk (FR) is being positioned as the moderator of the mentioned relationship between IMS and SCM performance. With these under consideration, the following research questions are listed.

i. Can IMS being used to determine the performance of the SCM, thus establishing the relationship between IMS and SCM in the aerospace industry.
    a. What are the variables representing IMS that can be proven to affect SCM performance?
        1. Does the stock holding (one of the IMS variable) affecting the SCM performance?
        2. Does the safety stock (one of the IMS variable) affecting the SCM performance?
        3. Does the storage practise (one of the IMS variable) affecting the SCM performance?

4. Does the inventory risk (one of the IMS variable) affecting the SCM performance?

b. Which of the SCM performance variables is affected?

1. Does IMS affecting the on-time delivery (one of the SCM performance variables).
2. Does IMS affecting the balance score card (one of the SCM performance variables).
3. Does IMS affecting the inventory turn (one of the SCM performance variables).
4. Does IMS affecting the inventory-financial risks (one of the SCM performance variables).

ii. What kind of effect FR can provide to the model of the study? Can FR be proven to become the moderating variable in the relationship between IMS and SCM performance?

a. Can FR be proven to be the moderating variable in the relationship between each of the four variables representing IMS and SCM performance.
b. Can FR be proven to be the moderating variable in the relationship between IMS and each of the four variables representing SCM performance.

1.5 Research Objectives

The research objective provides the answer to the question of "what do you wish to achieve at the end of the research?" Thus, the following research objectives of this research work are proposed as the following;

i. To study the perception of managers on the crucial effect of inventory management strategy (IMS) to the supply chain management (SCM) performance in the aerospace industry, an industry that involves high value and cost during the business operation. This involves testing of 16 direct relationships, between four (4) variables of IMS and also four (4) variable of SCM performance with the relevant discussions.

   a. To test for the significant contribution of stock holding practice and policy (one of the variable of IMS) to the on-time delivery (one of the SCM performance variables).

   b. To test for the significant contribution of safety stock practice and policy (one of the variable of IMS) to the on-time delivery (one of the SCM performance variables)

   c. To test for the significant contribution of storage practice and policy (one of the variable of IMS) to the on-time delivery (one of the SCM performance variables)

   d. To test for the significant contribution of inventory risk practice and policy (one of the variable of IMS) to the on-time delivery (one of the SCM performance variables)

e. To test for the significant contribution of stock holding practice and policy (one of the variable of IMS) to the balance score card (one of the SCM performance variables).

f. To test for the significant contribution of safety stock practice and policy (one of the variable of IMS) to the balance score card (one of the SCM performance variables).

g. To test for the significant contribution of storage practice and policy (one of the variable of IMS) to the balance score card (one of the SCM performance variables).

h. To test for the significant contribution of inventory risk practice and policy (one of the variable of IMS) to the balance score card (one of the SCM performance variables).

i. To test for the significant contribution of stock holding practice and policy (one of the variable of IMS) to the inventory turn (one of the SCM performance variables).

j. To test for the significant contribution of safety stock practice and policy (one of the variable of IMS) to the inventory turn (one of the SCM performance variables).

k. To test for the significant contribution of inventory turn practice and policy (one of the variable of IMS) to the inventory turn (one of the SCM performance variables).

l. To test for the significant contribution of inventory risk practice and policy (one of the variable of IMS) to the inventory turn (one of the SCM performance variables).

m. To test for the significant contribution of stock holding practice and policy (one of the variable of IMS) to the inventory-financial risk (one of the SCM performance variables).

n. To test for the significant contribution of safety stock practice and policy (one of the variable of IMS) to the inventory-financial risk (one of the SCM performance variables).

o. To test for the significant contribution of inventory turn practice and policy (one of the variable of IMS) to the inventory-financial risk (one of the SCM performance variables).

p. To test for the significant contribution of inventory risk practice and policy (one of the variable of IMS) to the inventory-financial risk (one of the SCM performance variables).

ii. To examine for the designated moderating effect of the financial risk (FR) consideration to the established relationship between the IMS and SCM performance.

a. To test for the significant moderating effect of FR consideration on the relationship of each significant variable between IMS and SCM performance.

b. To discuss about the role of the financial risk factors as a moderator in enhancing the SCM performance by revealing the effect of FR consideration of the strength of the relationship between IMS and SCM

1.6 Research Contribution

As the study is intended to cover the perception of managers on the relationship between inventory management strategy (IMS) and supply chain management performance (SCM) within the context of the high technology industry, the aerospace sector with the moderating effect of financial risks. The aerospace industry is slightly unique and different from most traditional industry, where most of the upstream built up higher inventory partly due to the bullwhip effect, but due to competitiveness of business, every business entity's inventory target is to reduce losses which may be contributed from scrap or obsolescence. Thus, the outcomes of this study have both theoretical and practical implications.

Theoretically, the research support and enhances the body of knowledge in the supply chain management performance and the inventory management strategy literatures, which was argued earlier as limited, particularly in the context of the relationship between inventory management strategy and supply chain management performance of the aerospace industry in Malaysia. Moreover, insights from the aerospace industry provide new evidences in supporting most the proposed hypotheses that explain the relationship between the constructs of the study. In fact, the findings are unique to the industry and it can be used to support the theory enhancement on such relationship in the future.

Given the fact that there is a limited documented application of resource based-view theory in the aerospace manufacturing sector in Malaysia, this research clearly contributes to the existing literatures. The research covers the contemporary delivery issues faced by the relatively new organizations in the aerospace industry, which are very detrimental to their reputation and survival. The best practices to order fulfilment, which is based on resources-based view application, are proposed. The suggestions can be used to evaluate and generate further improvement in inventory management strategy and supply chain management performance in the high technology organizations.

As the financial risk is, for the first time, being tested as the moderator of the relationship between inventory management strategy and supply chain management performance, this offers a new findings and knowledge. The findings have verified the moderating effect of financial risk consideration to the tested relationship and this specific finding is assumed as the first in Malaysia, if not the world.

Practically, the variables associated with the IMS can be applied to the industry and the established model perspective can be used to provide references to government, perfectionist and practitioners in the real world. It is also applied to the academician and the manufacturing industry, especially personnel who are involved in decision making regarding IMS and SCM in their organizations. This research is viewed as a major knowledge contributor to the practitioners and can be of a great interest to the management of high technology companies and their stakeholder, especially in the aerospace sector, for having a better understanding on the importance of IMS to support SCM.

1.7 Thesis Organization

Chapter 1 of this thesis has provided a general introduction and brief overview of the research. It covers the background of this study in explaining the importance of manufacturing sector in contributing to the country GDP. And, to mitigate the eroding semi-conductor industry migrating to other under-developed countries, Malaysia government is encouraging other high technology industry. This study is focusing on the aerospace industry and study the improvements critically needed to strengthen the supply chain management performance.

Chapter 2 covers the relevants literatures pertaining to the variables which include inventory management strategies, supply chain management performance and financial risk. In addition, this chapter also review the strong link between supply chain management performance and company performance. Chapter 3 covers how the conceptual framework was developed. In additional, detailing the hypotheses and the methodology used to measure the respective variables in this study. And the pilot study leading to the formation of the questionnaires.

Chapter 4 provide the outcome of the various analysis to all the hypothesis. Explanation to the findings to the test results were included. Chapter 5 summarizes then key findings of the study and provided the conclusion for this research. The contributions of this study is highlighted with recommendation for future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, the relevant literature from journals, reference books, thesis, conference papers and other sources for this study is reviewed. The coverage includes the following major subject areas;

i. The theories and models used in the study of the supply chain management (SCM) and its performance
ii. The theories and models used in the study the inventory management strategies (IMS)
iii. Relationship between IMS and SCM performance
iv. The concepts of financial risks
v. The rational for positioning the financial risk consideration to the relationship between the IMS and SCM performance as moderator.

The write-up begins with the literature review of the key variables under study; the supply chain management performance, the inventory management strategy and the financial risk in the companies (Kouvelis et al., 2009). The definitions and the works used in this study are presented and cited. Such information is used to contextualize the definitions used in this study for the variables under investigation. Practical challenges currently faced by companies in aerospace industry formed the base of this study. At the end of this chapter, the reasons for positioning the variables as dependent, independent and moderating

variable are provided. The development of the theoretical and the research framework is included in the next chapter.

2.2 The Literature

2.2.1 Supply Chain Management and Performance

2.2.1.1 Supply Chain and Supply Chain Management

Supply chain management is an integration of customer requirements, internal processes, and upstream supplier performance (Paulraj & Chen, 2007). The supply chain is a series of activities and organizations for a product (Walters, 2006). Over the past few decades, supply chain management has come to be seen as a key component of organizational competitiveness and effectiveness, but is still relatively new to some of the companies (Womack and Jones, 2005). This is very true which, apart from the multinational organization, it is hard to find such functions being applied in the local or SMEC companies. Only recently, as the knowledge of supply chain management is shared widely by many of the larger corporations, many local Malaysian companies have recognized the need in this specialize area, after reviewing the best practices of existing large or multinational organizations. This is partly due to the fact that doing business is getting more complicated and complex. Companies started to face issues and problems that, although got solved, but is still repeated month after month.

The success of an organization is not only limited to their internal processes and as noted by Christoper (2017), the organization has started to recognize the role played by suppliers and hence, the organization works to improve on their own as well as their supplier's supply chain performance. Supply chain integrates all the related processes within the organization, as well as externally with its suppliers, distributors and customers (Queseda et al., 2008). The organization started to treat their suppliers as partners in business and began to work on supplier's development so that the supplier can continue to grow and support their business as their volumes ramp higher. Such action denote the start of an effective supply chain management as the scope is to manage end to end of the business.

With the greater complexity in business, mainly in terms of materials, processes and other challenges faced in today's businesses, supply chain management is definitely a key strategic factor to improve the organizational effectiveness and performances to realize of organizational goals such as enhanced competitiveness, better customer service and increase company profitability. It is important to note that technologies and competitive forces are changing at an ever increasing rate and the viability of a company now depends largely on how well it is capable of responding to customer requirements while working to achieve the lean management concepts and cost competitiveness.

Supply chain management task is to ensure all processes, materials and partners work in tandem with the objective of the organization including the lean concepts. However, it should be noted that supply chain management will not compromise their objective over lean thinking. Therefore, supply chain management performance is related and directly link

to the organization performance. A supply chain does not lead to an improved productivity if each stakeholder in a business is pursuing its goal independently, which has been the traditional practice. Such practice has now changed, where companies often work together closely with their business partners and some degree of information sharing is also found to exist in the relationship. Instead of mere profit, business leaders need to have a certain trust in their respective partners and work on the "win-win" concept to sustain a long term benefit.

In the supply chain process, inventory existence is highly critical for the fulfilment of customer's orders. More organizations have realized the importance of inventory to meet the customer's order and it also determines the customer's service level. It is important to note that inventory must be available in the supply chain and will be somewhere within the value chain of each organization. Bozarth and Handfield (2008) supports such fact claiming that the direction and guidance are important in making any decision regarding the supply chain, particularly during its operation. Thus, supply chain should be observed as the series of activity crucial to the availability of product or services at the end of the chain to meet the customer's expectation. Continuous effort by organizations to improve efficiency with the hope to reduce the cost of supply chain operation (Kilgore, 2003) and stay competitive in the business is highly critical.

While the flow of materials is key to any supply chain process, but information flow is also equally critical to the success of the supply chain performances (Sweeney, 2006). Chopra and Meindl (2001) stress that information "serves as the connection between the supply

chain's various stages, allowing them to coordinate their actions and bring about many of the benefits of maximizing total supply chain profitability". From here we can conclude that without the supported information, the flow of materials is without necessary details and this can slow down the process due to unavailability of data to proceed for next process (Tyndall *et al.*, 1998). For example, the transportation of goods from the distributing centre to the various outlets, even though the physical products are already in-transit, the information must also be made available in the related outlets so that preparation are made in receiving the products which may include spaces or location preparation to store inventory accordingly.

Storage preparation is important as some goods may need a controlled environment or may even have shelf-life and goods with higher movement frequency are normally placed at the location with easier access. Receiving the information in advance will enable receiving parties to make plans and preparations, not only for their internal arrangements, but also in the receiving process, for example the unloading period, which could shorten the time for the truck at the receiving bay. Shorter time to perform the receiving process are perceived positively in terms of companies' logistic and hence, affecting the companies' corporate image in a positive light.

Another example will be the vendor managed inventory (VMI) as currently being practiced widely by many supply chain professionals across the globe and these partnerships have improved the suppliers' on-time deliveries while increasing their inventory turnovers (Simchi-Levi et al., 2000), and demonstrate how information sharing leads to mutual

advantage for both parties in such partnerships. Vendor managed inventory simply means that buyers is pushing ownership of the total inventory management to their suppliers including replenishments of the inventory. The usual arrangement concept is, the buyer will only pay when the inventory is drawn from the storage location. Such transactions normally is captured in the system immediately and invoice to the buyer is also generated automatically.

There is a mutual benefit between the buyer-seller under this arrangement. While the buyer may be free of obligation to the inventory, the seller would normally enjoy long term business and has the tendency to push for more sales as their goods are readily available on site as compared to their competitors who are not having the VMI arrangement with the same customer. The down side of the VMI arrangement is the need for the suppliers to conduct physical inventory counts on a regular basis, which could be on weekly in most of the cases. Another down side is the cost of inventory that suppliers need to finance as part of their business.

Within the context of integration in the supply chain, the need to ensure end-to-end, right from supplier to customer, processes along the chain are critical to ensure success and effectiveness in the performance of the supply chain and this is similarly quoted by Sweeney (2006). The integration in the supply chain is key to the success of the supply chain management for any organization (Flynn, Huo & Zhao, 2010).

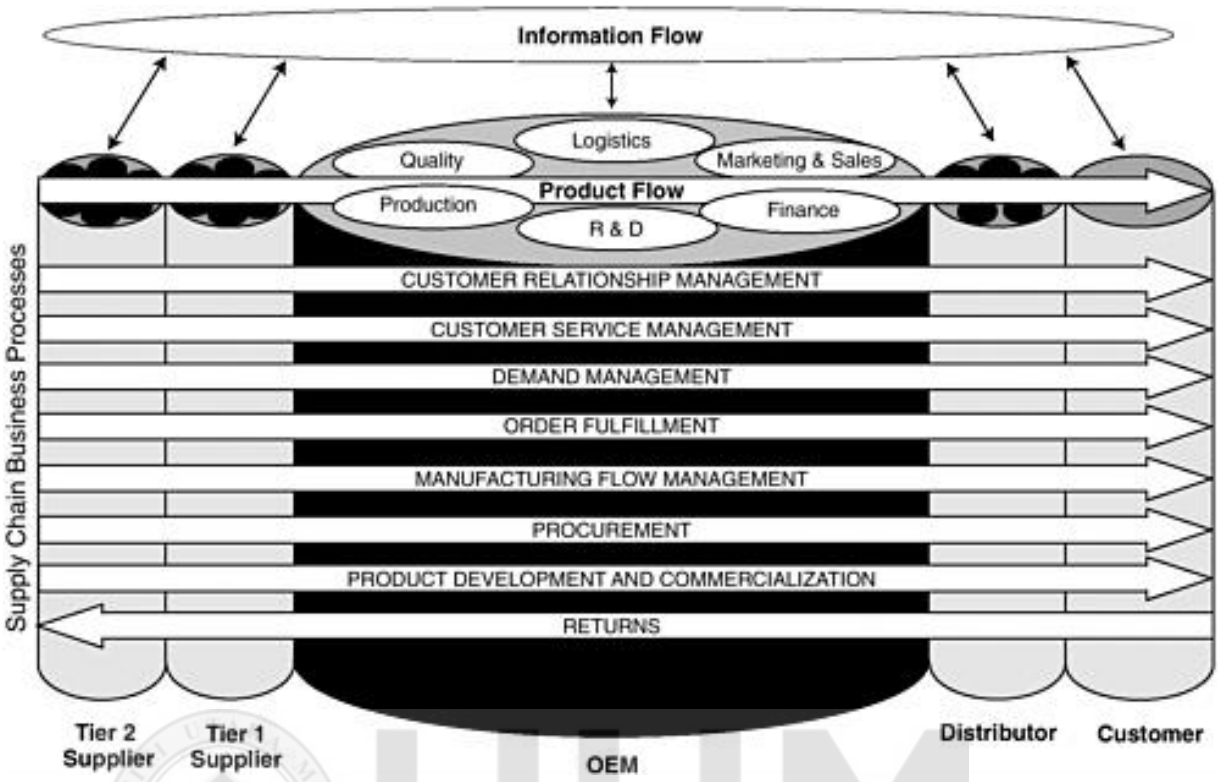


Figure: 2.1
Integration of various processes in supply chain management.
Source: Douglas, Martha and Janus

Thus, we should realize that no organization works in isolation as all companies are linked somehow in the supply chain perspective. Supply network theory states that supply networks consist of unique, complex, adaptive systems of focal firms and suppliers (Choi, Dooley & Rungtusanatham, 2001; Pathak, Day, Nair, Sawaya & Kristal, 2007). The suppliers are categorized and functioned as first-tier, second-tier, and tertiary members in the network, while the focal firm utilizes centralization or decentralization strategies to organize the network. Cooper *et al.* (1997) specifically described Supply Chain Management as 'an integrative philosophy'.

The work of Fawcett and Magnan (2002) identified four levels of integration in practice.

i. Internal cross-functional integration;

ii. Backward integration with valued first-tier suppliers;

iii. Forward integration with valued first-tier customers; and,

iv. Complete backward and forward integration ('from the supplier's supplier to the customer's customer').

Supply chain consists of both, the internal as well as external supply chain (Narasimhan, Swink & Viswanathan, 2010, Lee *et al.* 2001). The external supply chain is facing environmental factors that can affect directly and indirectly on the supply chain itself (Queseda et al., 2008). The environmental factors could be due to political reasons, economic, technological or geographical (Kleindorfer & Saad, 2005). The criteria used to measure the impact on the success of the supply chain are supplier failures, supplier quality problems, malfunction of IT system, accident like fire and natural disaster. In supply chain management, the location or the country of business is the most important. The basic infrastructure must be available and potential to grow or improve in the near future. Facilities like airports and seaports will assist in the transportation and shipment arrangement. Availability of other benefits, for example storage locations or closeness in terms of distance to customers are equally important.

The internal supply chain is within the organization and therefore, the risk is caused by problems in and within the organizational boundaries. Examples are faults of machines or problems related to information technology (James Rice & Caniato, 2003). The criteria here for measuring are: machine breakdowns, import or export restrictions, transportation

failure, delivery chain disruptions, increasing customs duty, change in customer demand, technological change and increasing raw material prices. Due to the complexities of some process in the industry, for example, in the aerospace, the knowledge and skills of the workforce are equally important and a mandatory to share with their customers. The ability of the workforce not only to run the equipment but also the capability in maintaining the equipment is highly needed. Internal control and process are the next two areas which are crucial in the supply chain management.

The objective of the supply chain management is to have a robust and yet, an agile and competitive process to compete internationally at a competitive rate. While the external supply chain may not easily controlled by an organization, but the internal supply chain is very much within the control and management of the organization. Therefore, most organizations will continue to focus and work on their internal supply chain to gain their competitiveness in the market. Such competitiveness may give the edge to the organization to stay on the top.

Ganeshan (1995) propose that decisions for supply chain management be divided into two broad categories, strategic and operational. Strategic decision is usually at corporate level and is linked to medium or long term planning which is normally 3-5 years and above, while operational is shorter in terms of planning and can be on an annual basis. Both categories complement one another and it will be difficult or different without each other. From the long term strategic plans, the day-to-day operation plan can be implemented accordingly. Similarly, some organization design their strategic plan with reference to the

operational decisions. Whether it is strategic or operational, there are four major decision areas in supply chain management and all fours have both the two categories stated above. The decision areas are:

i. Location: Location or the geographic placement of stocking points and sourcing points is the natural first step in creating a supply chain. The location of facilities including production site involves a commitment of resources to a long-term plan by which how the product flows through to the final customer are designed. This represents the basic strategy to penetrate customer markets, and will have a considerable impact on revenue, cost, and level of service. These decisions should be determined by an optimization routine (Arntzen, Brown, Harrison & Trafton, 1995). Many of the suppliers have relocated their facilities near to their prime customers. This action will reduce the transportation lead-time as well as bringing the cost of transportation down tremendously. It is obvious that governments in developing countries provide very special incentive to attract larger companies to invest in their country as other supporting industry will follow too. Location decisions are primarily strategic and they have great implications on the operational level.

ii. Production: Strategic decisions also include the type of products and which facility or location to manufacture or pack them. These decisions have a big impact on the revenues, costs and customer service levels of the firm too (Hult *et al.,* 2004). It is important to mention here that the manufacturing capabilities and capacities are important and will determine the degree of vertical integration within the firm (Simchi-

Levi *et al.*, 2000). Operational decisions are normally short term and focus on detailed production scheduling on day-to-day basis. However, to determine the product type and the manufacturing method to ensure the product is able to be priced competitively in the market is the prime importance. A decision on the resources are equally important, for example the availability of skill workers or cheaper labours or ease of obtaining the raw materials to support the production. Robust processes and the state-of-art equipment to ensure fast conversion of the raw materials to finished products will reduce the inventory at the work-in-progress (WIP) phase and this will also reduce the need for huge working capitals. Having a low or manageable working capital means reduction or avoidance of bank borrowing and having to pay little or no interest borrowing to the financial institutions.

iii. Inventory: This refers to the decision on how the inventories and related matters are managed to support the business. Inventories exist in every part of the supply chain and they can be in the form of raw materials, semi-finished or finished goods depending on the process where they are located. Finished goods to one party can be a raw material to another party. For example a product to a supplier is their finished good while to the customer, it could easily be their raw materials or semi-finished products. Buffer stocks exist to cater for any uncertainty that might exist in the supply chain, for examples, delays in shipping or quality rejection during receiving or even during storage or production. Since holding of inventories can cost anywhere between 20 to 40 percent of their product value, having an efficient inventory management is critical in supply chain operations to ensure no inventory is at the wrong level at the

wrong locations. However, most researchers have approached the management of inventory from an operational perspective. Deployment strategies such as the push versus pull, control policies, optimal levels of order quantities and reorder points, and setting safety stock levels are critical as they are the primary determinants of customer service levels. These strategies have been deployed by most of the large companies to stay competitive, however, many still are reluctant to employ such strategies. Inventory strategies are prime and key factor to support the supply chain and, also the success of the companies to meet their customer's delivery and expectations.

iv. Transportation and Distribution: The logistic option for transporting inventory such as road, rail, ocean or air, is closely linked to the inventory decisions, since the best choice of mode of transportation is the one with the lowest indirect cost of inventory associated with it. Air option is fast, reliable and warrant lesser safety stocks, but it is very expensive and in most cases, the pricing with this option is not acceptable by the customer and hence, is not a likely option. However, when there is a delay in delivery due to shortage of inventory or poor quality, air shipment turns to be the best mode of transportation to keep the delivery promise and thus, meeting the on-time delivery (OTD) measurement.

Ocean or rail options are definitely much cheaper, but they necessitate holding relatively larger amounts of buffer inventory against the inherent uncertainty associated with them. Ocean by far is still the most common mode for transporting across countries and since the invention of containers, shippers find it safe and

convenient. The only challenge is the availability of sea port, but again, this has been compensated with more and more container haulage company being set-up across most countries. Railing is a major challenge as there is no railing track to every part of the country or town or companies and this has made such mode restricted to only between container collection point which is known as container depot to nearest seaport. Building the railing track is very expensive and in most cases, is near impossible. As transportation is more than 30 percent of the logistics costs, operating efficiently makes good economic sense. Shipment sizes, routing and scheduling of equipment are key to effective management of the firm's transportation strategy (Oliver & Webber, 1992).

With more complex products, for example the time and temperature sensitive cargoes, the challenge in getting the cargo to a location in the same condition before it is shipped has been the focus for many shippers.

Smyth, Huber & Sweeney (2007) mentioned that the supply chain management is much more than the firm's operations and logistics. It is about developing, managing and leading vital systems and processes that are at the very heart of business profitability and growth. Supply chain management concept resulted mainly from two bodies of knowledge: (1) purchasing and supply management and (2) transportation and logistics management (Tan *et al.,* 1998 in Tan, 2000).

Supply chain management scope or coverage involves the following but not limited to the following functions:

i. Supply: Areas include Supplier Management, Supplier's evaluation, Supplier Certification/Audit and Strategic Management.
ii. Operation (including management of inventory): Areas include Demand Management, MRP/ERP application software system, Lean Production System and Inventory Visibility
iii. Logistics: Areas include Costing, Delivery Timing, Distribution Network and Order Fulfilment.
iv. Integration: Areas include Process Integration (Flynn, Huo & Zhao, 2010) and Supply Chain Performance Management

2.2.1.2 Definition of Supply Chain Management (SCM)

Stadler (2008), summed up the many definitions of SCM by various authors and researchers as

> *'The task of integrating organizational units along a supply chain and coordinating materials, information and financial flows in order to fulfil (ultimate) customer demands with the aim of improving competitiveness of the supply chain as a whole'*.

Some researchers suggested a clearer supply chain management definition by adding the information system necessary to monitor all of the activities (Lee, 2002 & Talluri, 2002). While the American Production and Inventory Control Society (APICS, 1990) define the

supply chain as the processes from the initial raw materials to the final consumption of the finished products linking across supplier-user industries. The supply chain constitutes all functions or process within and outside an industry, which enable the value chain to make products and provide services to customers in the most efficient approach (Chopra and Meindl, 2001).

Supply chain also covers integrated management of every organization throughout the whole chain (Horvath, 2001, Talluri, 2002). Thus, in the end, supply chain management produces value, whether in the form of products or services to end user or customer. Products move through a series of organizations and operations, between the original suppliers and the final customers. Such process is part of the supply chain management. The definition of supply chain management by the Supply Chain Council (2002) is that the supply chain encompasses every effort involved in producing and delivering a final product from the supplier's supplier to the customer's customer. Supply chain management is a function responsible for the flow of materials (Gupta and Maranas, 2003) thus ensuring right items are available in the quantity required with the correct quality just on time at the location needed or specified by the customer, including all activities and processes to supply product or services to a final customer. It is important to note that a customer can also be a supplier to their customer.

Supply chain management is the streamlining of a business' supply-side activities to maximize customer value and to gain a competitive advantage in the marketplace with the quality acceptable to the customers or consumers and at the price they are willing to pay.

Supply chain management represents an effort by suppliers to develop and implement supply chains that are as efficient and economical as possible. Therefore, from here we noted that time and cost are two important criteria's in the performance measurement of the supply chain. Supply chains also cover every area and process right from production, to product development, to the information systems needed to direct these undertakings (Shah & Shin, 2007).

Typically, supply chain management will attempt to link and manage the production, shipment and distribution of a product to the customers. In an effective supply chain management, companies are able to reduce excess cost and provide products much faster to the market which can be an edge for some businesses. This is the results of having tighter control of the internal inventories, internal production, distribution, sales and also the inventories of the company's product purchasers. Supply chain management is based on the idea that most of every product that comes to market or reaches the customers no matter the destinations, are the results from the efforts of various organizations called the supply chain. Although these supply chains have existed for ages, until recently, most companies have paid only scant attention to them.

However, with the increase rate of globalization and having more organization going international, there is definitely added complexity in the business process as well as the business dealings. Management requires a party to manage and control the end to end of the business and therefore, more and more organizations started to understand the benefits, especially the need for an effective supply chain management.

2.2.1.3 The SCM Approaches to Company Performance

The objective of supply chain management is to improve the supply chain process so that the appropriate product gets to the customers on time and with minimum cost (Si et al, 2007). Believing that supply chain management can lead to better response to customer needs and ultimately become more profitable, many managers have been focusing their attention on supply chain management (Ketchen et al, 2004). Supply chain metrics are normally linked to customer service satisfaction index as quoted by Lee and Billington (1992). In the distribution systems, apart from suppliers and customers, there are also intermediaries or known as distributors or agents. Everyone in the supply chain is part and member of the total network. Each determines not only their performance, but ultimately affects the supply chain in total. In an effective supply chain network, members maintain and sustain a customer-driven culture, offering the right product in the right place, at the right time and at the right price (Kuei et al., 2001).

One of many approaches in supply chain management and the most common is the just-in-time (JIT) concept which is widely practiced by many companies around the world. From here, supplier partnership program usually initiated by the customers started to evolve and become very important as in the case of Toyota in 1970. Under such partnership, suppliers and customers share the same destiny as the success of one is linked to another. Trust becomes a great emphasis and sharing of knowledge between them become seamless. The amount inventory required is shipped accordingly to the requirements or demands and usually a pre-set limit on the inventory holdings. There are little inventory holdings and hence, no large storage is required. Suppliers with many dealings with their other customers

and also, deem as the expert in their products can contribute advices and suggestions for production as well as process improvements.

In such arrangements, a highly integrated information system known to many as the enterprise resource planning (ERP) is used as a tool to capture the necessary data, not only for records but also in assisting top management in the decision making process. Furthermore, the ERP system also indicates a different set of performance measures to manage supply chain, where one can efficiently plan materials and information flows to minimize cost efficiency, effectiveness, delivery and flexibility (Shah & Shin, 2007). Information required must be accurate and timely so that decision can be achieved. This is a very positive move, but not many organizations can achieve mainly due to company confidential data or protection of intellectual property.

Another equally common and popular concept is the vendor managed inventory (VMI). Most companies recognize the importance of inventory holdings, but holding the inventory involved operation cost as well as risk of writing off due to various reasons. With higher business volume, most of the large companies insisted their suppliers to manage the inventory on their own expenses and ensuring continuous supply, maintaining a steady supply when needed, both for production or to fulfil the order and shipment. However, in such arrangement, it is also important to note that the supplier will enjoy long terms and consistency in business as normally a contract for this arrangement will be signed thus, assuring the commitments from customers towards their suppliers.

In this arrangement, the ownership of inventory stays with the suppliers until it is drawn and use in the production. During the materials transfer, the transaction capture will also auto generate the invoice to the buyer. The suppliers also have other benefits such as the ease in withdrawing the stock and sell to another customer which may require it urgently and also the ability to sell as spot-buying.

2.2.1.4 SCM Performance

The measurement of anything, including cost is a fundamental element of management, 'what gets measured gets managed' (Austin *et al.,* 2007). Performance measurement in the supply chain management is divided into quality, cost and customer service (Sinha & Subash Babu, 1998). Effective management in a supply chain, the measurement goals must consider the overall supply chain goals.

Van Hoek et al. (2001) emphasized that to assess supply chain performance, the effective supply chain metrics must be centred on customer satisfaction. In the context of customer service, it is further divided into flexibility, dependability and innovation of the service and products. Being flexible means having the capability to provide products or services that meet the individual demands of customers, which can differ in terms of specifications and this is very important as manufacturing today move to smaller quantity with large varieties in their daily production plan compared to the older days where production deals only with mass production and larger volume of the similar product. With most organization, capturing a larger market share to increase their business, customer service requirements constantly increases and effective management of inventory in the supply chain is crucial

(Slack *et al.,* 1995). In a supply chain, the total cost associated with inventory can be broken down into the following (Levy, 1997);

(i) Opportunity cost, consisting of warehousing;

(ii) Capital and storage: Cost associated with inventory at the incoming stock level and work in progress;

(iii) Service costs, consisting of cost associated with stock management and insurance;

(iv) Cost of finished goods including those in transit;

(v) Risk costs, consisting of cost associated with pilferage, deterioration, and damage;

(vi) Cost associated with scrap and rework; and

(vii) Cost associated with too little inventory accounting for lost sales/lost production.

Supply chain management performance can be measured based on competence success. It does play a significant role in the knowledge based economy and its effectiveness has been the main focus from many parties in the total supply chain management. However, it is noted that there is a problem to measure the effectiveness of most top management in decision making, especially when the knowledge based factors are as important as the value of assets and the ability for cost reduction (Walters, 2006). The knowledge based variable are the significant value of innovation and the opportunity available as the result of the collaboration.

As quoted by Leavy (2005), the value of innovation is the result of the flexibility to renew business models and access competency in the supply chain while collaboration would result in the engagement of the data and knowledge sharing including any integration projects from the parties. It is important to note that an integrated success for any companies, the company competence as well as the team and individual performance, are crucial.

Knowledge based supply chain management, similar to other areas of activities, normally is from the internal resources where the companies who are creating are also the ones implementing it. Therefore, any learning from others in the company must be via themselves as well as the external sources too. Excellent performance in the supply chain management, especially with the high rate of globalization, and with the stiff competition, definitely increases the needs for collaborations. Companies need to review their strategy and goals, and consider the interaction with different level of issues in terms of the knowledge-based plans (Lindgren et al., 2003). The implementation of virtual team could initiate and speed up the different types and level of collaboration and such action may also lead to changes in the strategies of supply chain management. The team, including the management must continue to seek and explore the competence priorities through a possible new variable that may benefit the value chain of the company.

Competence management issues of an effective supply chain management can be subdivided in a four level strategic analysis that can assist in the top management decision making process. The four levels of strategic analysis will cover areas in competence

management, knowledge management and lastly, the supply chain management. The analytic network processor also known as ATP is a technique widely used to analyse the characteristics and complexity of the supply chain management. It is interesting to note that, even though there are increasing studies of ATP but few are related to supply chain management and until 2005, there was only one study on knowledge management related to supply chain management performance.

One of the examples is the case of the company, The Xerox where they improve their supply chain optimization through improvement in the inventory management. To ensure sustainable growth and profitability, and to encourage customer loyalty, they review their end to end processes in the supply chain. Some of the initiatives taken are the digitization of reports instead of hardcopy, sharing the actionable insights with their partners, automate those labour intensive processes and, working with a knowledgeable team. Is obvious the last point will be the most critical as having competent team, the rest will materialize in the matter of time.

Supply chain management consists of many stages and this includes the customer as mentioned by Simchi-Levi et a. (2000). Any issues regarding the supply chain, more often the blame lies towards the human resources and their competency in regards of knowledge management. However, knowledge is better positioned as an important attribute compared to competence management strategies which are definitely more challenging in most manufacturing facilities. Most are not able to positively respond to the goals of the supply value chain. Knowledge management is an important strategy for effectiveness and is

divided into strategies, infrastructure and distribution. Raisinghani and Meade (2005) challenged that once upon a time where agility is much discussed in the supply chain management strategy, is now not the case anymore. He stressed that the tangible and intangible components in a holistic platform can be the leading edge of the coming century on supply chain management performances.

Most companies set important targets to the respective functional areas and this is similar to supply chain management. All companies also recognize that responsiveness is key to success for below. The normal target set are (Tamas, 2000):

a) Forecasting – accuracy
b) Order management
c) Time to market
d) Inventory management, and
e) Capital efficiency

Apart from responsiveness, another important attribute is consistency as it builds better trust from the customer and the chances are, a customer may stay with a company that has gained the trust from their customer. Issues like late delivery, poor quality and the price difference can easily make the customer to change their supplier. Consistency in performance is an evidence of the robust processes internally as well as externally and to some extent, the competent knowledge and skill of the workforce.

Supply chain management is important because funds are tight up in inventory and the lesser inventory holding is better, but not compromising on service level to the customers. Business strategies such as cost leadership and product differentiation is very much driven by supply chain management, which normally is lean and agile in nature to stay competitive. Organization is leveraging on the effectiveness of the supply chain as any improvements will give a direct impact to the company performance, including better service to customers. With the high degree of globalization and the complexity in business, to further cope with the new and additional challenges, an effective supply chain management is definitely required. In addition, with a proper and structured supply chain, organization will be able to recognize gaps and opportunity for improvements.

Supply chain management is a function responsible for the flow of materials (Gupta and Maranas, 2003) and inventory management is an important part of this broader function. It is impossible to separate inventory management from other decisions with regards to the supply chain management. Part of this study is to determine the supply chain determinants of organizational flexibility which enable firms to adapt to changing production requirements, product configurations, and organizational strategies (Schilling & Steensma, 2001). It is clear that inventory is a prerequisite for effective supply chain management performance and therefore having the right inventory management strategy will definitely provide a right level of inventory at the right location to meet the order fulfilment.

2.2.2 Inventory Management Strategies

The purpose of an effective inventory management strategy is to minimize inventory holding costs while maintaining adequate inventory level to meet customer demand. Harrington (1996) noted that inventory is where the biggest cost is hidden in most of the businesses today and yet little attention is apportioned to this scope in business. A business owner must analyze the advantages and disadvantages of each strategy to determine which method will work best for them by analyzing the cost of carrying inventory and the cost of purchasing and replenishment of the inventory. When stock on hand is low to cover demand and if the level continue to fall until safety stock is impacted it will likely to cause stock-out if there is also a delay in the replenishment due to whatever the reasons. In such situation, sales will be affected and thus, the customer service level is impacted directly (Hult *et al.,* 2004).

Supply chain management decision affects inventory management due to factors such as location, space availability, handling facilities, system and investment. An effective inventory management will optimize the supply chain, eliminate cash flow and reduce the occurrence on inventory shortage caused by variable orders. Therefore, it is of utmost importance to optimize inventory management to satisfy the company's strategic goal. Lee *et al.,* (1997) describe a problem frequently encountered in supply chains, called the bullwhip effect, where the demand variability increases as one move up the supply chain. Such distortion in the information throughout the supply chain can lead to inefficiencies, excessive inventory investment, poor customer service, lost revenues, misguided capacity plans, ineffective transportation and missed production schedules (Lee *et al.,* 1997 and

Chen & Yu, 2001b). Pyke and Cohen (1994) insist that in a normal business operation, most industries have at least 50 percent of the company's assets were tied up in inventory.

As the consumers become more knowledgeable, more items are now added to categories of products with shelf life, which means the validity of the product has a life –span and over keeping it will make it no longer saleable. Due to a shelf life policy, the condition of storage has become an important factor in preserving the quality of the materials in terms of form, fit and function, which is very true in the aerospace industry especially in the composite manufacturing. The composite materials use to form the panels located in the body of airplanes, the raw materials itself requires a minimum of -20 degree Celsius storage condition. Such storage condition must be maintained until is used in the production. This would include the delivery as shipment must be in a refrigerated truck or container to preserve the storage condition, hence the quality. If due to any reason the condition changes, the composite materials used in the aerospace industry might be scrapped as it might lose its mechanical properties even though the shelf life may still be valid.

There is little or no boundary between inventory management and supply chain management as all supply chain activities have a direct impact on stock and vice versa. A change in demand in terms of quantity or type will potentially affect the organization stock holding for not having the right level of stock. From the many key activities, supply chain management recognizes that inventory control as a major factor to determine the success of its performance as this activity has a huge influence on the inventory level and integrity, emphasizing more on the stock record or the system. The manner in which customer's

orders are processed, generated and scheduled also determines the performance of downstream activities and inventory levels. Order lead time is part of the total order cycle time, which refers to the period between receiving the customer's order till the delivery of the finished goods. Supply chain response time can be minimized with the shortening of the order cycle time and this leads to the improvement of customer's satisfaction level. An effective way to achieve the same objective is to have a well-integrated action performed by cross-functional teams working together and effectively to reduce the order lead-time and remove the redundancies as stated by Schonberger (1990). Therefore, inventory management strategies are needed to provide the optimum inventory to meet all the requirements.

2.2.2.1 Definition of Inventory Management Strategies

Wanke (2011a), the inventory management involves a set of decisions that aim at matching the existing demand with the supply of products and materials over space and time in order to achieve specified cost and service level target, observing the product, operation, and demand characteristics too. In short, inventory management means the stock or inventory control and its policy (Krupp, 1997) which is the inventory management strategies. It is the function responsible for all decisions in regards to inventory stock in an organization like policies, activities, procedures to ensure the right amount of each item is held in stock at any time and locations. In some companies, the inventory management strategies could encompass the logistic arrangement as inventory in-transit depending on the International Commercial Terms (Incoterms). Inventories are materials and supplies that a business or company carries either for sale or to provide inputs or supplies to the production.

Inventory management strategies are responsible for planning and control of inventory flow from the raw materials stage right to the customer. Inventory management is necessary as supply rate is not always equal to demand's rate and therefore, acting as a buffer to mitigate any shortcoming in the inventory level. Inventory refers to raw materials, semi-finished or also known as work in progress (WIP) and finished goods (FG) which are typical categories of inventory in a manufacturing industry as quoted by Capkun, Hameri and Weiss (2009). They also stated that raw material is highly correlated with financial performance, while WIP is part of the gross profit measurements and FG in relation to operating profit measures.

Inventory are goods or refer to as "materials" especially in a manufacturing environment and these are items not use immediately and are stored by an organization or department internally until it is needed, example sold, consume, etc. Types of stock depend on the industry and apart from manufacturing, they are classified into spares and consumables too. As much as inventory is needed, it can also be a liability, especially with shelf life items. Moreover, their exposures are defined as the amount of committed inventory within the total supply chain and are normally based upon expected demand and the cumulative lead times associated with the current supply chain.

2.2.2.2 The Inventory Management Strategies

As inventory can be both, provide sales to an organization, and risking losses to companies in terms of scraps of non-moving or obsolete items and also damaged items during the storage. Therefore, economic order quantity (EOQ) in inventory management strategy is

widely practiced, initially by Ford Harris in 1913. The goal is to minimize costs, for examples, the holding and ordering costs. This strategy assumes that a perfect world and lead time for the receipt of orders will remain constant. It also assumes that demand for a product will remain at a constant or near constant level. The objective in economic order quantity (EOQ) is to determine the order quantity that minimizes average inventory management cost and time, thus avoiding shortages or overages of inventory. Inventory has a clear strategic role in allowing smoother production and financial performance. Smoother production will create good outputs with better quality and hence, improve customer's expectation and this is normally linked to effective supply chain management. The financial performance can be heavily affected by the inventory management strategies, for instance, too high inventory affecting the fund tied up in operation and high scrap which is considered a loss of asset, affecting the Profit and Lost statement.

Management of inventory is a task that top management seldom regard as being important until there are issues caused by shortage of inventory. Therefore control of inventory is necessary to ensure the company has the right goods available to avoid shortages and prevent missing or theft. Any change in the inventory level without proper recording will affect directly in the accounting statements. Companies can be holding inventory from 45% to even 80% of the total expenditures. Therefore, it is true to claim that many companies have too much of their capital committed to the major asset which is inventory. Worst case is having the wrong or obsolete inventory still existing in the "book or system" which would be reflected in the accounting statement. It is important to differentiate between value of inventory holding and the cost of inventory holding, as value will show either its

original, replacement or market value of the inventory itself. Different companies may use the valuation differently and this is acceptable provided the practice is consistent throughout the year of the accounting period. Inventory holding costs are the expenses incurred to stock the inventory, examples are the storage cost, insurance cost and management cost.

Inventory is the most important key in the supply chain performances and therefore, managing inventory should be considered as a high priority in the top managements. There are a few reasons for inventory control and one of them is to ensure that the composition of inventory aligns with the demand or sales trend in terms of the products. The process also helps in securing the best rate of inventory turnover for each of the items and this is used as a measurement. From here, we can differentiate the fast-moving items from the slow-moving and non-moving items. While plans are to prepare for the fast moving, action can be taken to move the slow or non-moving items. In this sense, we can reduce the need to mark-down or even scrap parts. Scrapping the inventory could be due to quality issues, damages and out of date items. In some cases, the accounting of items needs to write-off inventory due to items' missing and lost.

There is no specific rule on the ideal level of inventory which can be applied to, as different industries and companies varies from one another respectively, in terms of the level of inventory the company should maintain. The inventory level largely depends on some factors, examples are lead time, volume and accuracy of forecasts. Having too large of an inventory will result with more scrapped items due to obsolescence or unwanted quality.

Apart from such risk that impact financially, amount of capital tied up will also be substantial. However, having insufficient or not available to support the order fulfilment may cause more damages towards company's reputation, where customers may claim for underperformances. In the aerospace industry, a customer's claim can be very substantial and could grant a penalty that most suppliers try to avoid. However, having a stock-out can be very expensive to a company. To avoid issues of over-stocking and under-stocking, there are a few systems that could be applied, that could assist the management of inventories.

Among the approaches that are used to manage or control the inventory are:

a) The Eyeball System

One of the simplest system and easily found in many places, especially small retailers and manufacturing operation. It is more physical and visual in nature where the person in charge will have to make a regular walking inspection around the storage and if the person notices any items out of stock, he/she would have to physically place order for replenishment. However, this system is not fool proof as it is very subjective and any hidden items will likely to be missed out.

b) Reserve Stock System

This is also known as brown bag system and much more systematic that the eyeball system. This system involves a reserve stock that is normally set aside. The reserve lot will be used when the open inventory is used up. Furthermore, when the situation occurs, an automatic reorder is triggered immediately. The

quantity of the reserve stock should be sufficient to cover until the next shipment arrives. Therefore, the lead time of supplies and the rate of product usage are important to determine the reserve quantity. And such reserve stock normally must be made known to the finance department.

c) Perpetual inventory system

This is the most secured among the three systems. There are three types of the perpetual inventory system which are the manual, stock card and computer operated. The most advance is the computed generated, a programmed instruction used to trigger and forward purchase order to supplier automatically when the volume of inventories fall to a specific level. All the types share the same objective, which is to keep the numbers correct and provide the information to where needed. This system also ensures that the inventory is always available.

Effective management of inventory is the core of supply chain management excellence. Inventory scope includes a number of aspects, mainly the raw materials, finished goods, inventories in-process, vendor's inventories and more which sits at the intersection between demand and supply. Yet our understanding of inventory management strategies and practical practices in many inventories-related aspects still have a long way to go in most industries and companies. As a matter of fact, it is only in the last decade or so that the direct link between inventory management and cash flow were comprehended thoroughly and companies started reviewing the importance of inventories. During the recession in 2008-2009, most companies started to reduce inventories sharply and

primarily through “slash and burn” method, with the target of corporate survival. However, the technique may not be sustainable especially when the economy took a turn and started to recover. Moving out of the recession, companies have faced a number of issues that are adding to their supply chain network complexity due to an inventory reduction.

Companies then started to realize that effectively managing of inventories, a level at a time, are not sustainable and definitely no longer sufficient enough. Issues and challenges need to be tackled more holistically, considering actions, tools and strategies that can resolve or mitigate the growing global inventory challenges to have the inventory levels as low as possible while maintaining or even improving customer service levels at the same time. One of the challenges of supply chain global network complexity is the number of inventory stocking points or “nodes” in the value chain.

There are few of the actions to enhance the inventory management strategies, however, there is no definite solution that could be practiced, especially in the face of the complexities and rate of globalization. It is natural that most companies that started with refining their tune for their forecasting technique, for example, in any forecasting, to expect some degree of errors.

Another common action is reviewing the safety stock mechanism. The simplest approach is the SKU segmentation approach where products are put into two or more batches where the quantity will largely depend on the ordering and delivery lead time (Chen & Samroengraja, 2000). Leading companies have started to increase the frequency in which

they review safety stock policies. As business changes, it is important to ensure the data is accurate and updated to the latest to reflect the current demand and the new requirements. Studying the trend of items with high demand and the variability of information and data may result with better performance. Most of the issues faced by companies are due to lack of insight, considering the how and where a complex supply chain inventory buffer should optimally be held.

Solving all the issues and challenges well is almost impossible without the help of automation. Software and technology gadgets have been part of important accessories for inventory control and management. In addition, functional name had also transformed from traditional Sales and Operation Planning (S&OP) basis to Sales, Inventory & Operations Planning (SIOP). This has recently changed due to the importance of inventory and need by setting up targets for the inventory levels needed in supporting the demand and the business as a whole. In some organization, they argued that the inventory-related decisions were always inherent to the S&OP process, which may be true from a theoretical perspective.

Technology, especially the program or software which is commonly known as the Enterprise Resource Planning system (ERP) has the capability to support the complex inventory rules and policies. Normally this is done by channeling common inventory pools and allowing companies to take action quickly in pursuing combined cross-channel inventory strategies. It is interesting to note that many solutions provide the ability to dynamically identify the optimal sourcing location, whether in the company's own supply

chain network, or a possible drop ship directly from a drop ship item, a company may also be able to take a good bite out of current inventory levels. In the ERP, a module for distribution management (DOM) planning can help to mobilize or trigger movement of inventory, when and where necessary.

Like all programs, DOM software also varies considerably in capabilities and focus. Inventory optimization, or IO is an important requirement in all these systems. The traditional supply chain planning software only optimizes inventory levels one node or echelon at a time, but the latest ERP software is able to work on a wider scope depending on requirements and states of the inventory holistically, even at the distribution channels.

Contingency plans must be in place to mitigate or at least cushion the impact caused by shortages of inventory either in manufacturing or retailing sector. Any disruption in delivery of goods or even services will affect the order fulfilment and this will have a direct impact on customer service level. In industries such as aerospace, any delays will attract very heavy penalty, including the possibility of the existing contract being terminated. To ensure that the business is running as smoothly as possible, companies must keep on reviewing the inventory management strategies regularly so that alternative plans are available when the needs arises. Few suggestions to mitigate the loss of sales due to unavailable inventories will be discussed later on in the study. The first and most important in inventory management is the source of supplies. It is important to have a minimum of two suppliers of unique items and their reliability in terms of delivery and quality must be monitored regularly. In case of shortages, arrangement for special delivery, including

opting for a faster mode of transport must also be considered. Although the cost of airfreight often proves to be more expensive than other options, however, it is sometimes considered a better option rather than having a poor delivery performance record to customers. Notifying customer of such potential delay is also relatively important so that the customer can make alternative arrangements. In most cases, companies fail to do so, fearing that the customer will be upset, which is a very usual response from customers towards the delay in their orders. However, in some cases, the customer is willing to share their inventory level and allow a certain number of days of delay due to their inventory holding. As inventory management strategies have a direct impact to supply chain management performance, when the shortages of inventory happens too frequently, management should also review their supply chain management strategies to develop a better and robust process to avoid interruption in deliveries.

Review of the literature dealing with inventory management model selection shows that it originally focused on production and distribution environments in which demand and lead time tends to be more predictable or, in other words, in which it is easier to answer the questions of "what" and "how much" to order (Wanke & Saliby, 2009; Wanke, 2011b; Rosa *et al*,. 2010). The forecast is often inaccurate, even though many organizations are doing their best to improve the accuracy of forecasting. Spedding and Chan (2000) further add that inventory management technique do not adequately address issues relating to short life cycle and long lead time. The traditional assumption that buffer stock in a manufacturing environment is to cope with uncertainties which actually emerged to be one of the reasons for the increase in lead-time (Slack et al., 1995). This is typically true for

companies located in Asia including Malaysia, in relation to the aerospace industry, as most of the raw materials suppliers are still based in the United States of America or Europe respectively.

However, there is a growing literature related to the specific problems raised by low and very low consumption items such as spare parts (Rego & Mesquita, 2011; Syntetos *et al.,* 2012) and this can be easily applied to the aerospace industry as the quantity required in the various manufacturing companies in the aerospace industry also deals with low quantity product's consumption as compared to electronic or other industry. In addition to the issue, in contrast of the nature of the products being produced, the raw materials suppliers imposed minimum order quantity (MOQ), which enforce an amount of purchase for a transaction. The trend of manufacturing as mentioned earlier, has taken a turn from mass production of low mix, high volume to high mix, low volume currently. Due to constant changes in customer expectation and taste, most Original Equipment Manufacturer (OEM) companies also do not keep a high inventory due to the rapid changing demand.

Determining the most effective type of inventory strategy is an essential element for the success of a business and the organization as a whole. Otherwise, the company may lose money through sales due to shortages or excess of inventory, causing obsolescence and write-off. Among the inventory management strategies, the most common strategies are Just In Time inventory management (JIT), Vendor Managed Inventory (VMI) and Economic Order Quantity (EOQ). Again, it is important to note that effective management of inventory and their strategies in a supply chain are becoming more critical.

2.2.2.3 Inventory Management Strategies Contributions and Challenges

Effective inventory management strategy is the core of supply chain management excellence. Fawcett, Waller & Fawcett (2010) states that inventory is and has always been, a critical supply chain management resource. Inventory management strategies seek to answer: when to order, how much to order and how much stock to keep as safety stock (Namit & Chen, 1999; Silva, 2009). According to Wanke (2011), inventory management involves a set of decisions that are aimed at matching existing demand with the supply of products and materials over space and time in order to achieve specified cost and service level objectives, observing product, operation, and demand characteristics. Inventory holding levels are affected by customer service expectations, demand uncertainty, and the flexibility of the supply chain (Hult *et al.*, 2004). For products with relatively certain demand and a long product life, it should be relatively easy to maintain even as inventories are reduced. However, for products characterized by erratic demand, a short shelf-life cycle, or product proliferation, a more responsive supply chain and larger buffer inventories may be needed to meet a desired customer service level (Ketchen et al, 2004) which is a typical case in the aerospace industry. The volatility of customer demand will definitely add challenges to the inventory management strategy.

Management and control of inventory have been a concern for most managers, especially those in the supply businesses. Of late, many managers are rated and valued for their ability to manage inventory effectively to support the business. This is important as there are costs related to holding inventories and the total costs should be as low as possible. However, it is of paramount importance that the level of inventories is kept sufficiently to ensure the

company will have the right level of inventory to service the customer demand. Therefore, the manager's role in balancing both these objectives is important for the businesses.

To manage and control inventories, few areas of focus which most managers need to be aware are:

a) Buying Practices

Every company would like to have low or no inventory, but realistically, it is not possible. To ensure the inventory is at the lowest level possible, the company needs to determine if the reordering is either based on Reorder point or Periodic. Both strategies have their advantages and disadvantages, but each company needs to determine which is more appropriate to their business. Although inventory is a cost, nevertheless top managements have started to realize that there is also cost incurred without inventory. Therefore, to strike a balance is important for the procurement department.

b) Monitoring of inventories

Proper inventory control is at the receiving function where every delivery is checked for the product and quantity against the purchase order. In most companies, the incoming quality approval is needed before the stock can be put away for storage. It is important to note that someone must be responsible to check the inventory on a regular basis and normally this is the job of an inventory controller.

As required by the regulation, audit of a third party accountancy company is necessary to close the accounting book on a yearly basis and therefore performing the annual physical inventory counting is compulsory. However, in achieving a better management of inventory, a more frequent and regular cycle counting has been a practice by most companies lately. To avoid counting the low value items too frequently, ABC classification of inventories is being implemented in most companies. During the exercise of cycle counting, any variances between the physical and the system numbers will need to be resolved. Furthermore, there is also an additional benefits which are enabling companies to identify the slow or non-moving items as well as if there is any shortages in the stock holding. Missing inventories must be corrected in the system immediately to avoid wrong planning and future miscalculations.

c) Storage space

The space requires for inventory storage must be large enough for a specific contingent period as well as for future business expansion. Most companies will reduce the storage space as it is not a value-added cost and prefer to allocate more space for production. In the storage of inventory, the location plays an important role, for examples, the chemical drums may need to be stored in an open storage while expensive items like the CPU may need a locked or stored in a strong room. The frequent and fast moving items are normally placed at easily accessible locations for efficient logistics.

Of late, many companies including those in the aerospace industry are carrying inventories, which requires special storage condition, for example, a -20 Degree Celsius kept-product, and this posed additional challenges to the management. It is important to note that currently, management and control of inventories are much more complex compared to the past decades, as most items come with a shelf life and some items may even have a very short period before expiry. This has resulted in some of the principles related to inventory management like the economic order quantity (EOQ) no longer relevant.

d) Inventory Turns

This is an important measurement in the inventory management. The inventory turn is measured by taking the sales value and comparing it with the inventory value. The higher the number, the better the performance of inventory management. By taking the inventory turn of each item, items which are slow or non-moving could be identified and actions have to be taken on those inventories as any dead stock items are real losers in terms of inventory control. In acquiring a good result on inventory turn, companies must increase sales and reduce the average inventory values.

e) Inventory Cost

Value of inventory can range between 20-25% of the working capital in a small retailer but in the manufacturing sector, the percentage can range easily between 40-60%. In order to manage and control the high value items, again the ABC

classification is important to ensure high value items are given more focus than cheaper items. This is to ensure the expensive items are not overly or excessively stocked as the value can easily influence the total storage cost for any period. Apart from expensive items, companies need to ensure there is no duplication of items, especially when they carry too many lines of products as this will potentially increase the storage cost too.

Without inventory, most operations, processes or transactions are simply impossible to be carried out and hence, sales will be greatly affected. Stocks itself can affect the lead time and availability of materials, and determine the customer service level too. Therefore, not having inventory in the supply chain simply means like "not having meat apart from skeleton only". This means that no matter how robust the process in the supply chain, having no or insufficient inventory would simply mean there is no whatsoever results and revenue will not be achieved. As part of the mitigation plan, the company may hold buffer stock and Sheffi (2002) states that companies can consider holding emergency stocks and the usage only in the event of total disruption to the business. From the above, it is very clear that having a valid or usable inventory is mandatory for the success and efficient performance of the supply chain management. Otherwise the company will end-up in firefighting mode, paying higher price for raw materials or even higher freight for delivery to compensate the delays or shortage of inventory in meeting the customer's expectation.

2.2.3 Financial Risks

Holding inventories means an ever-present risk towards institutions and organizations. Risk normally refers to a source of uncertainty, for example, in the absence proper management, it can enter multiple losses, whether directly through income and capital losses or indirectly, from restrictions in achieving organization's objectives of trade and financial (Jamat & Asgari, 2010). However, the financial risks of an organization are predominantly targeted at its shareholder, as the performances of the organization are largely affected by the supply chain management which in turn, is affected by the inventory management strategies.

In the perspective of supply chain management, the biggest factor affecting the risks is the possibility and the after-effect of a mismatch between the supply and demand. Such risk focuses on inventory level and location. Not having the sufficient inventory to fulfil the need of the customer will reduce the customer service level, but having too high of an inventory, means the possibility of scrapping the inventory. As inventory is categorized as an asset (or liability depending on the status), it has a direct impact towards the organization's financial reporting. Knowing the inventory could be affected financially, the study here will limit and focus on the financial risk only. Therefore, the research is to study the influence of the financial risk on the relationship between inventory management strategies and supply chain management performance. Nevill *et al.*, (1998) noted on nearly all merchants' balance sheet, inventory tops the list of valuable physical assets. Any lost or potential loss of inventory will greatly impact the cash flow position and performance of the company.

The important or major financial statements are the balance sheet and income statement. The balance sheet includes details such as the asset, liabilities and owner's equity which entails the inventory. Inventory incurs carrying cost which is the cost of capital, storage and risks. Any reduction or loss in inventory will affect the financial statements and therefore, a lost to the organization (Bode, Wagner, Petersen & Ellram, 2011). To avoid losses or potential losses, financial or accounting personnel are responsible in monitoring the inventory level, including the aging of inventory, on a monthly basis. Items which are categorized as high risk will need to be given more attention. This has led to the reason as to why financial risk is used for this study.

Financial performance measurements are important for strategic decisions and external reporting, day-to-day control of manufacturing and distribution operations is better handled with non-financial measure.

As stated earlier, a supply chain management decision affects inventory management and there is little or no boundary between inventory management and supply chain management as all supply chain activities have a direct impact on stock and vice versa. Given the validity of the argument, the next important area in the study is by uncovering what are the financial risk involved. Changes in demand in terms of quantity or type will have cost to the organization holding stock, thus, in such cases, financial risk is also present. As noted earlier, among the key activities of supply chain management is inventory control.

As supply chain management becomes more global and gained strategic corporate focus, there will be a need to understand the financial significance on a firm. When the financial significance is identified, the risk elements are essential to consider. Such financial risk will increase with firms penetrating new and emerging markets or involve with high technology industry where the product life is relatively short in comparison with others.

To manage supply chain risks, two major strategies existed which are reactive and proactive approaches towards supply chain risk management (Kleindorfer et al., 2003). The reactive mode is associated with redundancies where safety stock is an option in order to minimize damage (Sheffi & Rice, 2005). Inventory management strategies not dealing with safety stock, affects the effectiveness of the performance of the supply chain management and thus, could lower the level of customer service. This proves to be a poor cushion for companies due to non-delivery or quality issues in the product.

In the proactive supply chain management, planning in advances is practiced to mitigate risks before they emerge (Knemeyer *et al.,* 2009, Mitroff & Alpaslan, 2003). Having the inventory policy is also an act of proactive by the management to avoid stock out as well as overstock. Characteristics such as tighter coupling, increased complexities, reduced inventory levels, and ever-greater geographic dispersion has reduced costs in supply chains, but have also created greater vulnerabilities (Bode, Wagner, Petersen & Ellram, 2011). Christopher and Lee (2001) termed the "risk spiral" when there is no visibility to potential risks and is associated with the accumulation of buffer stock and the creation of

long pipelines. This is where the study of the financial risks as a moderator is significant to the inventory management strategy and supply chain management performance.

2.2.3.1 Definition of Financial Risks

The financial risk is defined as the cash flow of a party or company that will not be adequate to meet its financial obligations. It is also referred to as the additional risk that a firm's stockholder bears when the firm uses debt and equity. Similarly, financial risk is also involved in the exposure in the inventory (Kouvelis et al., 2009) that will result in financial losses due to stock adjustment from missing inventory, expiry in shelf life, damaged or simply when stock is no longer in use. Our research on financial risk affecting the inventory as well as supply chain management performance aligns with Kleindorfer (2008 a, b).

Financial risk management is defined as the practices and procedures that an organization use to optimize or reduce the amount of risk it handles in relation to its financial interests. Top management of a company that practicing financial risk management should produce a written policy on the financial risks they are willing to accept and the rest of the organization can follow such policy. The people in the organization involve with the financial risk's concerns will monitor the risks taken, and release reports on the results of monitoring these risks to share with the management for better decision and action taken to mitigate such risks as and when necessary. In a broader sense, financial risks involved every level of business, although the amount and the degree may be different. The risk is not only necessarily internal as external environments can also create greater risks.

Risk in the supply chain can be categorized under delays, systems, forecast, intellectual property, procurement, receivables, inventory and capacity. In disruptions, the causes of risks are natural disaster, labour disputes, war and terrorism, single source of supplies and supplier financial. The disruptions of materials flow within the supply chain may normally be unpredictable and can be critical to the company performance. In the delays category, it could be caused by limited and the inflexibility of supplies, poor qualities, different modes of transportation and excessive handling. Such occurrences happen when the material flow is affected, mainly from suppliers due to the inflexibility of their internal process and unable to respond to the changes in demand. This may be due to the high occupancy of their capacity. At the system risk, the failure in the linkages, breakdown of the infrastructure and networking, and issues in the system integration or any functional programs. With more companies moving towards automation and rely heavily on information technology systems (Shah & Shin, 2007), there is a great threat that any breakdown in any of the system can cause issues or disruption not only internally but also externally, especially with customers.

In the forecast risk, the study focusses on the accuracy of the forecast, data or information for decision making and the effect of bullwhip especially to the upstream companies in the supply chain. Such risk normally resulted from a mismatch between a company's forecasting against the actual demand from customers. A low number in the forecast will result in a short of supply while a high forecast might end up with having excess inventories and end up with either scrapping the inventory or a large mark down on the prices. This risk is directly affecting inventory and hence, very crucial for this study. There will always

be a risk in forecasting and therefore, some companies have already started to move away from such business model and started to practice the pull-system of demand to mitigate the issues resulted from forecasting. Intellectual property covers the confidentiality of information pertaining to products, design, market, strategy and supply chain model. In the case of procurement, risk is more presentable in single source suppliers, the exchange rates, capacity numbers and the term of contracts. Intellectual property risk was recently elevated with many companies opting for globalization to be more competitive by outsourcing their manufacturing to less developed countries in Asia. Receivables risk is straight forward, focusing on the number of customers and their financial status. Inability to collect from receivables can affect the company working capital and hence, could result in higher cost of conducting business as a company may have to rely externally to fund the on-going business. To avoid serious impacts, companies commonly give all their creditors a credit limit. When such limit is reached or nearly reaching, normally shipment will be on-hold. Such action is prudent as it limits the company exposures on this risk.

Risk in the inventory includes the probability to obsolescence, the inventory holding cost, finished good value and uncertainty in demand and supply. Inventory is always a cost to any company and therefore any over or excess in the inventory will impact the financial performances as chances of write-off the inventory will be high. This is most evident in the computer related companies, as technology development is so rapid that parts in stock will turn obsolete within a couple of months. This is proven through Dell Computer's direct business model, which can be sustained in difficult times, having most of their competitors out of business during the period of time. This again reflects very clearly that financial risk

is part of the relationship between inventory management strategies and supply chain management performance.

The last category is capacity, which affects cost and flexibility in relation to the capacity (Chen & Yu, 2001b). Capacity issue is related to a company's top management decision and their strategic planning. Regardless, having excess capacity can hurt the company performance as the company has continued to pay for depreciation while generating outputs.

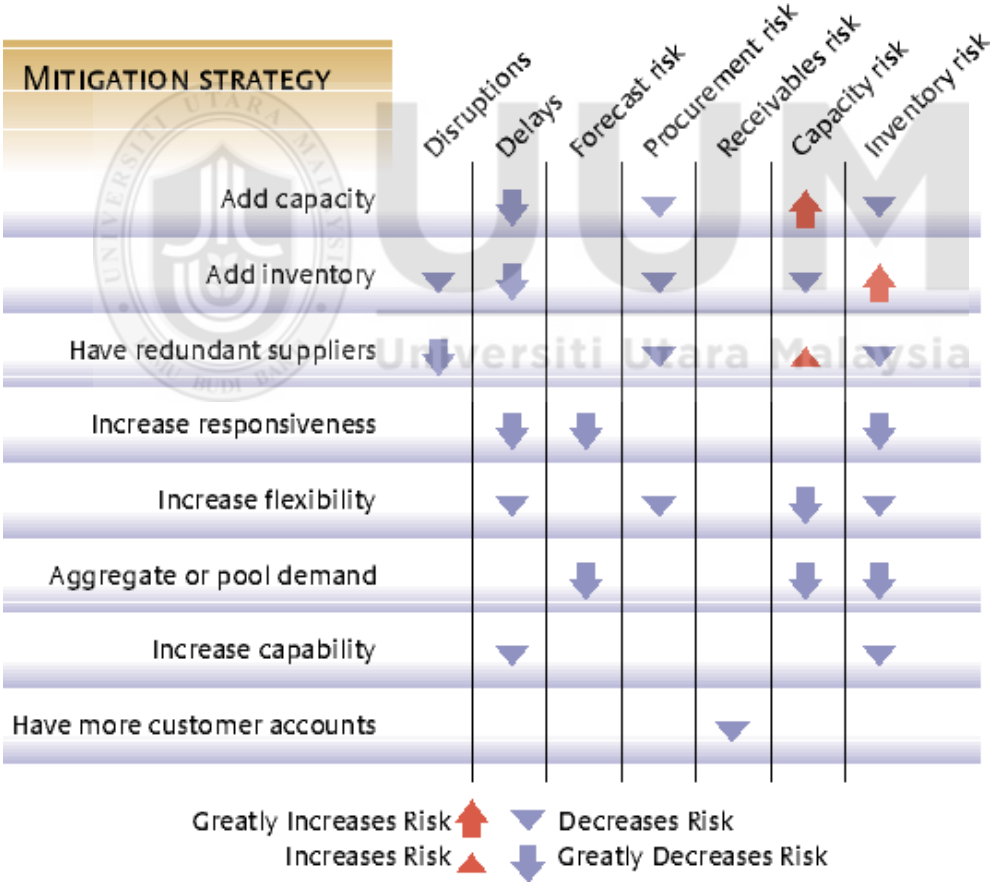


Figure: 2.2
Example of the Mitigation Strategies.
Source:https://www.ukessays.com/essays/management/supply-chain-risk-management-management-essay.php

2.2.3.2 Financial Risks Perspective

Globalization has made it possible for many companies to take advantage of international supply and demand markets, creating a new era of opportunities and increasing sales potential. However, with these enticing prospects, dangers and risks associated with longer and more complex supply chains are also presentable (Tang 2006), which often span multiple countries or even continents. Lead time uncertainty also can affect or in fact, impact the performance of supply chain very significantly as the result will have a direct impact to the inventory and hence, the business or sales. Shortage of inventory cost is high in relation to holding costs, and this gives direct results to service level.

Some of the catastrophes associated with internalization are the Hurricane Sandy on the East Coast of the U.S. in 2012, the floods in Thailand in 2012 affecting many of the automotive industry, and the Japanese tsunami in 2011 affecting the economics of Japan totally. The financial crisis affects most companies and countries (Blome and Schoenherr 2011), as well as the political instability and regime changes to many countries especially in Asia (Doukas *et al.* 2011).

On March 17, 2000, the power line in Albuquerque, New Mexico was hit by lightning and affected a massive surge in the nearby electrical grid, which resulted in a fire in a nearby factory owned by Royal Philips Electronics. N.V. and millions of their microchip damaged. Two of their main customers, Nokia Corp., a Scandinavian mobile phone maker and Telefon AB L.M. Ericsson, also another mobile phone company, faced a same fate, but as

they practice different supply chain model, resulted in two dramatically different outcomes from one event.

This simply reflects the importance of risk assessment and the need to have some mitigation plan in place. The type of disruption can affect the business, unless the level of preparedness of the companies is very effective. To avoid total disruption in business, most companies have started to work on their "business continuity management" in anticipation of the risk. Such plans are part of the powerful mitigation strategy to neutralize the potential risk or negative impact to the companies. The mitigation strategies for the known risk is critical to business otherwise further disruption may cause heavy sales losses. Losses in sales could ultimately result in loss of customer which can be very detrimental to the company's performance.

Kaplan and Norton (2004) articulated four perspectives that can guide companies to translate strategy into actionable terms:

i. *Financial Perspective*: The revenues, profit margins, and expenses are very important to an organization seeking to achieve its goals. A common mistake with organizations is that they normally do not link the financial goals with non-financial strategic objectives of the company. This perspective gives respect to the relationship between stated financial goals and other relating goals within the company.

ii. *Customer Perspective*: The customer perspective is viewed as the set of objectives the organization must achieve to gain customer acquisition, acceptance, and perpetuation. Objectives are an outgrowth of assumptions made about the customers and their attitudes, the markets they represent, and the value they perceive in a relationship with the organization. With the availability of the internet, customers become more knowledgeable and know what they want and also their rights as customers.

iii. *Internal Perspective*: The internal perspective reminds us that the background works or processes, which are driven by objectives and goals, must be in place to ensure that the customer and financial objectives are achieved. Internal processes, cultures and procedures in all departments and business units support the value proposition to the target market segments. Processes must be efficient and practices lean management in order to reduce the amount of work in progress (WIP), as low as possible.

iv. *Learning and Growth Perspective*: This perspective is the basis for all other perspectives and serves to remind companies that the basis for all other results in the internal, customer, and financial perspectives are found in the learning and growth of the people. Learning dictates how people absorb new ideas, improve their skills and turn them into action. The skills and knowledge can be used not only to recognize issues and gaps, but also the ability to generate mitigation plans or solutions on a permanent basis.

2.2.3.3 The Effect of Financial Risks

Relating to inventory management on financial risks, the scope can, for example, observe commodity risks, which can jeopardize even the best thought-out strategies (Tevelson, Ross & Paranikas, 2007). Comparing the price variation of commodity currently, it is obvious that the commodity risks are even more pronounced than before. Prices of many commodities, such as corn, soybeans and wheat, are now fluctuating as much in a single day as they did in a year in the early 1990s (Wiggins and Blas, 2008). Ford had announced over a billion United States Dollars (USD) loss of the precious metals inventory in the early 2000s due to a misplaced bet on rising prices, and Hewlett Packard (HP) had a significant risk exposure to flash memory components in the mid-2000s. In these so-called high-profit products, for example products in the aerospace industry, decision makers exhibit risk averse behaviour (Schweitzer and Cachon, 2000).

Kleindorfer (2008a, b) has emphasized for the need of integrating long-term contract and with access to reasonably liquid spot buying for short-term responses to realize any uncertainties occurring, for example demand or change in price. The effectiveness of such integration of long term-short term contracting normally will lead to increases in expected profits, but will also increase the cash flow volatility (Chatain, 2011). This can be of a concern to companies relying on cash flow volatility and thus raising the need to analyse the impact of such against their financial standings.

The optimal inventory policy is when a dual sourcing is used, and in the presence of a fixed cost. This was studied by Yi and Scheller-Wolf (2003). While other organizations

also practice the minimum-maximum policy, the most important point to note here is that, inventory is an asset and can also be a liability over time, change of customer preference or change in technology. Simchi-Levi et al. (2005) addresses the optimal creation of a portfolio of supply contracts (including long-term fixed commitment, flexibility and capacity reservation contracts), which when integrated with potential spot market purchases can effectively deal with demand and spot market price risks, and offers insights on the structure of such a portfolio and the optimal replenishment policy under it.

From the above, we can conclude that inventory is a key determinant for the success of any supply chain management and the organizational performance as a whole. Inventory is needed to fulfil sales and the main subject in generating revenue for the organization, without which, not only sales will be affected, but customer service level will also be impacted and could easily damage the reputation of the organization in a very short time. The resources, time and funds that an organization normally spends to build its image after many years can slowly but surely be tarnished by word of mouth from the customers on the company capability to fulfil commitments and the customer service level.

Organizations that puts a concern on inventory would usually prefer having the lowest inventory level, as all organizations are aware that the inventory can be costly and also sometimes unnecessary due to high potential in worthiness's depreciation with time (Chopra & Sodhi, 2004). Thus, management of the inventory is crucial and it is closely related to the financial risk, as a result of the cost incurred for writing off the unnecessary inventory normally during year end. Again, it is clear that the financial risk consideration

is a necessary consideration to make sure the business prosper, which is achieved when the supply chain management performance is on top. This happens when the cost of inventory is kept at the lowest possible, with the other factors considered. As most companies realized the importance of inventory, the mindset to have the lowest inventory level has rapidly moved to having the optimum inventory to cater for any unsure incidents which could impact the delivery fulfilment to customers as well as the company performance. The cost of holding inventory is definitely far lower than losing a customer or the penalty for shipment delays. This is where the inventory management strategy becomes a prime importance, looking into the whole process from supplier to customer.

The variable for supply chain management from the quantitative information aspect are in demand, inventory, and backlog, which could potentially be affected by the bullwhip effect (Lee, Padmanabhan & Whang, 1997), and can improve the efficiency of production planning and inventory control and hence, giving financial impact to organizations. The process towards reduction in the bullwhip effect starts with the improving accuracy in forecasting. The bullwhip effect started due to unreliability of the forecast and couple with other issues like quality and high possibility of shipment delays. Suppliers are building additional stock to avoid delay or shipment or failure to capture or meet additional order with shorter lead time.

Among all the risks, perhaps the biggest challenges faced by any company is mitigating the supply chain risks to avoid any reduction in profits. The objective is to continue striving the highest possible profit and efficiently at whatever level of risks. This stage can only be

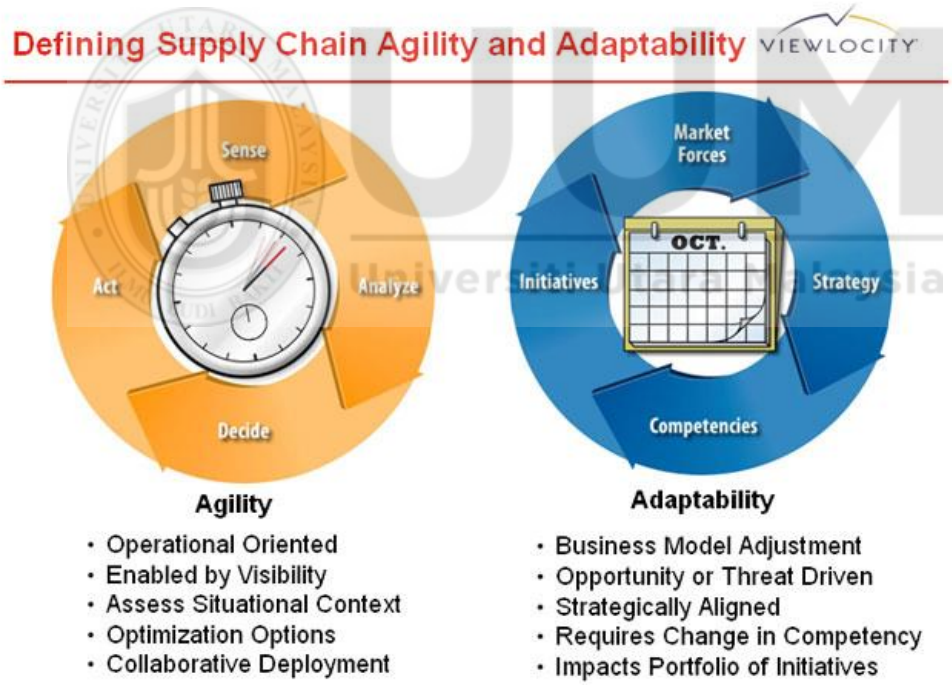
achieved through improving the efficiency and minimizing the risk. Alternatively organization can maintain the level of efficiency and reduced the risk as well as the outputs. Therefore, to mitigate the risk level, especially on inventory, company with high holding cost products or short shelf-life, should consider using the redundant suppliers in its strategic planning. Stock-pilling of inventory to hedge against any disruption may be practical for commodity items which are generally low inventory holding costs with low possibility for scraps.

2.3 Organization and Supply Chain Management Performance

Performance represents achievement amount of company to financial and market objectives (Rajabzadeh, 2010). Supply chain performance includes increasing on-time deliveries, failure reduction, reactivity improvement, decreasing stocks, less internal interruptions, cost reduction, increased flexibility, reduced bullwhip-effect and external disruptions resilience (Lee, Padmanabhan, and Whang, 1997). Organizational performance involves the recurring activities to establish organizational goals, monitor progress toward the goals, and make adjustments to achieve those goals more effectively and efficiently. The recurring activities are what normally the leaders and managers inherently do in their organizations to ensure meeting the objectives.

To monitor the organizational performance, periodic assessments of the organization, whether explicitly or implicitly, it is important and helpful to have some basis for analysing the results. Of all the performance measures, inventory spans the entirety of the supply chain, and hence, is not just confined to production only. Diagnostic models can provide

that basis and some even suggest that these models should come without bias or suggested solutions, and are able to be used to accomplish an objective, unfolding understanding of organizations. Thus, linking the related supply chain processes across enterprises is a mean to create efficiencies, generate customer value, and most of all, gaining a competitive edge to improve company performance (Devaraj, Krajewski & Wei, 2007). Capkun, Hameri and Weiss (2009), emphasize on the supply chain management regarding information transparency, reliable lead time and clever positioning of various value added operations in a long logistical chain. Apart from information, the balances between lead time and positioning are also related to inventory management.



Figures: 2.3
Supply Chain Agility and Adaptability.
Source: Viewlocity

Organizational performance comprises the actual output as measured against its intended targets and goals. According to Manning (2009), it involves the recurring activities to establish organizational progressitor progresses toward the goals, and make adjustments to achieve those goals more effectively and efficiently.

Organizational performance is defined as the ability of an organization to fulfil its mission through sound management, strong governance and a persistent rededication to achieving results. “Flexible or lean manufacturing methods and associated employment-related practices” are some example (Jeffrey, 1996). William stated, “Creating flexible, high-performing, learning organizations are the secret to gaining competitive advantage in a world that won’t stand still” (William, 1994).

The initial step in identifying the nature of an organization's performance is through understanding the business situation and condition which this is normally back up with trends supported by solid data. The next element is a business strategy which encompasses the reason for being, purpose, vision, mission and company values. Organizational design elements will include tasks, people, information, decision making, rewards, and structure. The fourth is culture and the final piece is business results.

2.3.1 **Model of Organization**

Among the models being covered in this study are:

i. McKinsey's 7S Model Published by Waterman and Peters in 1980s, this is the most commonly accepted model. Its popularity lies in the fact that both hard elements and soft elements have been considered and their interactions are firmly established. The model covers the benefits and limitations, for instances, the description of important organizations, no external environment (input) elements, throughput (output) element, recognition of the interaction between and no feedback loops the elements and no performance variables.

ii. Jay Galbraith in Galbraith's developed Star Model 1960s, which is widely accepted because of the model's strategic approach that seamlessly links competitive advantage to strategy to structure, people, lateral processes and reward mechanisms. The example of the benefits and limitations is the description of important, as it does not "call out" some key organizational elements, including inputs/outputs and recognition of the interaction culture between the elements.

iii. Marvin Weisbord in the 1970s develop the Weisbord Six Box Model which gives attention to issues such as planning, incentives and rewards, the role of support functions, internal competitions. The benefit limitations include some diagnostic, focus on some elements, questions in each box may lead to overlooking of others and requires the purpose to be stated.

iv. David A Nadler and M L Tushman in the early 1980s develop the Nadler and Tushman's Congruence Model. The basic principle of this model is that, an organization's performance is derived from four elements: tasks, people, structure, and culture. The higher the congruence, or informal compatibility, amongst these elements, the greater the organization performance. The benefit limitations are, easy to follow, few named elements may lead to and allows for discussion of what wheel spinning or overlooking of comprises informal & formal crucial aspects, organizations and boxes must be congruent with each other.

v. Burke & Litwin in 1992 developed a model, namely Burke-Litwin Model, which shows the various drivers of change and ranked them in terms of importance. The model is expressed diagrammatically, with the most important factors featuring at the top. The benefit limitations include feedback loops, very detailed, "Calls Out" for a more qualitative approach and difficult to grasp at a glance aspects. These are actually the motivational aspects.

From the study by Combs, Crook and Shook (2005), it is important to differentiate between operational and organizational performance. The operational performance combines all non-financial outcomes of organizations while the conceptual domain of organizational performance is limited to economic outcomes. On this basis, four organizational performance variables are profitability, liquidity, growth, and stock market performance. From here, we can conclude that operational performance will have a direct impact on the organizational performance.

From the above literature review, we can conclude that organizational performance is measured by the following key performance indicators (Combs, Crook & Shook 2005):

i. Profitability
ii. Liquidity
iii. Growth, and
iv. Stock market performance.

2.3.2 2 Management effectiveness in enhancing organizational performance

Organizational performance is normally linked to the target and to be successful, the processes and management control must be effective to monitor as well as to strategies the action taken to achieve the target of the organization. Below are some of the organizational performance models:

i. Organizational performance is measured in terms of marketing, operations and finance (Gyaneshwar Singh Kushwaha* & Deepak Barman, 2010). Supply chain management has come to the forefront as a philosophy by which firms can operate inter-organizational, and merge both strategic initiatives and their upstream - downstream processes in order to achieve business excellence (Christopher, 1994). Capkun, Hameri and Weiss (2009) mentioned that strategies to improve operational performance are: business process re-engineering; total quality management; supply chain integration and activity based management. In the supply chain management, Just in Time (JIT), lean initiative and agile set-up are all very relevant and important.

ii. Jay Galbraith developed the Star Model in the 1960s, which emphasize process as an important element. Marvin Weisbord in the 1970s developed the Weisbord Six Box Model explains about the role of support functions. David A Nadler and M L Tushman in the early 1980s developed the Nadler and Tushman's Congruence Model which is derived from tasks as one of the components. And lastly, Burke & Litwin Model in 1992 mentioned about operation strategy.

iii. In today's business environment, apart from being low in price and maintaining the quality, organization is constantly looking at the lean concept following the Kaizen initiatives from the Toyota Production System (TPS), first introduced in Japan which is highly accredited and recognized by large organizations including companies in the aerospace industry. Another example is the prescription for mass customization and agility (Goldman *et al.*, 1995; Meier and Humphreys, 1998). The next strategy is to enhance their processors to be highly efficient as well as flexible. As the organization grows in size, to better manage it, there is a need for integrations in the processes and database (Vickery *et al*., 2003). Efficiency, flexibility and integration are all part of and the role of supply chain management.

iv. From the research by Combs, Crook, and Shook (2005), as stated above, there are differences between operational and organizational performance. The operational performance normally takes into consideration of all non-financial outcomes of

organizations and as such, improvement can be managed via the supply chain management as processes are checked accordingly to avoid duplication or waste.

2.4 The Research Related Theories, Model and Guiding Principles

Supply network theory states that supply networks consist of unique, complex, adaptive systems of focal firms and suppliers (Choi, Dooley & Rungtusanatham, 2001; Pathak, Day, Nair, Sawaya & Kristal, 2007). As the supply chain management discipline becomes matured, many are trying to established theories. For example, Chen and Paulraj (2004) and Croxton, Garcia-Dastugue, Lambert and Rogers (2001), using a conceptual theory building approach to develop frameworks and identify the key constructs and processes surrounding supply chain management while Lambert, Cooper and Pagh (1997) and, Mena, Humphries and Choi (2013) use an inductive multiple case study approach to develop theories of the supply chain management.

Ken Burnett (2002) emphasizes that the capability of any organization in identifying, understanding and meeting the needs of important customers is the strength of a successful organization. In quality management, companies practice reduction in process variance, which has a direct impact on supply chain performance measures, including inventory and time measures, such as cycle time and delivery dependability are deemed important and affect customer satisfaction index (Flynn et al., 2010). Total quality management (TQM) methods can be utilized to eradicate these inefficiencies, thereby improving the overall effectiveness of a supply chain.

Customer's demands and supply chain relationships are the key in selecting the most appropriate method of target costing for supply chains (Flynn et al., 2010). Activity-based, process-based, value-based and cost management approaches may be fit for TQM in supply chain management (Lockamy & Smith, 2000).

Figure: 2.4

Operational Excellence's Elements in Supply Chain.

Source: APICS

The literature review analysis suggests that inter- and intra-organizational factors play an important role in a firm's proactivity in managing supply risks. As this is also in line with contingency theory, which suggests that an optimal course of action is dependent on the

internal and external situation of a firm (Narasimhan, Swink & Viswanathan, 2010), this theory can be related to the effective supply chain management.

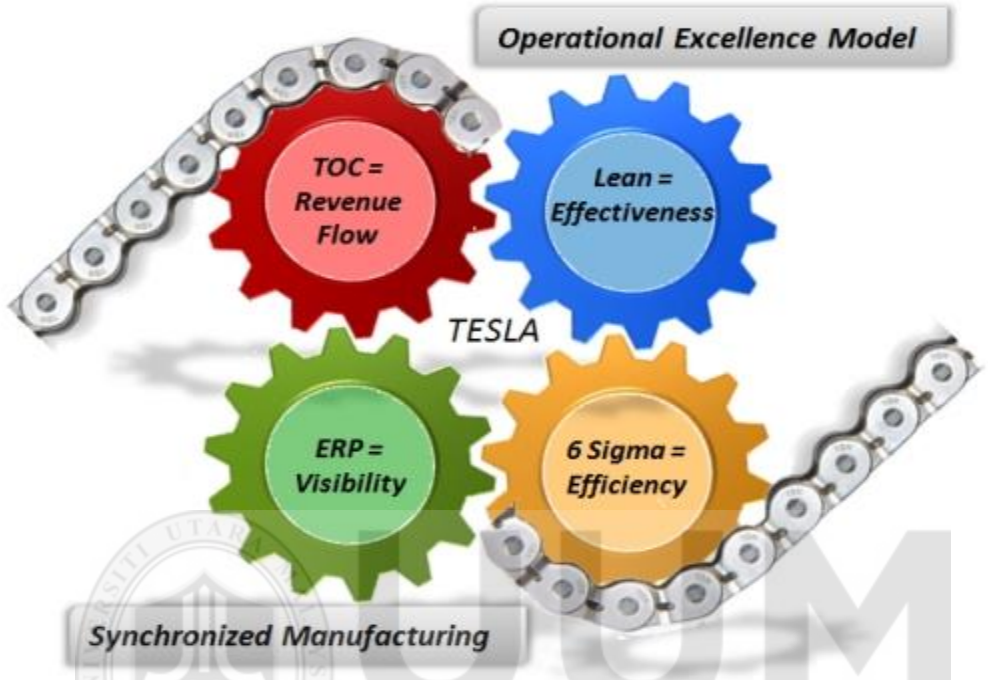


Figure: 2.5
Example of Operational Excellence Model in Supply Chain.
Source: TESLA

Contingency theory states that there is not a single best way to manage processes of organizing, decision-making and leadership since different environments provide different antecedents (Fiedler 1964, Lawrence & Lorsch 1967, Luthans 1976). For instance, referring to research in the field of organizations, it is noted that organizations are always settled in an environment which consists of an internal and a rather contingent external context (Waterhouse & Tiessen, 1978). Otley (1980) applying a contingency framework to management accounting is based on the assumption there is no universally appropriate accounting system which applies equally to all organizations in all circumstances. This

particular feature of an appropriate accounting system will depend upon the specific circumstances in which an organization finds itself.

While the inputs are referring to both, the internal and external issues, 'process' in the organization here means that the organization responses to these inputs, such as strategies and actions. The outputs refer to the outcome or results of these processes, seeking to find the best way for an organization to cope with its contextual features by using the right processes. Usually, these outputs refer to performance indicators for proactive supply chain management. Therefore, contingency theory forms a natural theoretical basis for explaining the circumstances under which proactive supply chain management evolves.

2.4.1 Theories Regarding SCM Performance

One of the popular theories regarding the supply chain performance is the balance score card (Kaplan & Norton, 1993). Recently, an increasing number of the literature focus on the adaptation of balance score card to fit the needs of supply chain management (Brewer and Speh, 2000; Bullinger et al., 2002). Balanced scorecard receives broad attention not only in scientific literature but also in practical applications. In addition to financial criteria, the balanced scorecard comprises a customer's perspective, a learning and growth's perspective as well as an internal business's perspective. These perspectives can integrate a set of attributes that provides a deeper insight for decision making (Stadtler and Kilger, 2008).

Every attribute selected for a balance score card (Kaplan& Norton, 1993) should be part of a link of cause-and effect relationships, ending in financial objectives that represent a strategic theme for the business. The attributes are designed to pull the organization towards the overall vision. This methodology is consistent with the approach of supply chain management by helping organizations to overcome traditional functional barriers and ultimately lead to improved decision making and problem solving (Walters, 2006). Ravi et al. (2005) combined analytic network process and balanced scorecard for conducting reverse logistics operations for EOL computers.

In this paper (Leung et al., 2006), the application of the concept of balanced score card (BSC) perspectives which links financial and non-financial, tangible and intangible, inward and outward factors, as customer's objectives for prioritizing the attributes that affect selection of upstream partners in a supply chain.

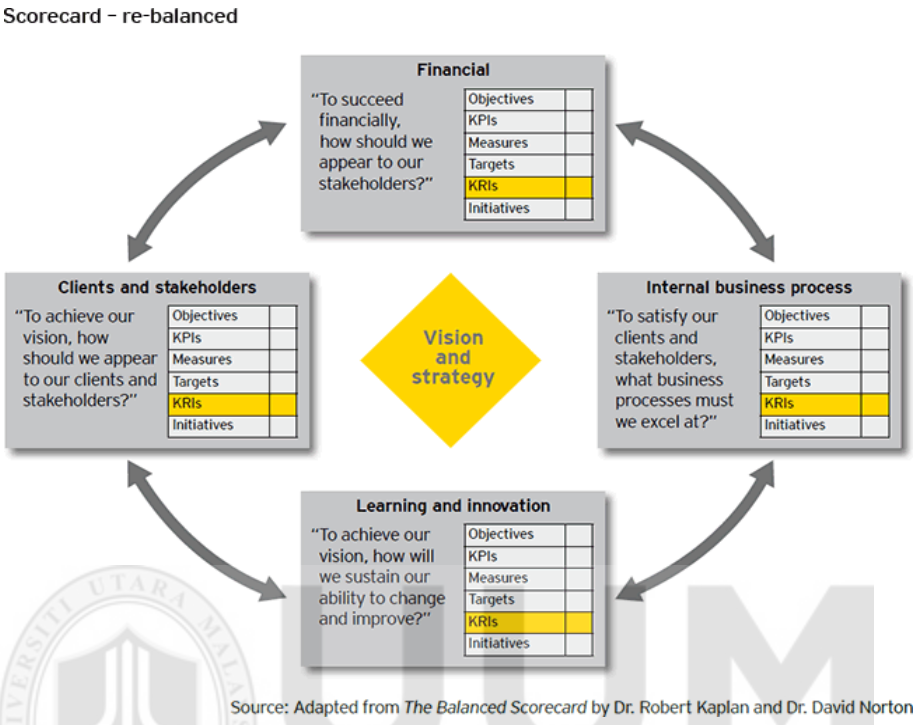


Figure: 2.6
Balanced Scorecard components.
Source: Adapted from The Balance Scorecard by Dr. Robert Kaplan and Dr David Norton

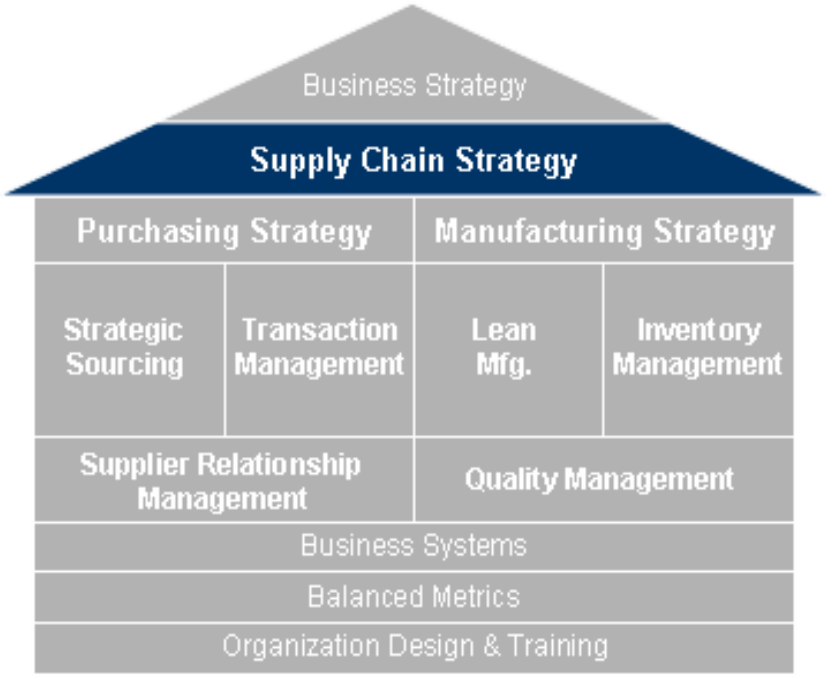


Figure: 2.7
Supply Chain: Overall Strategy Map.
Source: ttp://www.strategicsupplymanagement.com/expertise_supply_chain_strategy.htm

2.4.2 Supply Chain Management Models

In 1987, Breitman and Lucas attempt to provide a framework for a comprehensive model of a production-distribution system (Springinklee & Wallenburg, 2012), known as "Planets", that is used to decide what products to produce, where and how to produce it, which markets to pursue and what resources to use. Parts of this ambitious project were successfully implemented at General Motors Company (GM).

In 1985, Cohen and Lee developed a conceptual framework for manufacturing strategy analysis, where they describe a series of stochastic sub-models, that considers annualised product flows from raw material vendors via intermediate plants and distribution echelons

to the final customers. They use heuristic methods to link and optimize these sub-models. They later give an integrated and readable exposition of their models and methods.

In 1989, Cohen and Lee modified the model to a normative model for resource deployment in a global manufacturing and distribution network. Global after-tax profit (profit-local taxes) is maximized through the design of facility network and control of material flows within the network. The cost structure consists of variable and fixed costs for material procurement, production, distribution and transportation (Springinklee & Wallenburg, 2012). They validate the model by applying it to analyse the global manufacturing strategies of a personal computer manufacturer.

Arntzen, Brown, Harrison, and Trafton in 1995, provide the most comprehensive deterministic model for supply chain management. The objective function minimizes a combination of cost and time elements. Examples of cost elements include purchasing, manufacturing, pipeline inventory, transportation costs between various sites, duties, and taxes. Time elements include manufacturing lead times and transit times. Unique to this model was the explicit consideration of duty and their recovery as the product flows through different countries. Implementation of this model at the Digital Equipment Corporation has produced spectacular results, savings an amounting order of 100 million United States dollars.

2.4.3 Theories relating to IMS

The most relevant theory relevant to inventory management strategies is the theory of constraints (TOC). The TOC is developed by Eliyahu M. Goldratt to address the cost-accounting problems or the "cost world." Theory of constraints (TOC) is a philosophy which emphasizes that all management actions should center on the firm's constraints. The theory by Eliyahu M. Goldratt is making use of throughput (money for goods sold to customers) accounting in place of output (goods produced that may sell or may boost inventory) and considers labor as a fixthe outputt. Inventory is considered as an asset but meant to be sold. In the throughlabouraccounting, there is only one class of variables, like materials and components, which vary directly with the quantity produced. Although the value per unit is assumed to be constant and in reality, the larger the quantity, the lower or cheaper the price due to bulk purchases. Many organizations provide blanket orders of huge quantity to negotiate for a competitive price and at the same time, to maintain their cost of production or simply, their material's cost.

Finished goods inventories remain balance-sheet assets and incentive is given to reduce labour cost. Throughput accounting focuses on the relationships between throughput (revenue or income) on one side and controllable operating expenses and changes in inventory on the other.

Figure: 2.8
Supply Chain Management components.
Source: www.shutterstock.com

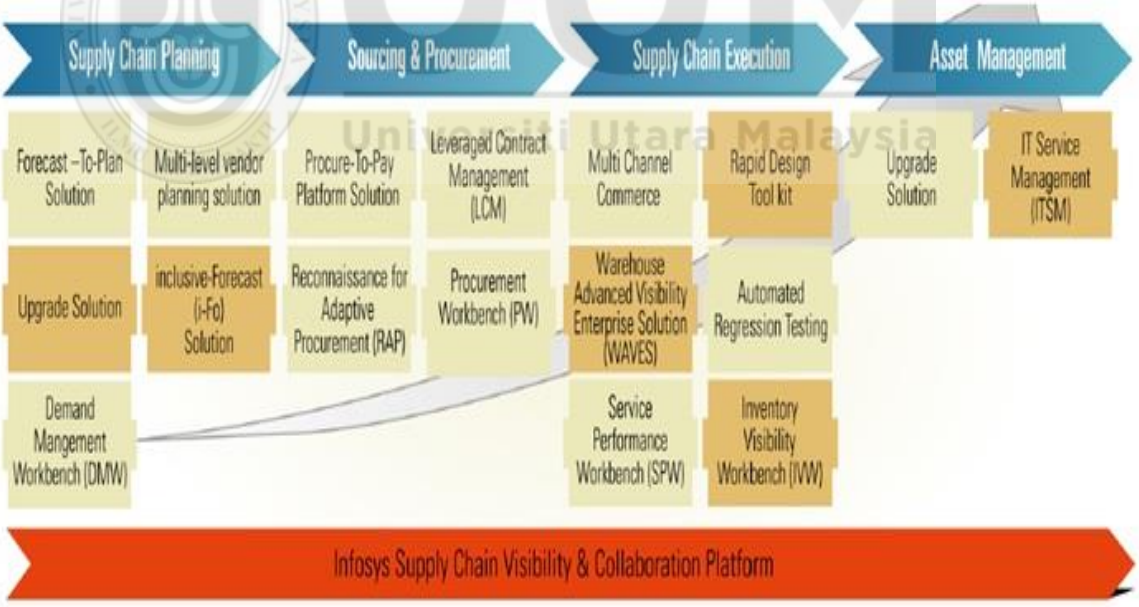


Figure: 2.9
Supply Chain Flow.
Source: Infosys Supply Chain

Below are some of the related theories and practises for inventory management:

- **Just-In-Time Inventory Management (JIT):** Organization realize that keeping a large inventory on hand can be costly and may impact the profit & lost accounting statement directly. Apart from the high cost of stock keeping, the company also runs a risk of writing off old and non-moving inventory. With the Just-In-Time inventory strategy, orders are placed and arranged to meet customer's orders and delivery, which place the inventory in the company's stock list only when it is needed. Money is saved by reducing inventory holding. The quantities of inventory are ordered when the company needs to produce the quantity of products required by customers. However, a close monitoring is required on the inventory levels at all times to avoid shortages which would result in an inability to fulfil customer orders (Flynn et al., 2010). Scheduling based on Just-In-Time approach has tremendous influence in the inventory levels a company may hold.

Just-In-Time (JIT) serves to reduce inventory holding and thus, its storage holding cost. Just-In-Time has a positive effect on earning and financial performance by reducing the risks involved (Capkun, Hameri and Weiss, 2009). It also assists in improving consumer services by having a levelled production, reduction in the set-up time and lot sizing. The application of Just-In-Time focuses on the attempt of performing production process without wasting expenses on simplifying the production process in some areas or practices in the organization. Four areas or practices of organizational management in Just-In-Time system are Kanban control system, lot size reduction, setup time reduction and Just-In-Time scheduling

(Flynn, Sakakibara and Schroeder, 1995). Just-In-Time also reduces the storage space which in turn reduces the cost of warehousing or the need for large warehouse which can be costly.

- **Economic Order Quantity (EOQ) theory:** The Economic Order Quantity inventory strategy assumes that demand for a product will remain at a constant or near constant level and in a near perfect world. The goal is to minimize costs, for example the holding and ordering costs. This strategy assumes that lead time for the receipt of orders will remain constant. No shortages are allowed with Economic Order Quantity. The objective in EOQ is to determine the order quantity that minimizes average inventory management cost and time, thus avoiding shortages or overages of inventory. This theory can be practiced in areas where the materials or items are having a long life span and there are continuous requirements from customers.

- **Material Requirements Planning (MRP):** MRP and MRP II are computer-based resource management systems designed for items that have dependent demand. MRP and MRP II review order quantities period by period and, as such, allow discrete ordering when needed. In this way inventory levels can be kept at a very low level; a necessity for a complex item with dependent demand.

Material Requirements Planning inventory strategy determines and maintain adequate inventory levels to ensure required materials are available when needed.

This system can be helpful, especially for organizations with multiple product lines or complex processes with a large raw materials inventory list. The major components or output from this MRP system are inventory status records, master production schedule and product structure records. MRP input is the order details which are available in master production schedule and product bill of materials to determine the inventory requirements while maintaining the lowest level possible.

- **ABC Analysis:** Most inventory systems will support the concept of cycle count which is why this ABC analysis is important for an inventory management. An inventory person, through ABC analysis, can focus on the high value or prioritize items instead of treating all items with equal attention – which would assist with the inventory physical count process. An organization can group its parts into categories and determine the proper interval by which an item should be physically counted and reconciled to the system balance.

Those parts with the highest cost and turnover are valued in the report as "A" items, while the lower extended cost parts are listed as "Bs" and "Cs". After determining the count interval (number of days between counts) for each part, a cycle count report can be used to provide a list of all items that would need to be physically counted for the week, month or other desired interval basis. This report prints an output, listing all of the items that need to be counted.

- **VMI:** Vendor-Managed Inventory (VMI) is a family of business models where the buyer provides related information to a vendor of the required product and the supplier takes full responsibility for maintaining an agreed inventory level, usually at the buyer's location. In some cases, third-party logistics provider can be involved in providing the necessary service. This strategy will ensure stock is readily available to meet demand and both parties sharing the risk. This business model is used by Walmart and many other big box retailers. VMI uses an electronic data interchange and this has helped to foster a closer understanding between the supplier and manufacturer.

2.4.4 Theories relating to Financial Risk

"Risk" is derived from Italian word risicare, which means to dare (Bernstein, 1996) but the meaning changes with the perception and interpretation of individual with time. Risk is defined by Mitchell (1999) as a subjectively determined expectation of loss where the greater the possibility of the loss, then the greater will be the risk. Risk is an ever-present in all the organization and in every function and processes. The study and knowledge of risk started as early as the seventeenth century by French mathematicians, Blaise Pascal and Pierre de Fermat and apply using mathematical concepts to the game gambling (Frosdick, 1997).

Risk may also appear between business relationship and the level of uncertainty in the relationship will determine the level of risk between customer and supplier relationship. Traditionally, supply chain is viewed covering more on the end to end processes and comparing the internal as well asan external processs. The focus in inventory is basically on the level and flow of materials, but the fact is that there is a financial impact. Inventory financing itself is already a risk and many have started to look into the mitigation of the risk. In reality, having the mitigation proposal without considering the inventory level to meet the order requirements is never the optimum solution. Therefore, inventory financing is an important factor to focus in any supply chain management design and implementation. If the company has cash constraints, then the inventory management and supply chain management risks are more important and serious to review. If loan status is satisfied and healthy, the total risk value is reduced accordingly, meaning the risk mitigation is partly in the financing process.

However, risk is different from uncertainty as risk is measurable in terms of probabilities of the outcome while uncertainty is not quantifiable and possible outcome is not known. Slack and Lewis (2001) mentioned that uncertainty is the main driver of risk and further elaborate that a company must mitigate or reduce their risk exposure through initiatives like prevention or contingency strategies. Some of the tools to help in risk management and to reduce the exposures of risk are failure mode effect analysis (FMEA) and risk benefit analysis (RBA) which have assisted many organizations. Harland et al. (2004) recognize that in a relationship if one of the partners attempts to take advantage of the other, it will be perceived that risk can become very significant. As organization goes international, migrating their manufacturing to a more cost competitive location, the development of risk management started as early in 1960 and became a great concern to more organizations (Grose, 1992).

The new approach of financial risk recognizes that the perception of risk will always be linked to financial outcome. Before venturing further in this tropic, risk management is an important part of top management. Hood and Young (2005) noted, many organizations have gone out of business because of their top management failure or lack of attention to implement an effective risk management strategy, for example Railtrack and Enron. They also noted that financial risk is the most developed and understood among all the risks in the organization, htover, it is not similar for risk in supply chain management which is less understood (Lewis, 2003). Risk management covers the examination of risks in the organization, where the outcome is the contingency pdevelopedelop to overcome or handle

specific risk. Eeckhoudt & Schlesinger (2006) focus on the effects of risk and risk aversion in the newsvendor model, also known as the perishable model, a mathematical model highly use in operations management and also in applied economics to determine the optimal inventory levels, where risk is measured by expected utility functions. With the level of globalization and the ease of information, competitive pressures are often the drivers of risk and as stated by Svensson (2002), some level of calculated risk must be undertaken by companies to sustain their business profitably.

Most organizations perceive risk in a negative perspective, although few may take advantage of the situation. As mentioned by Hood and Young (2005), risk is always related to loss instead of gain and such thinking is normally presented in most of the managers. Simon et al. (1997) perceives risk in terms of the possibility of an uncertain event or circumstances to happen that would have an adverse effect on the performance or objective of the event. Fone and Young (2000) states that risk management is the responsibility of top management and they need to assess the degree of risk and come with a contingency action for each of the risk registered. Of late, many organizations have already started to take risk management seriously and implement a program known as the "hazard identification, risk assessment and risk control" (HIRARC).

Figure: 2.10
HIRARC
Source: Dreamstime.com

Expected Utility Theory is vastly used in economics to explain the choicess under uncertainty. In particular, they determine comparative-static effects of changes in the various price and cost parameters in the risk-aversion setting. In the paper by Bouakiz and Sobel (1992), the authors characterize the inventory replenishment strategy so as to minimize the expected utility of the net present value of costs over a finite planning horizon or an infinite horizon. Assuming a linear ordering cost, they prove that a base-stock policy is optimal. The expected the utility approach pioneered by Bernoulli (1954) and later developed further by Von Neumann & Morgenstem (1944), as one of the cornerstones of present day economic science and perhaps the most widely used theoretical framework for human choices under conditions of uncertainty and risk.

Rabin (2000) concludes that expected-utility theory gives absurd results under the calibrations they perform. In summary, it is recommended presently for economists to recognize that expected utility as an ex-hypothesis. Rabin (2000) provides a theorem, however, that shows that the risk-neutrality implication of expected utility is not restricted to particular contexts, particular functional forms, or negligible stakes. Assuming nothing about the utility function except that it is increasing and concave, the theorem allows us to make statements of the form:

"If an expected utility maximizer always turns down moderate stakes Gamble A. They will always turn down large-stakes Gamble B."

The expected utility theory's presumption that attitudes towards moderate-scale and large-scale risks derive from the same utility-of-wealth function relates to a widely discussed implication of the theory: that people have approximately the same risk attitude towards an aggregation of independent, identical gambles as towards each of the independent gambles.

Expected utility theory certainly captures some of the intuition for risk aversion over very large stakes. Nevertheless, the theory is not close to the right explanation for most risk attitudes, and some of the uses to which economists put the theory are misleading. While expected utility theory appeals to economists as a normative model of rational choice, however, controversialabout questions arose on the ability of the model to explain actual choices. For instance, Rabin & Thaler (2001), questioned whetherto usele actually choose using linear probability weights, and Tversky and Kahneman (1981) showed that people's

choices can vary depending on the wording (or "framing") of a problem, rather than its objective features.

Because there have been repeated demonstrations of the shortcomings of the expected utility model, some may think that pointing out further failures as unproductive and therefore, less commend as time move forward.

Figure: 2.11
Risk – can be part of the process
Source:https://www.mitre.org/publications/systems-engineering-guide/enterprise-engineering/systems-engineering-for-mission-assurance/supply-chain-risk--management

2.5 Empirical Literature Linking IMS and SCM Performance

Effective supply chain management is the main factor of survival (Quayle, 1998). Furthermore, an effective management of the supply chain creates a competitive advantage for many organizations nowadays (Devaraj, Krajewski & Wei, 2007) and many organizations are aware of it and have started to emphasize a better focus on the role of supply chain. Supply chain management by definition involves the entire supply chain,

from the supplier out to the manufacturer, followed by the use of the retailer and then the final customer. In order to be efficient in supply chain management, three primary goals must be meet, which involve levels of inventory, speed of the transaction, and efficiency in sales. Apart from these basic three goals, the use of the technology in data transfer and sharing provide better decision making.

Supply chain management provides a diverse, major economic benefit to businesses such as manufacturing, retail and service organizations, etc. (Horvath, 2001). Implementation of supply chain management is not an easy or simple task as it encompasses not only the internal but also the external parties. The managers will most likely to face at least these challenges (Handfield and Nichols, 1999) i.e. information systems, inventory management, and in establishing trust between supply chain members. This is especially true in areas where supplier management and supplier development, as supplier is key in the supply chain process and also determine the success rate of the supply chain management performance. Hence, exchange of information is needed on a real time basis. The focus of supply chain management at the logistical end is the reduction of inventories, both within and across the organizations in the supply chain, and improvement of service level (Romano & Vinelli, 2001; Alvarado & Kotzab, 2001; Van, 1998).

Many commented that a successful supply chain management is dependent on their inventory management and its strategies. Thus, the objective of this research study is to validate such belief in an aerospace industry. Inventory costs have fallen by about 60% since 1982, while transportation costs have fallen by 20% (Wilson, 2007). Such cost

savings have led many to pursue inventory-reduction strategies in the supply chain. Earlier research has suggested that raw materials and finished goods will depend on supply chain management, and the relationship with customers and their main impact on performance comes from carrying cost (Capkun, Hameri and Weiss, 2009). This is one of the main reasons for this research study as many organizations would like to reduce their inventory keeping, financial wise, even though business or operation management needs inventory for succession of organizational mission. However, it is undeniable that without inventory, there will be no sales.

Is important to note that in a supply chain, as stated by Levy (1997), the total cost associated with inventory consists of the following:

- The cost associated with inventory as incoming stock level, work in progress;
- Service costs, consisting of cost associated with stock management and insurance;
- Cost held up as finished goods in transit;
- The cost associated with scrap and rework;
- Opportunity cost consisting of warehousin,, capital and storage;
- Risk costs, consisting of cost associated with pilferage, deterioration, damage; and
- The cost associated with a shortage of inventory accounting for loss of sales and loss in production

Inventory levels are affected by customer service expectations, demand uncertainty, and the flexibility of the supply chain (Hult *et al.,* 2004). Products with erratic demand, a short life cycle, or product proliferation, a more responsive supply chain and larger buffer inventories may be needed to meet a desired customer service level. Dubelaar, Chow and Larson (2001) found that significant positive relationship were found between inventory, service and sales. Even a slight change in consumer demand can ripple backward in the form of magnified oscillations upstream, thus resembling the result of a flick of a bullwhip handle (Lee, Padmanabhan & Whang,1997).

Consumers are demanding more customer service from firms throughout the supply chain. Firms with high customer service levels may gain a competitive advantage (Hult *et al.,* 2004). Firms who understand their demands, recognize stock out costs and carry appropriate levels of inventory, are ultimately better able to effectively manage inventory and provide the desired service level to customers. As industrialization affects agribusiness and agriculture in general, the importance of customer service and competitiveness will become critical for firms and supply chains.

For inventory management, although with improvement, the need for expediting late shipments never seems to disappear entirely. There are always delays in shipments for various reasons; slowdown because of customs crossing international borders, adverse weather patterns, poor communications and even simple human errors are always inevitable as quoted by Raja Marzyani Raja Mazlan1, Kherun Nita Ali2 from Universiti Teknologi Malaysia (UTM), Skudai 81310, Johor Bahru, Johor Malaysia. Mode of

transportation do affect inventory level significantly and the price plays an important role in decision making. For inventory in transit, management needs to understand the tradeoff where changing the mode of transportation can significantly affect the inventory level and hence, the investment. Levy (1997) mentioned that care must also be taken for longer lead-time, for example, in ocean freight from United Stated of America to Malaysia can take easily 45 days, due to the long distance and this can increase the "volatility" of the inventories.

In other research, Pujawan N. (2008) concluded that the details and specification of who is responsible for the safety stock and how large it should be, is always a crucial question in a supply chain relationship. Of course, a dominant buyer will impose the supplier to keep the safety stock, which means that the buyer passes all the financial risks as well as the instability on the supplier. The accuracy of forecast is also highly important to maintain the right level of inventory. Fisher (1997) states that supply chain management in many industries suffers from inventory, owing to their inability to predict demand accurately. However, this fall back to the Bullwhip syndrome and proves that inventory is built up across the upstream suppliers.

Supply chain management performance directly affects quality, customer lead times, inventory levels, and delivery time. Thus, supply chain management has a direct impacon a company's bottom linene. According to Fawcett *et al.*, (2006), competition now is not only found at the firm level. An organization that focuses on operational speed and variability reduction will outperform their competition (Schmenner, 2001).

Managing a supply chain is very difficult as there are various sources of uncertainty and complex interrelationships between various entities existing in the supply chain. Business strategies and supply chain management strategies set the context for inventory management and actual performance of stock holding which in return, determine the strategies which are more realistic and feasible.

Figure: 2.12
Supply Chain Risk Mitigation
Source: https://longitudes.ups.com/risk-mitigation-in-the-supply-chain/

Traditional distributor management fulfiled the emergency orders by increasing inventory. On the contrary, distributor integration can decrease the inventory by sharing inventory information between all the distributors. Erengue (1999) suggested four valuable research fields of supply chain and among them is the need for integrated approaches to managing

inventory decisions at all stages of the supply chain. The supply chain management operations level involves the end to end process from the material's acquisition to order fulfilment, which is the physical level or physical inventory and this is the basic elements of supply chain and the determinants of successful supply c.in management. Operation integration level consists of internal integration and external collaboration and the successful internal integration will normally end with a successful external integration as noted by Gimenez (2006). In the external collaboration, supplier integration at upstream is also equally important.

Figure: 2.13
Supply Chain Management main activities.
Source: http://www.ironsystems.com/services/supply-chain-management

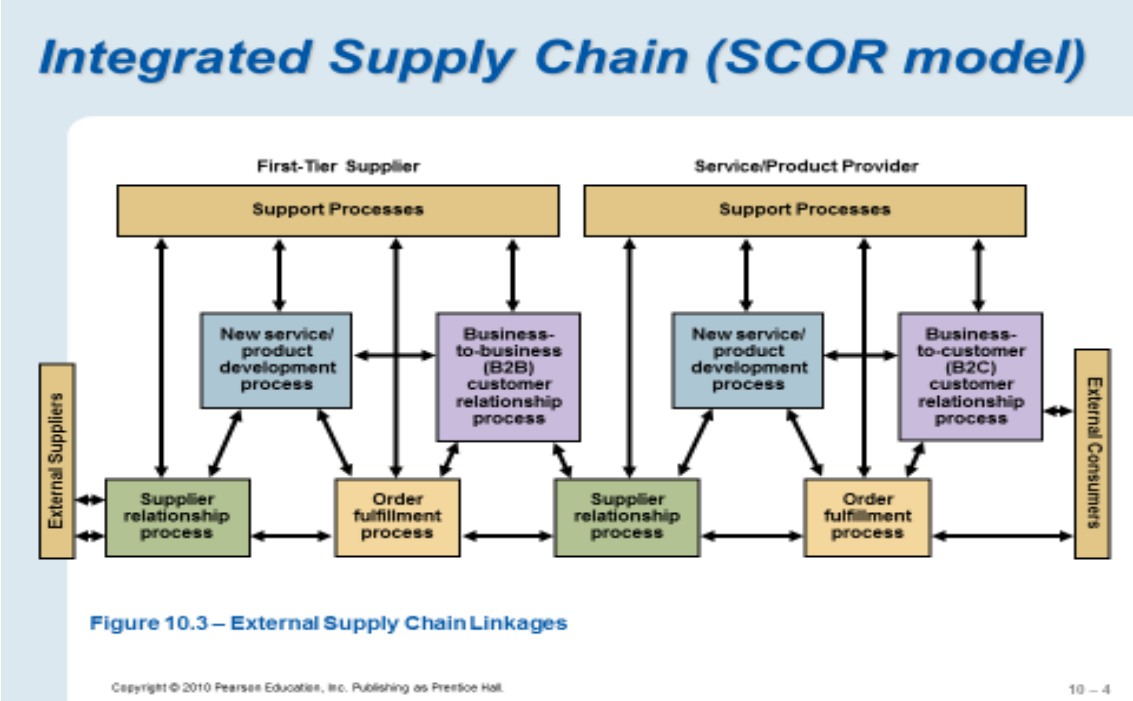


Figure: 2.14
Supplier Integration in Supply Chain (SCOR Model)
Source: Pearson Education

Performance of supply chain management using the SCOR (Supply Chain Operational Reference) model (SCC, 2008), which is founded on five distinct management processes and viewed in terms of overlapping management processes – source, make, deliver and return – within an integrated framework that encompasses all of the organizations in the chain, provides a good method to assess the supply chain performance, a process-based method of supply chain evaluation. From the model, the firm can obtain the benchmarking data and judge their internal operational performances. There are three levels to the SCOR model: Level 1 defines the scope and content of the supply chain operations reference-model.

Here, the basis of competition performance targets is set. Level 2 configures a company's supply chain from core "process categories" (e.g., make to order, make to stock). Level 3 defines a company's ability to compete successfully in its chosen markets. An individual company should not attempt to be "best in class" in all areas. Rather, a given company should target its strength in four to six selected areas to create differentiation in the marketplace, and ensure that it stays competitive in the other areas. The Supply Chain Council also gives the benchmarking information for participating companies.

From the perspective of filling customer's orders, no single part of the value chain working alone can significantly reduce customer's lead-time (Zhang *et al*., 2002). Chopra and Meindl (2001), "SCM engages the management of flows between and among stages in a supply chain to minimize total cost". This definition implies that supply chain management involvthe managementent of flows of products, information, and finance upstream and downstream in the supply chain (Christopher, 1994).

2.6 Reasoning on the Financial Risk as the Moderator

Reduction or shrinking product lifecycle is not only presentable in well-recognized areas such as high technology and electronics, but also virtually in every manufacturing sector. Past and recent accounting literatures have pointed that management control systems have been shown to significantly influence management practices (Chenhall, 2003) and management control system file is to gather data and uses the information to evaluate the performance of various organizational resources like human, physical, financial and also the organization as a whole in light of the organizational strategies pursued. The purpose

of risk management is to identify risky situations and providing strategies to reduce the probability and impact of a risk event (Fana *et al*, 2007).

Even though high proactivity in the field of risk management is frequently mentioned in the literature (Smeltzer and Siferd 1998, Kleindorfer and Saad 2005, Knemeyer *et al*. 2009) and believed to be the strongest measure in supply chain management (Tang, 2006a), a clear definition still does not exist due to the complexity involved in accessing risks management. Most scholars have attached temporal features to the concept. For instance, Tomlin (2006) discussed mitigation and contingency tactics with regard to supply chain disruption risks.

Exposures or risks in supply chain managementremains a key managerial challenge as this has a direct impactono the performance of organizations (Altay & Ramirez, 2010; Hendricks & Singhal, 2005). Two main types of supply chain risks can be categories under technological risk and strategic risk (Harland et al., 2004). Technology risk is the over-dependency on a single and limited source of process or technology while strategic risk is the dependency on a single (sole supplier) or limited supplier base. Corporate finance theory started from the proposition that financial capital is supplied to companies by investors who have the expectation to see better returns compared to normal bank saving interest. Cavinato (1990) from his research founded the supply chainchain can reduce the operating cost, improve the overall quality and bring reduction in the lead time. All the three improvements are linked to cost which provides financial relationship with supply chain management. Although it is essential to include financial in the research of supply

chain management, however, in most cases the risk assessment part has been ignore in most study on supply chain management (Tang & Tomlin, 2008)

Despite increased attention from academic and industry, the frequency and impact of disruptions remain stubbornly high. Inventory is one of the categories of risks in supply management, which relates financially as it involve holding costs, product obsolescence and most of all, the uncertainty in the demand and supply. Although many tried to work on the mitigation of this risk, most of these companies opt for insurance to absorb some of the risks.

Most metrics related to inventory management performance are lagging indicators, forthe examplesples are inventory turn, days of supply and obsolete inventory. In today's business need, companies can be more successful if they measure the inventory risks instead of just inventory. In other words, start to look at the total supply chain and not just focusing on the portion within the four walls. Harland et al. (2003) confirm that many research studies on the relationship between supply chain management and risk have taken place, but there is no written journal on the inventory management strategy and supply chain management performance with financial risk in an aerospace industry environment.

The fragility of the total supply chain moving towards globalization will see more emerging risks which are related to supply and the network design strategies. There is a lack of integration between risk management with supply chain management (Tang, 2006b), as companies often focusses on cost reduction and minimizing the working capital. Financial

risk involves the business model of the company as well as toperatingion model and its policy. Whether it is Vendor Managed Inventory (VMI) or direct purchase, all the orders are placed to meet the lead-time for a specific delivery. The risk is already presented to a company at the very beginning, even before the stock landed at the site. It has been said that inventory exposure is a good metric to measure financial risk in a supply chain environment. Not having the sufficient inventory in the operation will definitely affect and disrupt the supply cleadand this will consecutively leads to financial impact or losses.

Inventories are materials and supplies that a business or institution carries either for sale or to provide input or supplies to the production. Financially, inventories are very important especially to manufacturing companies as the inventory represent 20 – 60% of the total sales. Due to recession or maintaining competitiveness in the industry without increasing the working capital, most organizations consistently seek ways to reduce their inventory holding levels with the hope to be more responsive and demand-driven. In today's envirocompetitioncompetitive and commercial risk like loss of sales or poor order fulfilment due to non-availability of inventory must be viewed aconcernous concerns.

In inventory management, strategies' implementations are usually difficult or impossible as level and type of stock keeping changes with time and is never static. In short, stock is not easily managed and hence, some degree of financial impact existed, for instances, inventory's shortages and damages or shelf-life overdue. In such cases, it is important to realize and analysis the financial risks. Obsolete stock needs to be discarded by organizations as they have no real value and will not be used in the future. Information on

inventory in the system is always cost related and hence, to be treated with high importance as changes in the financial capability or policy will impact inventory and the supply chain.

In the next chapter, we will discuss on the data collection and all the related matter.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the research methodology for the study. Based on the analysis and the review of the related theories and models, this research method section is presented. It begins by stating the variables and explaining them in detail before proceeding with the development of the research framework. The methodology undertaken in this study is the quantitative method, capitalizing on the survey techniques. Data is collected mainly using e-mail questionnaires distribution. The process starts once they agreed to participatinth the study, after a personal call based on the relationship the researcher has from the previous post with one of the company in the aerospace industry. Data is collected through a set of questionnaire developed, as presented later, in addition to cater for some respondents where face to face interview data collection technique are employed.

In this chapter, the underlying theory or the guiding theory is presented, followed by the supporting theories required to guide the study. It is then followed by the discussions of the selected models relevant to the study. This is presented in section 3.2. In section 3.3, the discussions focus on the research framework for the study.

Section 3.4 discusses on the population of the study, the sampling that produces the sample and the data collection strategy. It covers the research site and the source of data. The following section 3.5 discusses the hypotheses and the questionnaire design (the

instruments) used in the survey. Section 3.6 is about data analysis and the explanation of the specific tests employed before analysis is performed. The research analysis techniques are discussed to the extent of how each technique compliments each other.

3.2 The Development of the Research Framework

The research framework of the study is developed by focusing on the general model of relationship linking the inventory management strategies (IMS) to the supply chain management (SCM) performance. This is according to the suggestion by Tashakkori and Teddlie (2010) who proposed that one can follow with the process of combining theoretical concepts from various domains in one conceptual model. Thus, the link is between the independent variable pointing to the dependent variable and in this study, the indication of the relationship between inventory management strategies and the perceived supply chain management performance.

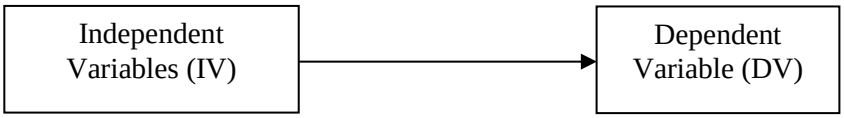


Figure 3.1
The general model showing the relationship between the independent and the dependent variables

Replacing the independent variable and the dependent variable which is investigated in this study, inventory management strategies and supply chain management performance respectively, the general conceptual model for this study is presented in figure 3.2 to follow.

Between IV and DV

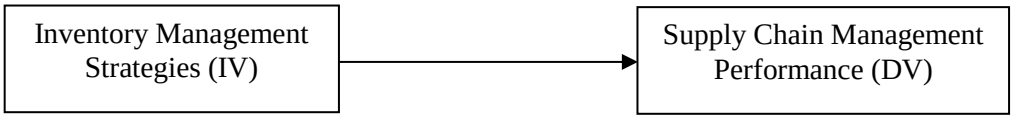


Figure 3.2
The general research model of the relationship

As discussed and highlighted in chapter two, the selected dimensions used to measure the performance of the SCM are categorized, as follow.

i. The on-time delivery factors
ii. The balance score card outputs
iii. The inventory turns
iv. The factors related to inventory and finance

The dimensions for the IMS are summarized as below

i. The stock holding practice and policy
ii. The safety stock practice and policy
iii. The storage practice and policy
iv. The inventory risk

Further inclusion in the conceptual model is the test of financial risk as the moderating factor to the relationship between inventory management strategies and supply chain management performance.

Thus, the general statistical model becomes as in figure 3.3 below.

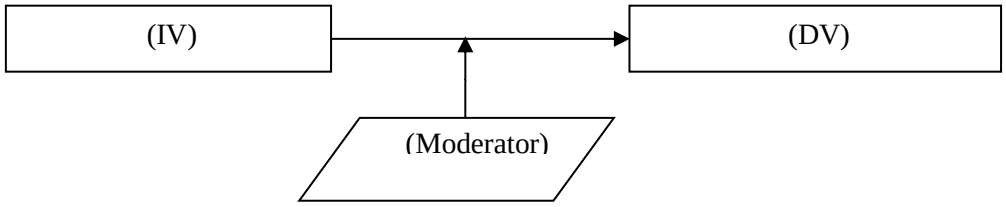


Figure 3.3
The general statistical model for examining the effect of a moderator

Thus, the conceptual model for this study with the moderating factor of financial risk is given as in figure 3.4 below

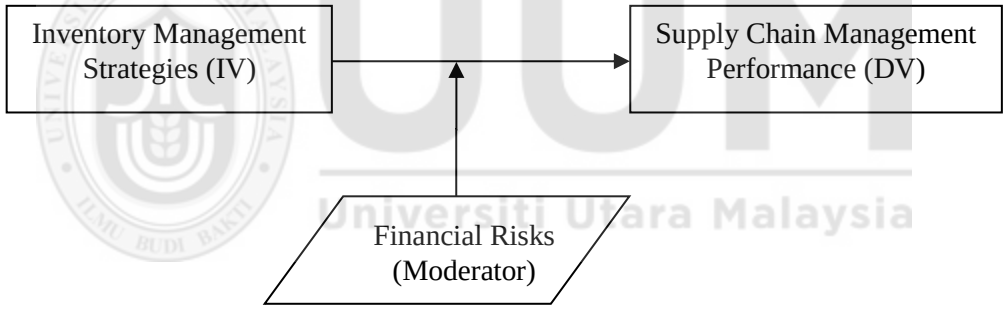


Figure 3.4
The conceptual framework examining the effect of IMS on SCM performance with financial risk consideration as the moderator.

The financial risks are normally associated with obsolete materials, aging inventory, penalty for nofulfilmentnt and sales volume, as mentioned in the literature review. In this study the following three aspects of financial risks, as the moderator variables are considered.

i. Influence of finance in inventory management process

ii. Influence of finance in supply chain management decision

iii. Importance of SCM performances to finance

In drawing the final research framework, by combining and including the variables and the variables representing the dependent variable, independent variable and the moderator variable, the research framework for this study is given in the next figure (Figure 3.5).

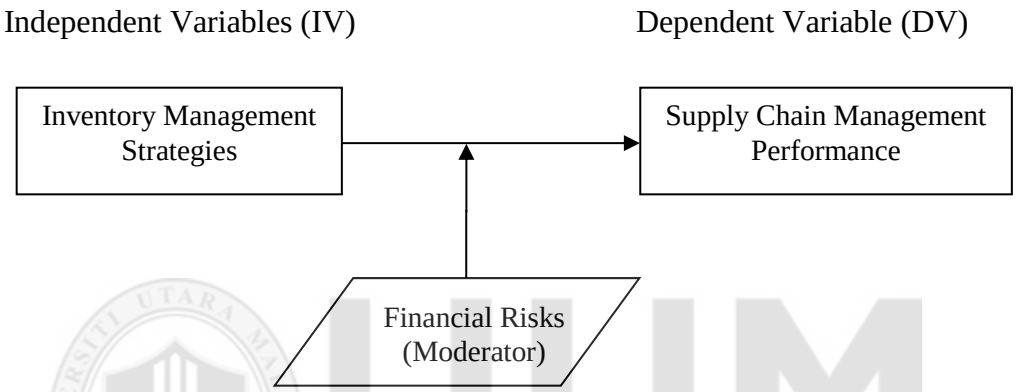


Figure 3.5
The Research Framework

3.3 Research Design

The research design for conducting this research is discussed in this section. This study follows the quantitative research methodology, instead of the qualitative research methodology or the mix model. The reasons for choosing the quantitative research methodology are the following;

i. The researcher intends to make some generalizations on the SCM performance based on the findings from the sample.

ii. The indicators of SCM performance and IMS as well as the financial risk consideration are well formalized, thus allow for this study to test for the applicability of the conceptualization of the model.

Moreover, the survey can be performed with the managers of any companies who are related and having availability of information which were related to the constructs of this research. However, for this research, data were collected mainly and directly from respondents of aerospace industry, where respondents are cleared and have the knowledge to respond to the research questions. Furthermore, the data regarding the variables under investigation are quantifiable and the final statistical analysis is, thus, possible.

Based on the quantitative design research method, the compulsory steps are summarized into the following three steps from the ten steps suggested by Sekaran (2011).

i. Data collection
ii. Data analysis and,
iii. Interpretation of the findings

Sekaran (2010) discusses the steps by mentioning the direction of the activities according to Figure 3.6. This is assumed as the steps in the quantitative research method and similar to below.

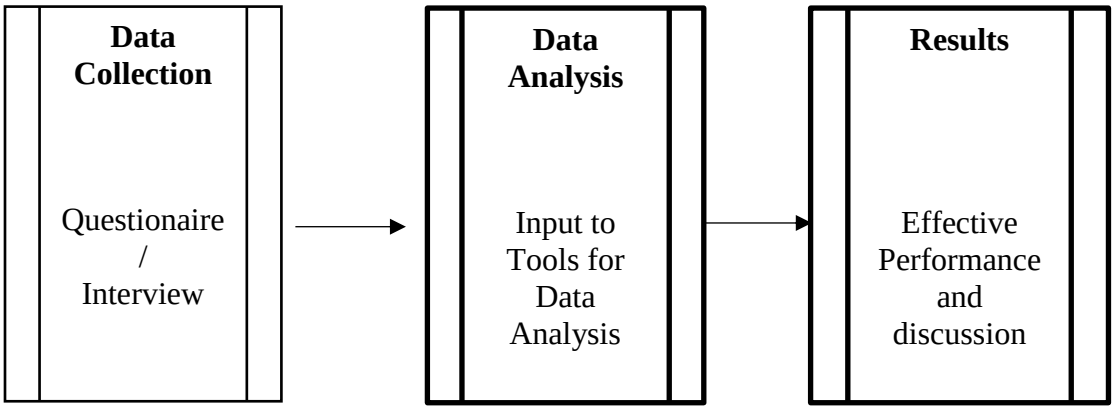


Figure 3.6
The General Steps in the Quantitative Research Design

For data collection, this research focusses on the primary data. It is more appropriate and logical when compared to sourcing the secondary data, as such data is not readily available due to the industry being relatively new in Malaysia. This explains that the secondary data is not in the plan as even if it is available it is very difficult to obtain. Moreover, in this industry, there are only a few players and is a norm that they are not willing to share their data openly. In addition, situations change rapidly in this industry and this makes the data collection method of primary data more relevant.

The data was collected through questionnaires, administered mostly by e-mail and in few cases, using mail and personal hand deliveries to the individual respondents. Assistance was provided to the respondents during the data collection exercise whenever there were inquiries, clarifications or if the cooperation of respondents were needed. The primary data, in a way, provides a fresh, accurate and current data leading to valuable information for this study. This is the one of the strength of the primary data, especially when there is a

lack of available secondary data from respondents in a high technology and specific industry such as the aerospace industry (Glass, 1976).

In the second stage (data analysis), the data was prepared for statistical analysis by data entry process in the excel spreadsheet. At this stage, Sekaran (2006) suggested for the data collected to be verified and validated, and this was being closely followed. The process of data validation involves the data screening and cleaning process for data outliers and testing for normality. This is referred to as the parametric approach. Statistical analyses such as correlation and regression were used. These testing methods provide the nature that measures of relationships between inventory management strategies and supply chain management performance and the effect of the moderator under study, the financial risk consideration.

According to Sekaran (2006), the three basic objectives in data analysis are:

a) To check the preliminary ideas of frequencies, central tendency and dispersion.
b) To test the goodness of data in terms of reliability and validity.
c) To test whether the hypotheses are substantiated.

For the last stage (results), the results from the analyses pave the ways for the interpretation of the findings. This was done through analysis of the findings and referring to the literature and the expert opinions from the industry.

Population and Sampling

One of the important aspects of the quantitative research approach is the identification of the respondents to be selected in the study (Sekaran 2010). To some, this referred to as the unit of analysis (Trochim, 2006*).* In this study, instead of having the information from one person in each company (the unit of analysis shall be the company), the research goes for the information from the individual in the companies (so, the unit of analysis is the individual). Within these companies, there are only a few departments that deal either directly or indirectly with supply chain, inventory and finance. By taking individual from these departments, targeting 20 individuals in each company, the population for the study is set.

The potential respondents in this study are those senior managers, managers or executives from the departments with scope related to the inventory management, supply chain or finance, in the companies that deal with the aerospace industry.

Within Malaysia, according to the Malaysian Industry-Government Group for High Technology (MIGHT, 2011), there are fourteen companies dealing with the aerospace industry. However, most of them are inactive or doing simple trading or a few are involved in the repair and maintenance activities. As the research wants to involve those who are active in manufacturing only, that really related to and explain the SCM performance and the IMS, only ten companies are selected and found to have these characteristics. Others were either not active or not involve in manufacturing. Some of these companies were only

involved in trading or in the maintenance, repair and overhaul (MRO) activities. Thus, these companies were excluded from the list of potential respondents

The ten companies are identified and as follows;

i. CTRM Aero Composites Sdn Bhd, Melaka
ii. Aerospace Composite Malaysia, Kedah
iii. Honeywell Aerospace Avionics (M) Sdn Bhd, Penang
iv. SME Aerospace Sdn Bhd, Selangor
v. Upeca Aerotech Sdn Bhd, Melaka
vi. GE Malaysia Sdn Bhd, Selangor
vii. Strand Aerospace (M) Sdn Bhd, Selangor
viii. Aviatron (M) Sdn Bhd, Penang
ix. Spirit Aerosystem Malaysia Sdn Bhd, Selangor
x. Aeromek Mfg. Sdn Bhd, Penang

Looking at the above list, it is realized that there is a major set-back. The number of companies involving in aerospace in Malaysia is considered as very few. All ten companies were selected because they were the only available companies that fulfil the requirement set earlier.

Thus, all together, there were 200 potential respondents from all levels of the management team. The selection of the respondents is based on the job related to the areas under study

with consideration given to their hierarchical position in the department. These individual are targeted as they fulfil the following criteria:

i. They are involved in the areas of inventory management, supply chain management and finance.

ii. They are currently attached to companies that are involved in the aerospace industry.

iii. They are considered to be the relevant parties with the necessary expertise and knowledge for the purpose of obtaining reliable data for this study.

The data collection was done in six months. The total number of questionnaires collected during this time is 81 questionnaires. This reflects a 32.4% response rate and an acceptable rate, according to Sekaran, (2016). The sample size for this study is not an issue as the target companies provide the population size. There is no worry about the suggestion by statistics experts, such as Sekaran (2010) suggesting sample size of more than 300, as this research deals with finite population and is taking the whole elements of the population as the respondents.

3.4 The Hypothesis

There are two main hypotheses to be tested in this research work, (i) the hypothesis on the relationship between the independent variable and dependent variable and (ii) the hypothesis related to the moderating variable.

They are as follows, the null hypothesis and the alternative hypothesis. First, the main hypothesis is regarding the effect of IMS on SCM performance.

H_0: The inventory management strategies variable do not significantly affect the supply chain management performance

and

H_1: The inventory management strategies variable significantly affects the supply chain management performance.

The second main hypothesis is regarding the moderating variable, the financial risk consideration on the relationship between inventory management strategies and supply chain management performance.

H_0: Financial risk does not moderate the relationship between inventory management strategies and supply chain management performance

and

H_1: The financial risk moderates the relationship between inventory management strategies and supply chain management performance.

From the first main objective, a number of sub hypotheses are identified.

1. H_{1a}: Stock holding practices and policy (representing the IMS) significantly affect the on-time delivery factors (one of the factor under SCM performance).
2. H_{1b}: Safety stock practices and policy (representing the IMS) significantly affect the on-time delivery factors (one of the factor under SCM performance).

3. H_{1c}: Storage practices and policy (representing the IMS) significantly affect the on-time delivery factors (one of the factor under SCM performance).

4. H_{1d}: Inventory risk practices and policy (representing the IMS) significantly affect the on-time delivery factors (one of the factor under SCM performance).

5. H_{2a}: Stock holding practices and policy (representing the IMS) significantly affect the balance score card outputs (one of the factor under SCM performance).

6. H_{2b}: Safety stock practices and policy (representing the IMS) significantly affect the balance score card outputs (one of the factor under SCM performance).

7. H_{2c}: Storage practices and policy (representing the IMS) significantly affect the balance score card outputs (one of the factor under SCM performance).

8. H_{2d}: Inventory risk practices and policy (representing the IMS) significantly affect the balance score card outputs (one of the factor under SCM performance).

9. H_{3a}: Stock holding practices and policy (representing the IMS) significantly affect the inventory turns (one of the factor under SCM performance).

10. H_{3b}: Safety stock practices and policy (representing the IMS) significantly affect the inventory turns (one of the factor under SCM performance).

11. H_{3c}: Storage practices and policy (representing the IMS) significantly affect the inventory turns (one of the factor under SCM performance).

12. H_{3d}: Inventory risk practices and policy (representing the IMS) significantly affect the inventory turns (one of the factor under SCM performance).

13. H_{4a}: Stock holding practices and policy (representing the IMS) significantly affect the inventory financial risk factors (one of the factor under SCM performance).
14. H_{4b}: Safety stock practices and policy (representing the IMS) significantly affect the inventory financial risk factors (one of the factor under SCM performance).
15. H_{4c}: Storage practices and policy (representing the IMS) significantly affect the inventory financial risk factors (one of the factor under SCM performance).
16. H_{4d}: Inventory risk practices and policy (representing the IMS) significantly affect the inventory financial risk factors (one of the factor under SCM performance).

From the second main objective, a number of sub-hypotheses are also identified to be tested, which are:

1. H_1: Financial risk consideration moderates the relationship between all dimensions IMS and the dimension of on-time delivery of SCM performance.
2. H_2: Financial risk consideration moderates the relationship between all dimensions IMS and the dimension of balance score card of SCM performance.
3. H_3: Financial risk consideration moderates the relationship between all dimensions IMS and the dimension of inventory turns of SCM performance.

4. H_4: Financial risk consideration moderates the relationship between all dimensions IMS and the dimension of inventory and finance of SCM performance.

3.5 Questionnaires Design and Structure

Several approaches were used to develop the survey questionnaire. Questionnaires used in previous studies were reviewed and modified to suit this study context as there is no similar study ever conducted in Malaysia, which focuses on the aerospace industry. Apart from adapting the past questionnaires, comments from leaders in the industry, the supervisors and other professors were used as guidelines to improve the questionnaire. Questionnaires were tested via pilot study prior to distribution to the targeted respondents to check the reliability of the questionnaires and to ensure its validity to the research.

The questionnaires are prepared in four sections. The respondents are expected to answer all questions in all the sections. The first section covers the profile of the respondents in the industry. This section is not seen as direct importance to this research as compared to the following sections, but it provides the details for additional analyses. For example, the age and hierarchy of employees can provide different results and therefore, further analyses can be drawn from here. The second section relates to the supply chain management performance, the third section relates to inventory management strategies and the fourth section refers to financial risks. All sections that are developed are highly relevant for this survey and overall study.

The explanations about the sections are as follows:

Section A: Questions in this section are pertaining to the respondent's demographic background. These include gender, nationality, education level, type of employment, position level, type of organization they are attached to, and whether their work is related to inventory, supply chain management or financial risks.

Section B: Questions in this section relate to supply chain management performance such as on-time delivery performance and balance score card which measures the financial, customer satisfaction, internal business and, learning and growth. Other are inventory turns which measure how many times the inventory turn (the larger the number, the better it is pertaining to inventory and financial risks).

Section C: Questions in this section relate to inventory management strategies such as the stock holding that are tied down to the operating funds, safety stock as insurance for any delays in shipments or quality issues, storage practice determinant of the storage condition as well as the level of inventory and inventory risks or exposures due to old, obsolete or damage inventory.

Section D: Questions in this section relate to financial risk. These include the order fulfilment and cost which are key risks in supply chain decisions, affecting organizations financially. This section also looks into the financial risk on

inventory aspect, as the level of inventory has an impact on the fund of operation.

A summary of the questionnaire item expected is presented below:

Table 3.1
Sections of Questionnaire

Section	Descriptions	Number of Questions
A	Respondent details	13
B	Supply chain management performance	25
C	Inventory management strategies	19
D	Financial risk considerations	10
	Total	67

Based on the previous table, the questions for section A are regarding the respondent details. It consists of 12-13 items. This is similar to the study by Aref, Marilyn and Joseph (2005), examining the significance of the dependent variable (supply chain management performance). The items are summarized in the following table:

Table 3.2
Items for respondent details

Item	Description of Questions	Scales
A1	Gender	Nominal
A2	Nationality	Nominal
A3	Level of Education	Nominal
A4	Employment	Nominal
A5	Position Level	Nominal
A6	Type of Organization	Nominal
A7	Keeping Inventory	Nominal
A8	Supply Chain Management	Nominal
A9	Involved in Inventory	Nominal
A10	Inventory is Important	Nominal
A10a	SCM and Inventory	Nominal
A11	Financial Risk	Nominal
A12	Contact Details	Nominal

Section B is designed to cover the supply chain management performance of the manufacturing, specifically the aerospace industry. The questionnaires guidelines are sourced from Wisner (2014) and the white paper, with the total of 25 items in this variable.

They are summarized in the following table:

Table 3.3
Items for supply chain management performance

Item	Description of Questions	Scales
B1	OTD Measurement	Interval
B2	OTD as KPI	Interval
B3	Penalize due to delay shipment	Interval
B4	OTD & Customer Satisfaction	Interval
B5	Inventory & Delivery Expectation	Interval
B6	Balance Score Card (BSC)	Interval
B7	Profit & Lost	Interval
B8	Customer Satisfaction	Interval
B9	Cost Improvement	Interval
B10	Training Need Analysis	Interval
B11	Inventory affects BSC	Interval
B12	Inventory & Customer Service	Interval
B13	Inventory Turns	Interval
B14	Maximum Inventory	Interval
B15	Sales Performance & Inventory	Interval
B16	Inventory Holding	Interval
B17	Vendor Managed Inventory	Interval
B18	Accrue for Inventory Risk	Interval
B19	Air freight due to delays	Interval
B20	Stock Count variance	Interval
B21	Financial Risk & Supply Chain Management decision	Interval
B22	SCM Performance & Inventory Availability	Interval
B23	Inventory & Order Fulfilment	Interval
B24	Inventory & Production	Interval
B25	Inventory level & SCM performance can be affected by Financial decision	Interval

Section C was designed to measure the perceived inventory management strategies from the respondents. The assessment includes 19 items and uses the five Likert-scale answer options and are drawn from the work of Krajewski (2013) and Muray (2013) respectively.

Table 3.4
Items for perceived inventory management strategies

Item	Descriptions	Scales
C1	Stock Policy	Interval
C2	Optimum Stock Level	Interval
C3	Just in Time	Interval
C4	Storage Space	Interval
C5	Variance in Stock keeping	Interval
C6	Safety Stock Level	Interval
C7	Safety Stock as insurance	Interval
C8	Safety Stock as insurance	Interval
C9	Safety Stock as insurance	Interval
C10	Storage Type & Condition	Interval
C11	First-in, First Out	Interval
C12	Temperature Sensitive product	Interval
C13	Inventory Integrity	Interval
C14	Scrap of Stock	Interval
C15	Shelf-Life of Product	Interval
C16	Shortage of Inventory	Interval
C17	Wrong Storage Condition	Interval
C18	Inventory Variance and P&L	Interval
C19	Product Cost Composition	Interval

Section D covers the financial risks. The question guidelines are drawn from Osadchiy (2015). The assessment comprises of 10 items and uses the five Likert-scale answer options.

Table 3.5
Description of Items in Section C – Financial risks

Item	Descriptions	Scales
D1	SCM & Order Fulfilment	Interval
D2	SCM Process & Financial Risk	Interval
D3	Financial Decision & Process change in SCM	Interval
D4	Inventory Policy Decision affected by Finance	Interval
D5	Finance decision	Interval
D6	Scrap need Finance approval	Interval
D7	Storage Level	Interval
D8	Aging imply Financial Risk	Interval
D9	Inventory & Working Capital	Interval
D10	SCM performance & Decision from Financial	Interval

Five points Likert-scale answers were used (Harpe, 2015) and these range from:

1 - Strongly disagree

2 - Disagree

3 - Indifference

4 - Agree

5 - Strongly agree

3.6 Questionnaires Distribution

The initial target is to reach all the selected companies related directly or indirectly to aerospace industry located in Malaysia, and the target respondents include the management personnel in the organizations, ranging from middle executives to top managements. One of the key concerns with regard to this industry is that most of the critical functional areas like supply chain management are relying on foreigners, expatriated from their parent companies or head office to lead such role. This requires all communication leading toward the distribution of questionnaires had to be done in English. The researcher needs to deal with this personally and with the help of assistants who are well versed in English.

One of the strengths, with regard to the questionnaires distribution is the contact the researcher has due to the previous working engagement at one of the Boeing subsidiary. Using personal connections, contacts were made with the key management personnel, in particular, the head of the department or company, so that with their participation and approval, the other officers responded to the surveys. All contacts were then approached individually either through email or by post, so as to promise confidentiality of the respondents.

Although the research expects to obtain 100% response rate (at the optimist level) or at least 50% (at the pessimist), the response rate of 32.4% indicates that many did not willing to share information. Although the responds came from all ten companies, the percentage varies for the top management and the executives, from each of the companies.

3.7 Data Analysis and Presentation

The main statistical analyses used are the regression and correlation analyses. The analyses are guided by the statistical software of the Statistical Package for the Social Sciences (SPSS). Both analyses are required to:

1. Establish the relationship between IMS and SCM performance
2. Test the moderating effect of financial risk consideration of the relationship between IMS and SCM performance.

3.7.1 Findings Presentation

The findings were presented with the explanation about the characteristics of respondents and their details, followed by the result of the hypothesis tested. The descriptive statistics was used to describe and summarize the information about the data collected during the data collection period. Analyses of descriptive statistics include the calculation of median, mode, mean, standard deviation, range, quartile, bar graphs and pie charts. Basic analysis on demographic data and related information important for analysis were also provided.

Details of the findings are presented in chapter 4.

3.8 The Pilot Test Findings

The pilot study was conducted to test the validity and reliability of the questionnaires developed. Analysis on the pilot data explains the need to clean and verify the usefulness of the questionnaires, which in turns reflects the appropriateness (in terms of independent and dependent variables) and validity of the data.

Twenty (20) individuals comprising both academicians as well as the public sector figures were invited to help in the pilot survey. Academician consisted of both lecturers and students and from the public section, the executives and the managers were included.

Results and details feedbacks from the pilot tests were obtained and the outcomes were summarized as below.

Table 3.6
Pre-testing the Questionnaires (Validity Check)

	Issues	Comments	Corrective Action
1	Content	a) To improve the question - straightforward	Reviewed & Corrected
		b) To change categories	Reviewed & Corrected
2	Relevance	a) Very Relevant	No action
		b) May not be used by all the industry	The focus is Aerospace

Table 3.7
Results from Kaiser-Meyer-Olkin (KMO) and Barlett's

KMO Measure of Sampling Adequacy		0.748
Barlett's Test of Sphericity	Approx Chi-Square	158.924
	Df	28
	Sig	0

Table 3.8

Results of Cronbach Alpha of the Pilot study

Variable	Cronback's Alpha
On-Time Delivery (OTD) Performance	0.664
Balance Score Card (BSC)	0.689
Inventory Turn	0.708
Inventory - Financial Risk	0.694
Stock Holding	0.617
Safety Stock	0.683
Storage Practise	0.610
Inventory Risk	0.718
Financial Risks	0.703

CHAPTER 4

DATA ANALYSIS AND FINDINGS

4.1 Introduction

The primary purpose of this chapter is to provide research results, which include demographics and descriptive statistics, reliability and validity, as well as results of the hypothesis tests. In Chapter 3, the detailed research method for this research study with justifications were discussed at length. This chapter presents the research findings of the study based on the data collected from the respondents attached to the aerospace companies in Malaysia and provided the data analysis results as well as the results of the hypothesis test findings. The main objective is to present the significant relationship between the Inventory Management Strategies (IMS) and Supply Chain Management (SCM) performance. Other reports include the results of the Financial Risk (FR) as the moderator of the relationship between the IMS and SCM performance.

In the data collection process, 200 questionnaires were forwarded to the target respondents, however, only 81 respondents replied within the period stipulated. All potential respondents are from the aerospace industry where their job nature is closely related to this study. The response rate is calculated at 40.5 %. This is considered sufficient following Sekaran (2003) statement, suggesting that a response rate of more than 25% for research is common. Moreover, it is a good rate considering the close contact the researcher has with the industry players and, the typical norm and culture of the people of Malaysia. Data collection was done within three (3) months, however, the total questionnaire design,

population identification and actual data collection process took about six (6) months. This is also partly due to the unavailability of population list, as the industry is relatively new and small. The potential respondents are largely from the aerospace and related industry, working for organization supplying materials or parts to The Boeing Company and Airbus Corporation.

The feedbacks received (from the questionnaires) were analysed using factor analysis, correlation and regression analysis with the use of Statistical Package Social Science (SPSS) software. The approach of the analysis process is organized based on the objectives and hypotheses of this study.

This chapter is organized in the following manner. Section 4.2 & 4.3 cover the response rate and non response rate respectively. Section 4.4 report on data preparation, screening and verification, which inclusive of missing data and outliers. 4.5 provide the background of respondents with 4.6 on descriptive analysis. Section 4.7 & 4.8 report on the results of factor analysis and reliability testing. Both these sections contained the findings of the various test performed using the data obtained from the survey. Normality testing is provided in 4.9 and 4.10 detailed the result of hypothesis testing. Section 4.11 covers the moderating effect of financial risks and 4.12 is the summary of the hypothesis testing and finally, the chapter summary in section 4.13.

4.2 Response rate

In the data collection process, questionnaires were distributed to 200 potential respondents who are working in the aerospace or related industry. Although the target sample size is set at 200 respondents, but due to the limited number of companies in the aerospace industry in Malaysia and as most companies are practicing lean in their organization set-up, the number of employees is equally limited and seems to be very occupied with their work load. This has made the interview session almost impossible between the researcher and the respondents.

The data collection process for this research is definitely a huge challenge. Although mentioned by Sekaran (2005), the biggest number of sample size or response rate in research is better for the achievement of good result and to avoid any barriers in the data collection process, researcher distributed more than the target number of sample size. It is a fact that many researchers found difficulty getting back to the relevant respondents and the attitudes of respondents not responding to the questionnaires as job expectation took precedent over the response to questionnaires. Initiatives were made to increase or speed up the responses by reminding the respondents via short-messaging (SMS) and emails (Sekaran & Bougie, 2010).

Below is the analysis of the response rate.

Table 4.1
Summary of the Response Rates

Summary of Responses		
1	Questionnaires Distributed	200
2	Questionnaires Returned	81
3	Incomplete	0
4	Questionnaires Completed	81
	Response Rate	40.50%

From the above Table 4.1, out of the 200 questionnaires distributed to various organizations from the aerospace industry on the relationship between supply chain management and inventory management strategies with financial risks as the moderator, 81 questionnaires were returned. From the 81 responses, none was found to be incomplete after clarifications with the respective respondents and this is an important exercise as different respondents in the different departments interpreted the questionnaires slightly in a different manner. However, it is interesting to note respondents were very enthusiastic with this research as many requested for a copy of the study. Therefore, this research is considered very positive and encouraging for those responded as well as for the researcher.

In conclusion, only 81 questionnaires were received, representing 40.5% percent, were taken into consideration for the data key-in process and used for the analysis of this research study.

4.3 Non-Response rate

According to Sekaran (2010), non response rate occurs after the sampling step in the data collection process or survey. The non response rate can be calculated by identifying those that reflects the total failure to obtain survey data. This non response rate in a statistical survey existed if response of respondents differ from the potential answer of those respondents who did not answer.

However, the above does not apply in this study as all respondents and potential respondents are in the same industry, which is a unique and relatively new industry in Malaysia, and with very few players in the industry. Therefore, all respondents are subjected to similar challenges in their day-to-day work and operation since their final customer will be either or both, The Boeing Company from USA and Airbus from United Kingdom. As there is also a limited number of suppliers supplying basic raw materials, both companies are working with the same set of suppliers. This further implied that most companies involving in the commercial airplane in the aerospace industry in Malaysia are working with similar parties and is expected to have encountered the similar experiences. This study supported Amstrong (1977) who states that non-respondents were identified to have similar characteristics of late respondents.

As respondents are in the same industry but in different departments, their responses are very crucial to this survey as we are considering the perception of individuals. Therefore, every returned surveys are taken seriously as their experience and knowledge at work is not easily obtainable from the public or in other industry due to the nature of this research.

This study is focusing on the need as well as the complexity dealing with inventory management strategies to satisfy the demand and expectation of the supply chain management performance in an aerospace industry in Malaysia. There will no vast differences in terms of responses from a manager or executive as the scope of coverage in their responsibilities and accountability are similar. The only difference between them is their authority in approval limit, which is true in the case of a company having manager and executive. Most organizations in this industry practice lean management and this is evidenced in their flat and organic structured instead of the traditional pyramid shape-like.

As the aerospace industry is relatively new in Malaysia, a new start-up company may not engage a manager, however, hiring an executive to handle the same scope of work of a manager in a growing or mature company. However, to ensure employees making the right and consistence decisions, a company normally spelled out the goals and targets very clearly to their employees and monitor the performance closely via key performance indicators (KPI) or balance score card. The leaders normally will create the culture that they expect their employees to act or react to issues or challenges.

4.4 Data Preparation, Screening and Verification

This is an important section for explaining the steps taken once the questionnaires were received from the respondents. Sekaran (2010) suggest that for any data preparation process, it is the responsibility of the researcher to ensure that data is valid as well as there is no errors in the data entry process. Each data column in this research is carefully entered into the spreadsheet and carefully monitored for the potential missing values, reliability,

outliers, validity, linearity in characteristic. Checking and rechecking on the data entry are done at this level to verify the data and to avoid any errors in the process.

4.4.1 Missing Data

Confirmation of the possible missing values is done. This is important as missing data happens in many ways during the data collection and the key-in process. Some of the respondents do not cooperate in answering all the questionnaires. This could be because of the respondents are not familiar or fully understand the questions, thus leaving the answer blank. Another possibility is the respondents may not be a subject matter expert (SME) of the question(s) in the questionnaires and hence, guessing is being used instead. And, it could also be because of the error by the researcher. Hair et, al (2010) states that missing values normally is caused the researcher end; error of data collection and error in the data entry process. However, after clarifications, the respondents confirm their reply. This is due to the limited number of respondents available in this research.

Moreover, it is necessary for the researcher to identify all the errors and eliminating the errors as such errors shall affect the results of the research. Missing data issues can be solved by two methods, by deleting the observations or cases which reduce the sample size and applying the remedy approach. In this research study, the researcher follows the methods, suggested by Hair et, al (2010) of identifying the missing data and remedy method needed where necessary. Although from the literature, the first step is to identify the missing data by checking the amount of missing data using the SPSS software for each of the variables and the next step is diagnosing the randomness of the missing data using

the Expectation Maximisation (EM). However, the data available do not show any issues as precaution has been taken in advance of and at the earlier process. The following table reports on the missing data for this study

Table 4.2
Results of Missing Data

Variable	No of Items	Missing Data %
Supply Chain Management		
On Time Delivery	5	0
Balance Score Card	7	0
Inventory Turns	5	0
Financial Risk Factors (FRF)	4	0
Inventory Management Strategies		
Stock Holding	5	0
Safety Stock	4	0
Storage Practise	4	0
Inventory Risk	6	0
Financial Risks	10	0

4.4.2 Outliers

An outlier is a value falling away from the norms when plotted in the straight chart (Churchill Jr & Iacobucci, 2004). Such occurrence of outliers could be due to variation in the measurement and could result in experiment errors and therefore, is excluded in the data set. As this could be errors in the data and the results can be damaging, i.e. distortion of the statistical test result. Investigating outliers is important in order to avoid results that are not representative of the findings.

In this study, it was found to have very few outliers and they have been removed to maintain the original dimensions which the researcher included in the study. The results obtained from the survey are assumed to reflect the scenario at work place as perception of managers may differ from one functional to another functional group.

4.5 Background of Respondents

Respondents typically are those currently working and attached to the aerospace companies based in Malaysia. Some of them may not necessarily located in Malaysia but have the overall responsibility over the performance of their Malaysia operation and normally employees in such organization have dual reporting lines, the full and the dotted lines.

4.5.1 Background of Respondents and their Industry

It is interesting to note that most aerospace companies in Malaysia are related to or subsidiary companies of the foreign investments. Thus, many of which have employees or especially for key positions, they have people posted here and, in some cases, they even based their employee in the parent company or regional office and responsible for operation right in Malaysia. Due to the extensive focus in Asia, many of the aerospace companies have set up regional centre in Asia and in particular, located in China and Singapore. This also implies that the management could be remotely managed from the distance office instead of the traditional management type where is based in the same facility and location. For example, the companies in Malaysia are managed by top management located in a

separate office and could even be at their headquarters or regional offices in the United States of America or Europe.

The 200 questionnaires were forwarded to respondents from the aerospace industry and the related supporting industry to aerospace. As such the respondents represent a broad level of personnel, ranging from the executives (and engineers) to the Vice President and Senior manager from the various functional departments in the organization. This is important as this research covers the functional areas of inventory, supply chain and finance or accounting in some cases. The roles, mindset and expectation of the employee in the different functional departments have a very different profile and hence, have a different focus.

From the responses, it is noted that many of the those based in the supporting industries did not respond signifying that they still do not understand the business as they are either very new in the industry or their knowledge of the requirements and expectation is still very raw.

Apart from the different roles and function, the researcher also intends to understand the level of education necessary to support this unique industry. The following are the summary, in tables, about the background details of the respondents from the analysis conducted.

Table 4.3
Respondents and their industry

	Type of Organization	No.	%
	Aerospace & Related	81	100
.	Non aerospace	0	0

Table 4.4
Respondents and their education qualification

	Level of Education	No.	%
	High School	7	9
	College	11	14
.	Degree & Above	63	78

4.6 Descriptive Analysis - Demographic Profiles

Questionnaires form a major part of the data collection apart from email exchanges and phone interviews, especially to clarify on doubts from the respondents. Questionnaires were forwarded to those potential respondents in the aerospace industry.

The background details of respondents were taken in this research study, which gather about gender, level of education, level of designation, the industry and also their feedback from their experience at work involving areas related to supply chain management, inventory management strategies and financial risk management. The data was collected to an insight into the subjects and to assist in the interpretation of the findings and analysis of the data. Below are the tables indicating the data collected on the respective factors.

Table 4.5
Respondent Profile - Demographic Analysis

Demographic Analysis			
Variable		**Frequency**	**Percentage**
Gender			
	Male	49	60
	Female	32	40
Nationality			
	Malaysian	57	70
	Non Malaysian	24	30
Level of Education			
	High School	7	9
	Collage	11	14
	Degree & Above	63	78
Employment			
	Full Time (Permanent & Contract)	81	100
	Part Time	0	0
Position Level in the Organization			
	Executive & Below	43	53
	Manager	30	37
	Top management	8	10
Type of Organization			
	Aerospace & Related	81	100
	Non Aerospace	0	0
.	Others	0	0

Gender of Respondents

Gender population is presented in the table 4.5. The male is 60%, while the female is the remaining 40%. This show that a high percentage of female is involved in this industry in relative to other industry and making important decision on areas like supply chain management, inventory management and financial. From the survey, we can conclude that female workers are equally interested to be part of this industry and I would expect to see more females joining this industry in the near future. This was included in the questionnaires to understand the ratio of the mix in this industry.

Nationality

On the nationality, from the Table 4.5 showing only 70% of the respondents are Malaysian, this simply implied that there are many foreigners still engaged and involved in the industry even though is based in Malaysia. Few reasons could be accounted for this and one of them is the difficulty to recruit experienced employee locally in Malaysia as this industry is fairly new in this country. This also could mean that the workforces are not trained or in a better word, are not tuned to the aerospace culture and environment. The companies may still concern on the gaps between the workers in Malaysia compared to the company's expectation of their employees to manage the aerospace business. With this finding, there is an immediate need to work on the development of human resources to support the aerospace industry, especially by the institution of higher learnings and the skill development centres.

This question is to ascertain the percentage of Malaysian respondents in this research and if the results of the data collection will be represented.

Level of Education

From the table 4.5, 78% of the respondents are having a degree or higher in their education. It is important to note of this percentage, a large number of them also possess master degrees with few even having a doctorate degree. This easily would mean that the aerospace industry is targeting candidates with minimum degree or higher qualification. Level of education also implied the better knowledge and skills in handling situation for an employee and what is more important is the maturity in managing their responsibility.

It is interesting to note that a large number of the balance without a degree are not Malaysian employees. This could mean the standard of our education is lower compared to other countries. However, on the positive note, there is an abundance of graduates available in Malaysia. Although we provide education in terms of knowledge and skills, and for future improvements, institutions of higher learning can consider courses or classes to groom students on soft skills example communication, personality and attitudes which is critical when working with multi-national companies.

Employment Status

The respondents are full time employees and they can be permanent or on-contract. This could imply that in the aerospace industry or related job functions required permanent employees instead of part-time resources which some organization may opt to in order to

reduce their headcount expenses. One of the reason is to avoid drainage of employees with the necessary core competency in their area of work to competitors. This could be attributed to the skills required and expertises that need to be developed over time in the employment. Another reason could be the confidentiality of information and the intellectual property (IP) that need to be governed and managed to avoid leakage to external of the organization. During the course of employment, employee could and need to access to many information in order for them to execute their job and hence, full time employment is preferred by the companies.

Position Level in the Organization

Table 4.5 shows the spread of respondents in the top management, managers and, executive and below. The percentage of mix in the respondents is representative of the expectation in an actual environment in any organization. This data is important to ensure the coverage is not aligned to only a specific level which will not reflect the correct data wanted for this study. As the composition is well spread across the organization, the research can be meaningful as the behaviours and decision making among them will be very similar in nature.

Type of Industry

The respondents are from the aerospace and related sector, which account for 100%. Such outcome is important as the respondents will have very good knowledge and understandings of the research questions and will be able to contribute positively to this survey and study which is focusing on the aerospace industry in Malaysia. In short, this

research is covering their work and will be of great interest to them and the management once the result of this study is published.

We have seen that in general, management or employees tend to have the perception that they are the expert in their areas of work after several years of employment. Such attitudes will be very damaging when an employee is moving to a different industry and assuming that the two industries are the same and have the same modus operandi. This study will definitely able to assist the management as well as the employee with better knowledge and to have better focus on the priorities in the aerospace industry.

4.7 Factor Analysis and Cronbach Alpha

In this research study, factor analysis was used to examine the appropriateness of the data to be used for further analyses. In the factor analysis, it is important to note that The Kaiser Meyer-Olkin (KMO) value must be greater than 0.5 (> 0.5) and the Barlett test of the Spheritycity need to be significant. Both these tests were used to assess the suitability of factor analysis. The test was done using the Principal Components Analysis extraction technique with varimax rotation on all the scales of the independent variable, the moderating variable and the dependent variable. Varimax rotation was used to help facilitate the interpretation of the factor matrix (Rummel, 1970) as factors are rotated for better interpretation since unrotated factors are ambiguous. Varimax normally minimizes the number of variables with high loadings of the individual factor and at the same time, make those with small loadings even smaller. Accordingly, Cunnigham (2004) states that

factor analysis method is to attempt to determine the nature of the construct influencing a set of the responses.

Ramani (2008) states that researcher indicated that the simplest method to explore the contructs, with conduct the factor analysis and there are several guides to be established :

- Bartlett test of Sphericity (Approximate Chi-Square) –

  Large & Sig. (p-value < 0.05)
- Communalities - > 0.50
- Components Matrix - > 0.30
- Factor Rotation. All items in Rotated Component matrix - > 0.5
- The Kaiser-Meyer-Olkin measure - = or > 0.5
- Total variance explained (Eigenvalues) - >1

The following are the results of the factor analysis testing.

Table 4.6
Factor Analysis of Inventory Management Strategy

Rotated Component Matrix[a]

	Component			
	1	2	3	4
STH2	**.872**	.221	.048	.037
STH1	**.872**	.201	.095	-.050
STH3	**.799**	.021	.027	.006
SAS3	.134	**.823**	.240	.085
SAS4	.092	**.815**	.078	.138
SAS2	.187	**.752**	.130	.025
INR1	-.023	.058	**.820**	-.085
STP1	.116	.246	**.793**	.094
INR5	.084	.145	**.775**	.214
INR3	-.074	.072	.010	**.882**
INR4	.066	.128	.148	**.862**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.685
Bartlett's Test of Sphericity	Approx. Chi-Square	310.128
	df	55
	Sig.	.000

Table 4.7
Factor Analysis – Supply Chain Management

Rotated Component Matrix[a]

	Component			
	1	2	3	4
OTD3	**.853**	.084	.113	-.038
OTD1	**.825**	.088	.278	.074
FRF2	**.789**	.199	.094	.043
INT4	.162	**.777**	.160	.000
INT5	.048	**.760**	.137	.115
FRF1	.229	**.691**	.169	.308
BSC2	.044	.105	**.810**	.010
BSC4	.209	.140	**.707**	.058
BSC1	.229	.220	**.679**	.087
FRF4	.082	.284	-.218	**.802**
INT1	-.084	.281	.103	**.750**
OTD5	.092	-.238	.352	**.726**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.658
Bartlett's Test of Sphericity	Approx. Chi-Square	307.207
	df	66
	Sig.	.000

Table 4.8
Factor Analysis – Financial Risk

Rotated Component Matrix[a]

	Component	
	1	2
FIR10	**.823**	-.154
FIR9	**.746**	.224
FIR2	**.714**	.218
FIR3	.073	**.875**
FIR1	.120	**.842**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.578
Bartlett's Test of Sphericity	Approx. Chi-Square	70.534
	df	10
	Sig.	.000

From the above tables (Table 4.6, 4.7 and 4.8), the original number of dimensions are maintained. However, the dimensions have changed and is summarized in the following table:

Table 4.9
Results of Factor Analysis after rotation.

Original Variable	No of Items	No of Item after rotation
Supply Chain Management		
On Time Delivery	5	3
Balance Score Card	7	3
Inventory Turns	5	3
Financial Risk Factors (FRF)	4	3
Inventory Management Strategies		
Stock Holding	5	3
Safety Stock	4	3
Storage Practise	4	0
Inventory Risk	6	0
Inventory Risk (write-off)*	0	3
Inventory Risk (Shortage)*	0	2
Financial Risks	10	0
Financial Risk (Risk on SCM)*	0	3
Financial Risk (SCM and Cost)*	0	2

***** *new dimension*

4.8 Normality Test

In the data screening process in handling missing data and outliers were performed to clean the data where necessary. The outcome of this test is positive as there is no missing data from the respondents. However, few outliers were found but as this survey was forwarded to different functional departments in each of the organization, it was decided to maintain those outliers to determine how the total result of this research as this is also true in an organization especially during a discussion, the decision can be influenced by few minorities who may have a different set of thoughts or concerns. Respondents in the

different departments may view the questions in a different perspective and therefore, may have responded at their understandings.

The next stage is to assess the normality distribution test of the data as this is an important criteria in the multivariate technique as well as the inferential statistics. The normal distribution is a key assumption for statistical analysis and structural equation model (Hair et al., 2010). Normality refers to the shape of the distribution of the data for each of the respective variable and its correspondence to the normal distribution of the benchmark for statistical methods. This is an important test for the data and in a perfectly normal distribution, the value of skewness and kutosis are zero (Coakes & Steeds, 2003).

Skewness and Kurtosis are usually used to test for normality of data in any research study. In Skewness, the positive result will show positive value while a negative skew will also show the negative value. For Kurtosis, the result will show a peak distribution of data (leptokurtic) when the value is positive and a flatter (platykurtic) if the values are negative. However, in general Skewness >3 and Kurtosis >10 may indicate a problem but if Kurtosis > 20, is definitely a more serious problem.

This research study will use the multivariate analysis and hence, the normality assumption is very important and also fundamental. Hair et al. (2010) states that the robust techniques are fewer effects when the assumptions are distributed, but as in all research gatherings with some of the assumptions critically determines a successful analysis. The results show all the data processed are within the acceptable range and hence, is within the normal

distribution. The results of the normality tests are shown in table 4.10 and the findings do not signify any issues in the data collected.

Table 4.10
Results of Normality Testing – Kurtosis & Skewness

		Statistic	Std. Error
DV_OTD	Skewness	-0.976	0.267
	Kurtosis	0.396	0.529
DV_INT	Skewness	-0.319	0.267
	Kurtosis	-0.358	0.529
DV_BSC	Skewness	-0.725	0.267
	Kurtosis	0.465	0.529
DV_IFR	Skewness	-0.491	0.267
	Kurtosis	0.661	0.529

DV_OTD refers to On-Time Delivery,
DV_INT refers to Inventory Turn,
DV_BSC referss to Balance score card and
DV_IFR refers to Inventory and Financial Risks

Figure: 4.1
Normality Q-Q Plot for On-Time Delivery (OTD)

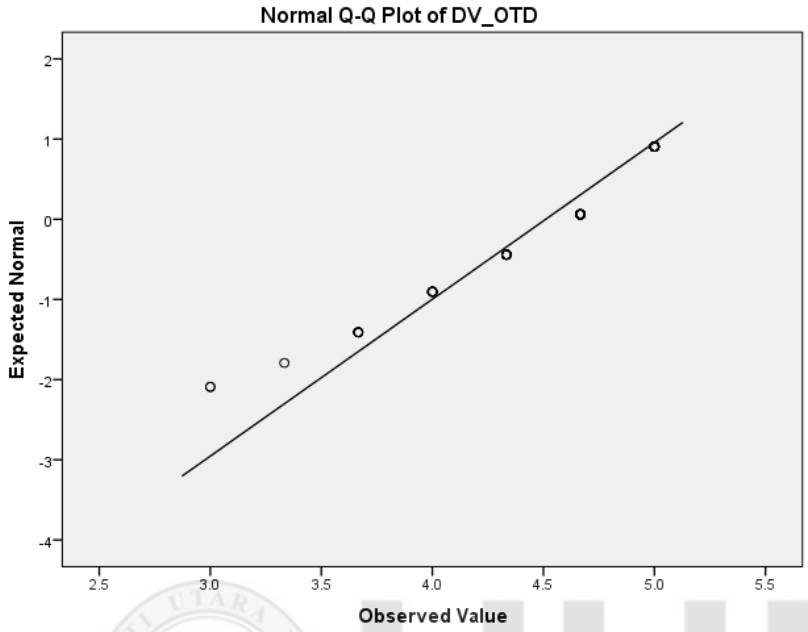


Figure: 4.2
Normality Q-Q Plot for Balance Score Care (BSC)

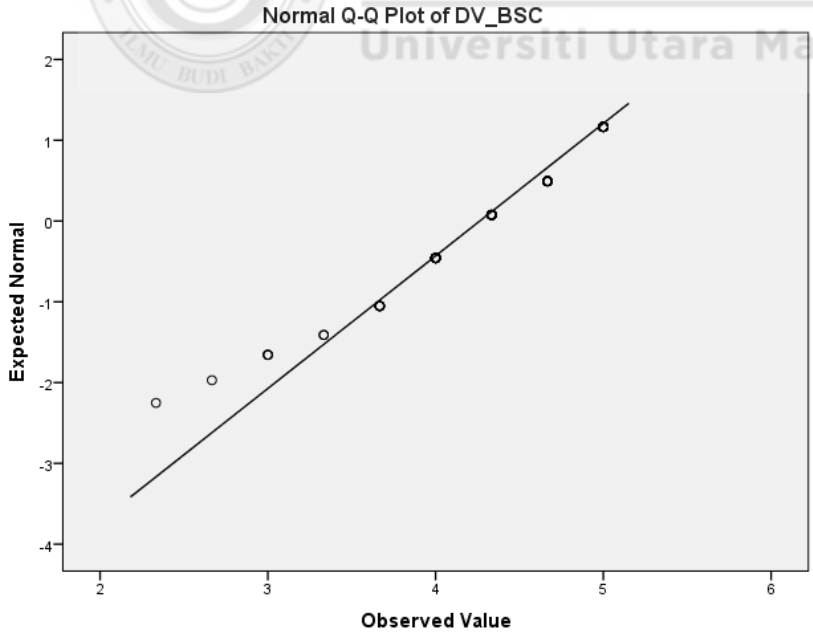


Figure: 4.3
Normality Q-Q Plot for Inventory Turn (INT)

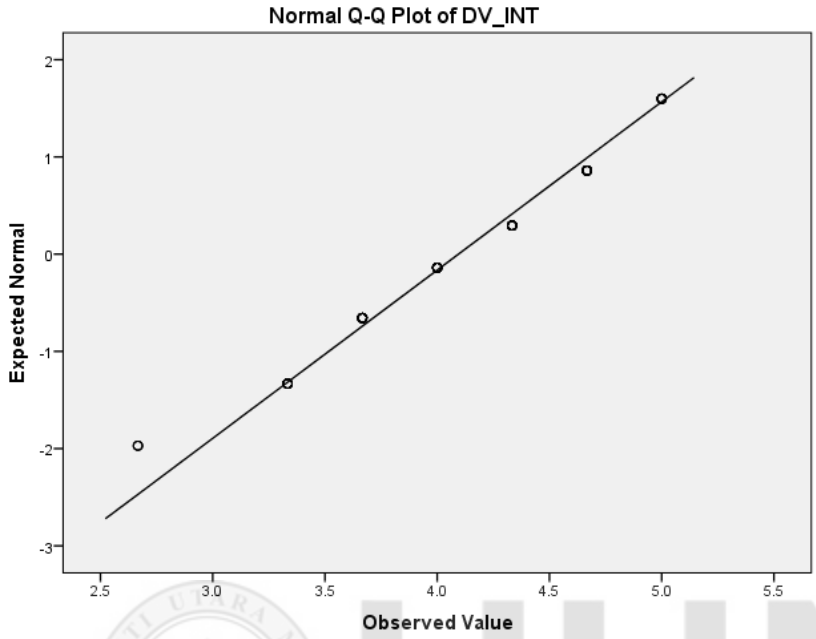
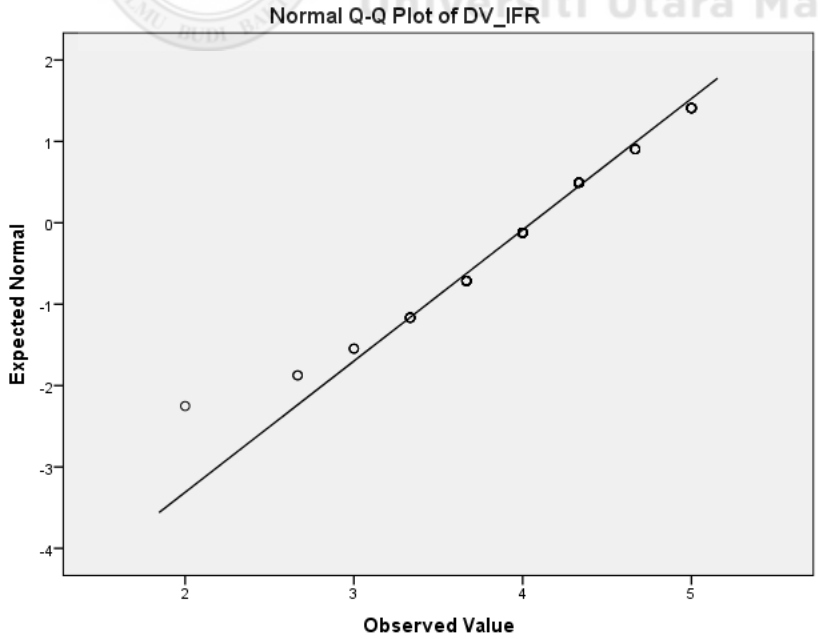


Figure: 4.4
Normality Q-Q Plot for Inventory Financial Risk (IFR)



From the table 4.11 on the results of Kurtosis and Skewness for the respective dimensions of SCM, and referring to the chart 4.1 to 4.4, the outcomes are fairly consistent for all the dimensions of the SCM. Therefore, we can conclude from the results that the deviation from normality is relatively lower when the observed value is of higher value. However, when the observed value is lower, the deviation is greater from normality.

Having said that, the deviations from the normality are still low and therefore, can be accepted.

4.9 Reliability Test of the Variables

This reliability test is to test the goodness of the data while the validity test is done to investigate on the instruments on its ability to measure what it is supposed to measure. The reliability will test the questionnaires used to collect the data as well as the data collected. This exercise will check the consistencies of the respondents' answer (Hair et al. 2010) to all the questionnaires in this study. It also tests the degree of the questions independently as measurement of the same concept in the sense of their correlations with one another (Sekaran & Bougie, 2010).

The Cronbach's alpha (Cronbach, 1951) was used to measure the reliability of of each scale and also the questions for each of the variables. Nunnally (1988) suggested that Cronbach's alpha of above or equal to 0.60 will be considered as reliable to determine the strength of reliability and to follow Hair et. al. (2010). The rule of thumb for Cronbach's Alpha guidelines are as below.

The results obtained for the moderator, financial risk are having a value of more than 0.60 for Cronbach Alpha signify that the data collected are valid and reliable. Meaning no data need to be deleted and can proceed for analysis using the data set obtained from the survey. The data collected in the survey execise is sufficient to provide a realistic finding on the relationship between the inventory management strategies and supply chain management performance.

The study shows the internal consistency with a Cronbach's alpha of greater than 0.60 and therefore, all the constructs from the factor analysis have good internal consistencies.

Table 4.11
Cronbach's alpha reliability coefficient for the main constructs

		Cronbach's Alpha	No of Items
Inventory Management Strategies			
1	Stock Holding	0.831	3
2	Safety Stock	0.769	3
3	Inventory Risk (Write-off)	0.749	3
4	Inventory Risk (Shoratge)	0.722	2
Supply Chain Management Performance			
1	On Time Delivery	0.783	3
2	Balance Score Card	0.676	3
3	Inventory Turns	0.715	3
4	Inventory & Financial Risk	0.671	3
Financial Risk			
1	SCM Risk	0.652	3
2	SCM and Cost	0.693	2

Table above states the results of the reliability test for each of the variables used in this research study. The three main variables measured are supply chain management performance as the dependent variable, inventory management strategies as the independent variable and financial risks as the moderating variable. From the results in the above table, all the variables are consistent and reliable. This test is positive and can proceed for analysis in this study.

4.10 Results of the hypothesis Testings _ IMS and SCM Performance.

To compute the relationship between the elements of inventory management strategies variable and the elements in the supply chain management performance variable, the data was subjected to the interaction test using the regression method and the outcomes are presented below. However, during the Factor analysis exercise, the results review that inventory management strategies out of the four original elements, stock policy is not significant to any of the elements in the SCM and hence, was ignored. All the four elements of the SCM are significant while in the financial risk as the moderator, the outcome is two dimensions.

In the regression testing, the P- value must be less than 0.05 in order to be considered significant. It is important to note that the coefficient of determination (R^2) of endogenous latent variable (Hair Jr. et al., 2013) is equally an important measurement. Cohen (1988) mentioned that R^2 values of 0.27 indicate a strong or substantial while value at 0.13 and 0.02 indicate is moderate and weak respectively.

The following are the results of the findings:

Hypothesis1a: There is a significant relationship between inventory management strategy and supply chain management performance for on-time delivery.

Table 4.12
Regression Analysis: Relationship between Inventory Management Strategy and On-Time Delivery (OTD)

Dependent Variable	**Independent Variable**	**Beta**	**Significant**
OTD	Stockholding	.164	.148
	Safety Stock	.040	.738
	Inv Risk (Write-off)	.327	.005**
	Inv Risk (Shortage)	-.147	-.078
	R^2	.166	
	Adjusted R^2	.122	
	F	3.784	.007**

*p < .05, **p < .01, ***p < .001

From the above table only Inventory Risk (write-off) is significant to On Time Delivery (M). Inventory risk (write-off) P value = 0.005 and t value = 2.863. R^2 value = 0.166, is closed to moderate (F = 3.784, and P < 0.01) and the adjusted R^2 = 0.122 also within the moderate range and indicated only a small variation. Other variables are not significant in explaining the On-Time Delivery dimension of SCM.

Hypothesis1b: There is a significant relationship between inventory management strategy and supply chain management performance for balance score card.

Table 4.13
Regression Analysis: Relationship between Inventory Management Strategy and Balance Scorecard (BSC)

Dependent Variable	Independent Variable	Beta	Significant
BSC	Stockholding	.160	.125
	Safety Stock	.159	.157
	Inv Risk (Write-off)	.361	.001***
	Inv Risk (Shortage)	.090	.375
	R^2	.290	
	Adjusted R^2	.253	
	F	7.764	.000***

*p < .05, **p < .01, ***p < .001

From the above table only Inventory Risk (Write-off) is significant to Balance Score Card and show a strong or substantial predictive validity. Inventory Risk (write-off) P-value = 0.001 with t-value = 3.425. R^2 value = 0.290, is considered strong (F = 7.764 and P < 0.001) and the adjusted R^2 = 0.253 also within the strong range and indicated only a small variation. Other variables are not significant in explaining the Balance Scorecard dimension of SCM.

Hypothesis1c: There is a significant relationship between inventory management strategy and supply chain management performance for inventory turn.

Table 4.14
Regression Analysis: Relationship between Inventory Management Strategy and Inventory Turn (INT)

Dependent Variable	**Independent Variable**	**Beta**	**Significant**
INT	Stockholding	.149	.157
	Safety Stock	.190	.096
	Inv Risk (Write-off)	.281	.010**
	Inv Risk (Shortage)	.166	.106
	R^2	.274	
	Adjusted R^2	.235	
	F	7.16	.000***

*p < .05, **p < .01, ***p < .001

From the above table only storage inventory risk (write-off) is significant to Inventory turn. Inventory risk (write off) P value = 0.010 and t value = 2.636. R^2 value = 0.274, is closed to strong (F = 7.16 and P < 0.001) and the adjusted R^2 = 0.235 also within the moderate strong range and indicated only a small variation. Other variables are not significant in explaining the Inventory Turn dimension of SCM.

Hypothesis1d: There is a significant relationship between inventory management strategy and supply chain management performance for Inventory – Financial risk.

Table 4.15
Regression Analysis: Relationship between Inventory Management Strategy and Inventory-Financial Risk (IFR)

Dependent Variable	Independent Variable	Beta	Significant
IFR	Stockholding	-.061	.599
	Safety Stock	.304	.017*
	Inv Risk (Write-off)	.061	.606
	Inv Risk (Shortage)	.055	.626
	R^2	112	
	Adjusted R^2	065	
	F	.393	.058

*p < .05, **p < .01, ***p < .001

From the above table only Safety stock is significant to Inventory & Financial Risk. Safety stock P value = 0.017 and t value = 2.444 but R^2 value = 0.112, is moderate and not significant (F = 2.393 and P > 0.05) and the adjusted R^2 = 0.065. Other variables are not significant in explaining the Inventory and Financial Risks dimension of SCM.

4.11 Results of the hypothesis Testings of the Moderating Variable

From the earlier chapters, is obvious that supply chain management performance will greatly impact the company performance and in order to have an effective supply chain, the existence of inventory is key important. But we also understand that keeping high inventory is not only bad in terms of the tied up of the operating fund and there are also risks attached to such action. The study is to find out if financial risk is the moderator of this relationship.

To test the moderating effect, Esposito Vinzi et al. (2010) states that first need to examine the main effects of the independent variable(s) on the dependent variable. Next, test the independent variable together with the moderating variable on the dependent variable and finally, multiply the independent variable with the moderating variables which will produce the interaction variable, and use this in the dependent variable. Hair Jr. et al. (2013) confirm that moderating effect is only valid when the interaction variable is significant.

The test of moderating effect was conducted and the following reports are obtained.

Table 4.16A (Moderation 1A)

Inventory Management Strategies and On-time Delivery (OTD) – Moderating effects of Financial Risk (Supply Chain Management Cost)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	.435[a]	0.189	0.168	0.46618	0.189	9.103	0
2	.435[b]	0.19	0.158	0.46909	0	0.036	0.851

Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total)[a]

Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total), Zscore(IVTTL_MVSCMCost)[b]

Table: 4.16Ai

Results of hierarchichal Multiple Regression Model of Total IV & MV_SCMCost of the moderating dimension on OTD

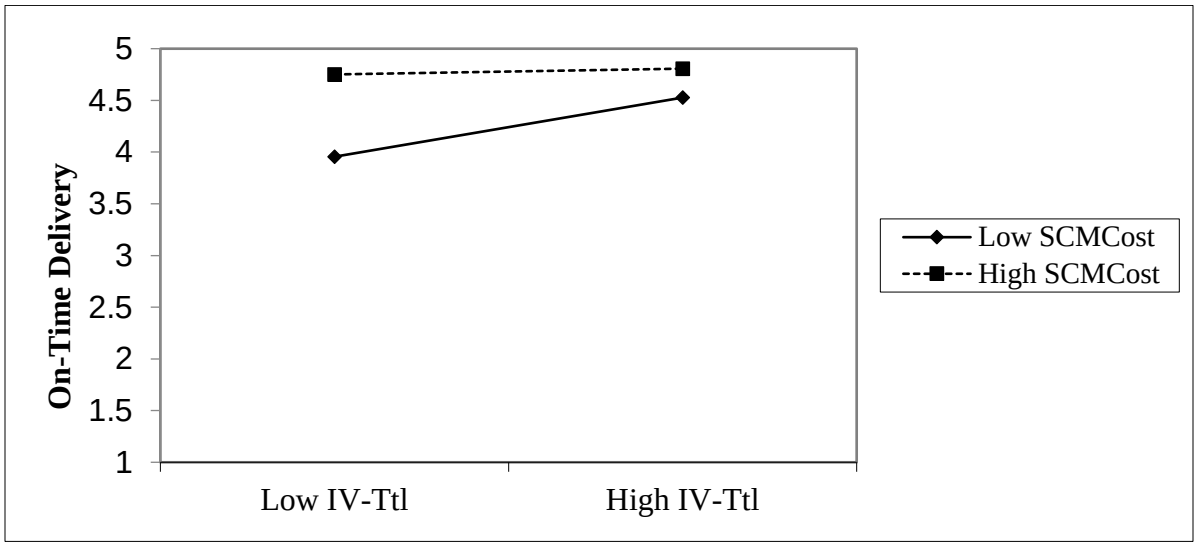
Model		Unstandardized Coefficient B	Std Error	Sig.	R^2
1	(Constant)	4.510	.052	.000	.189
	IV Total	.081	.054	.139	
	MV_SCMCost	.185	.054	.001	
2	(Constant)	4.510	.052	.000	.190
	IV Total	.157	.404	.699	
	MV_SCMCost	.269	.448	.550	
	IVTTL_MVSCMCost	-.129	.681	.851	

a. Dependent Variable: DV_OTD

b. Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total)[a]

c. Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total), Zscore(IVTTL_MVSCMCost)[b]

Figure: 4.5
Two-way interaction effects for unstandardized variable between IV-Total and OTD for SCM Cost



To test the moderating effect of Financial Risks (SCM cost) on the relationship between inventory management strategies and on-time delivery, a dimension of Supply Chain Management, a hierarchical regression analysis was conducted. The first model of the analysis took into consideration of the independent variable (IMS) and supply chain management cost which is one of the dimensions of the moderating variable (Financial risk) with the on-time delivery as the first dimension of the dependent variable (SCM).

The second model of the regression analysis added the interaction term of the IV Total and the moderating variable of MVSCMCost. The results of the analysis are shown in table 4.16A. A multiple regression model was tested whether the association between distance to IV-Total and On-Time Delivery. Results indicated that OnTime delivery were both associated with higher IV-Total. Each of the simple slope tests revealed a significant positive association between On-Time Delivery and MVSCMCost for higher levels of IV-Total.

Table 4.16B (Moderation 1B)

Inventory Management Strategies and On-Time Delivery (OTD) – Moderating effects of Financial Risk (Supply Chain Management Risk)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	.265[a]	0.070	0.047	0.97644346	0.070	2.953	0.058
2	.273[b]	0.075	0.039	0.98045170	0.004	0.364	0.588

Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total)$_a$

Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total), Zscore(IVTTL_MVFRSCM)$_b$

Table:4.16Bi

Results of hierarchical Multiple Regression Model of Total IV & MV_FRSCM of the moderating dimension on OTD

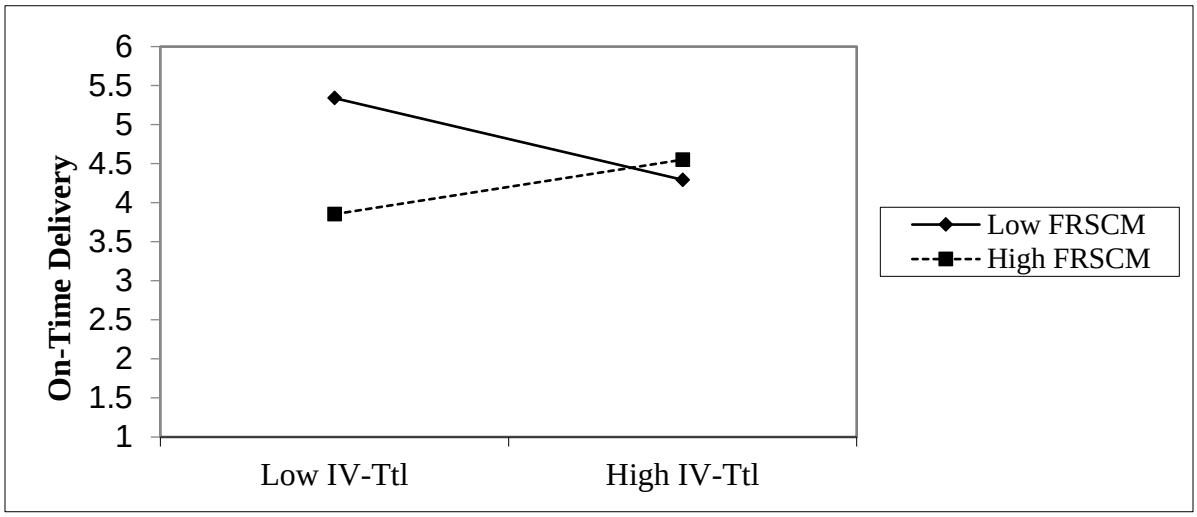
Model		Unstandardized Coefficient B	Std Error	Sig.	R^2
1	(Constant)	4.510	.055	0.000	2.953
	IV Total	.131	.058	.027	
	MV_FRSCM	.014	.058	.816	
2	(Constant)	2.369E-16	.109	0.000	2.074
	IV Total	-.087	.366	.813	
	MV_FRSCM	-.307	.534	.568	
	IVTTL_FRSCM	.436	.722	.548	

a. Dependent Variable: DV_OTD

b. Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total)$_a$

c. Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total), Zscore(IVTTL_MVFRSCM)$_b$

Figure: 4.6
Two-way interaction effects for unstandardized variable between IV-Total and OTD for FRSCM



To test the moderating effect of Financial Risks (SCM risk) on the relationship between inventory management strategies and on-time delivery, a dimension of Supply Chain Management, a hierarchical regression analysis was conducted. The first model of the analysis took into consideration of the independent variable (IMS) and supply chain risk which is one of the dimensions of the moderating variable (Financial risk) with the on-time delivery as the first dimension of the dependent variable (SCM).

The second model of the regression analysis added the interaction term of the IV and the moderating variable of MV-FRSCM. The results of the analysis are shown in table 4.16B.

A multiple regression model was tested whether the association between distance to IV-Total and On-Time Delivery. Results indicated that On-Time delivery were both associated with higher IV-Total. Each of the simple slope tests revealed a significant positive association between On-Time Delivery and MV-FRSCM for higher levels of IV-Total.

Table 4.16C (Moderation 2A)

Inventory Management Strategies and Balance Score Card (BSC) – Moderating effects of Financial Risk (Supply Chain Management Cost)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	.633[a]	0.401	0.386	0.47761	0.401	26.133	0.000
2	.649[b]	0.421	0.398	0.7284	0.019	2.580	0.112

Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total)$_a$

Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total), Zscore(IVTTL_MVSCMCost)$_b$

Table 4.16Ci

Results of stepwise Multiple Regression Model of Total IV & MV_SCMCost of the moderating dimension on BSC

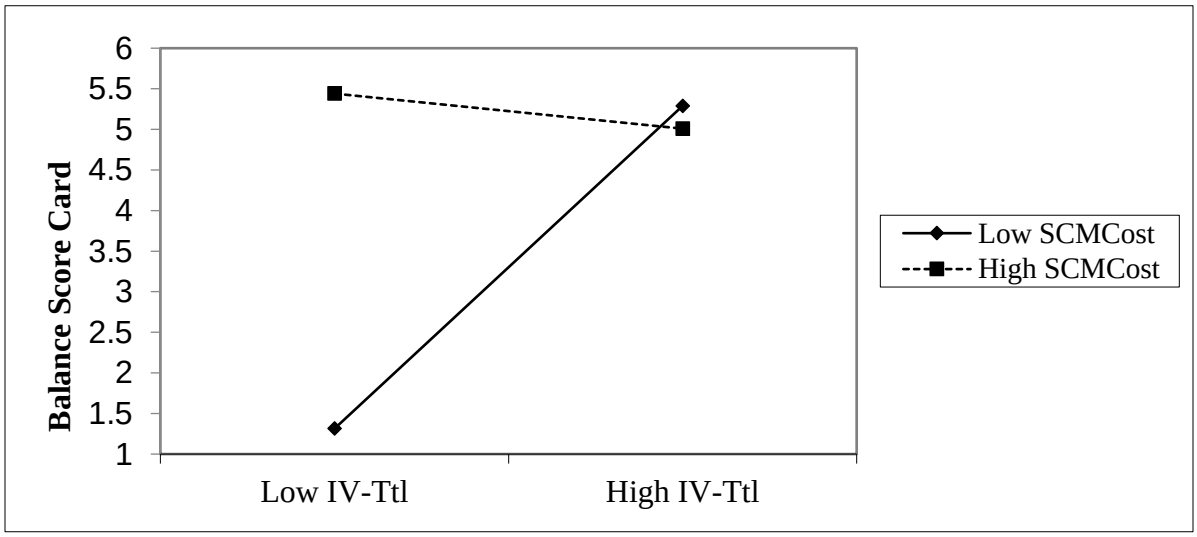
Model		Unstandardized Coefficient B	Std Error	Sig.	R^2
1	(Constant)	4.263	.053	.000	.401
	IV Total	.238	.056	.000	
	MV_SCMCost	.243	.056	.000	
2	(Constant)	4.263	.053	.000	.421
	IV Total	.886	.407	.033	
	MV_SCMCost	.962	.451	.036	
	IVTTL_MVSCMCost	-1.102	.686	.112	

a. Dependent Variable: DV_BSC

b. Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total)$_a$

c. Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total), Zscore(IVTTL_MVSCMCost)$_b$

Figure: 4.7
Two-way interaction effects for unstandardized variable between IV-Total and BSC for SCMCost



To test the moderating effect of Financial Risks (SCM cost) on the relationship between inventory management strategies and balance score card, a dimension of Supply Chain Management, a hierarchical regression analysis was conducted. The first model of the analysis took into consideration of the independent variable (IMS) and supply chain management cost which is one of the dimensions of the moderating variable (Financial risk) with the balance score card as the second dimension of the dependent variable (SCM).

The second model of the regression analysis added the interaction term of the IV Total and the moderating variable of MVSCMCost. The results of the analysis are shown in table 4.16C.

A multiple regression model was tested whether the association between distance to IV-Total and balance scorecard. Results indicated that Balance scorecard were both associated with higher IV-Total. Each of the simple slope tests revealed a significant positive association between Balance Scorecard and MVSCMCost for higher levels of IV-Total.

Table 4.16D (Moderation 2B)

Inventory Management Strategies and Balance Score Card (BSC) – Moderating effects of Financial Risk (Supply Chain Management Risk)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	.508[a]	0.258	0.239	0.87258019	0.258	13.535	0.000
2	.508[b]	0.258	0.229	0.87818481	0.000	0.008	0.931

Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total)$_a$

Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total), Zscore(IVTTL_MVFRSCM)$_b$

Table 4.16Di

Results of stepwise Multiple Regression Model of Total IV & MV_FRSCM of the moderating dimension on BSC

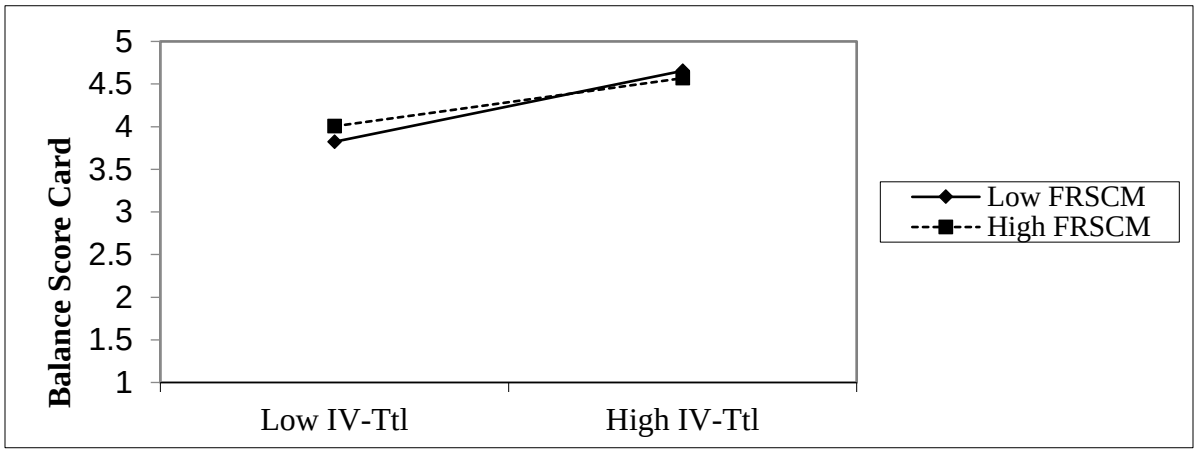
Model		**Unstandardized Coefficient**		**Sig.**	**R^2**
		B	**Std Error**		
1	(Constant)	4.263	.059	.000	13.535
	IV Total	.316	.052	.000	
	MV_FRSCM	-.026	.052	.685	
2	(Constant)	4.263	.059	.000	8.911
	IV Total	.349	.391	.375	
	MV_FRSCM	.024	.570	.966	
	IVTTL_FRSCM	-.067	.771	.931	

a. Dependent Variable: DV_BSC

b. Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total)$_a$

c. Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total), Zscore(IVTTL_MVFRSCM)$_b$

Figure: 4.8
Two-way interaction effects for unstandardized variable between IV-Total and BSC for FRSCM



To test the moderating effect of Financial Risks (SCM risk) on the relationship between inventory management strategies and Balance scorecard, a dimension of Supply Chain Management, a hierarchical regression analysis was conducted. The first model of the analysis took into consideration of the independent variable (IMS) and supply chain risk which is one of the dimensions of the moderating variable (Financial risk) with the balance score card as the second dimension of the dependent variable (SCM).

The second model of the regression analysis added the interaction term of the IV and the moderating variable of MV-FRSCM. The results of the analysis are shown in table 4.16D.

A multiple regression model was tested whether the association between distance to IV-Total and Balance scorecard. Results indicated that Balance Scorecard were both associated with higher IV-Total. Each of the simple slope tests revealed a significant positive association between On-Time Delivery and MV-FRSCM for higher levels of IV-Total.

Table 4.16E (Moderation 3A)

Inventory Management Strategies and Inventory Turn (INT) – Moderating effects of Financial Risk (Supply Chain Management Cost)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	.643[a]	0.414	0.399	0.44821	0.414	27.501	0.000
2	.645[b]	0.416	0.393	0.45024	0.002	0.295	0.588

Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total)$_a$

Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total), Zscore(IVTTL_MVSCMCost)$_b$

Table 4.16Ei

Results of stepwise Multiple Regression Model of Total IV & MV_SCMCost of the moderating dimension on INT

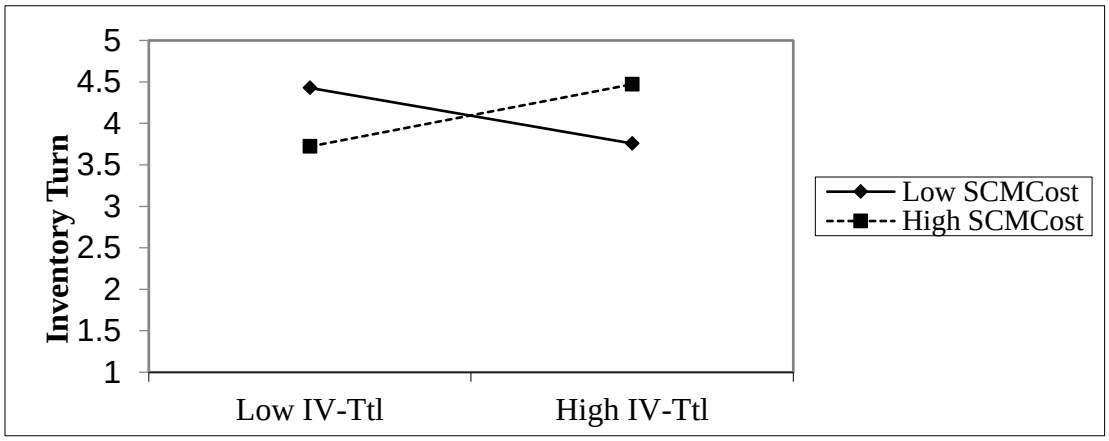
Model		Unstandardized Coefficient B	Std Error	Sig.	R^2
1	(Constant)	4.095	.050	.000	.414
	IV Total	.229	.052	.000	
	MV_SCMCost	.234	.052	.000	
2	(Constant)	4.095	.050	.000	.416
	IV Total	.020	.388	.960	
	MV_SCMCost	.002	.430	.996	
	IVTTL_MVSCMCost	.355	.654	.588	

a. Dependent Variable: DV_INT

b. Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total)$_a$

c. Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total), Zscore(IVTTL_MVSCMCost)$_b$

Figure: 4.9
Two-way interaction effects for unstandardized variable between IV-Total and Inventory Turn for SCMCost



To test the moderating effect of Financial Risks (SCM cost) on the relationship between inventory management strategies and inventory turn, a dimension of Supply Chain Management, a hierarchical regression analysis was conducted. The first model of the analysis took into consideration of the independent variable (IMS) and supply chain management cost which is one of the dimensions of the moderating variable (Financial risk) with the inventory turn as a third dimension of the dependent variable (SCM).

The second model of the regression analysis added the interaction term of the IV Total and the moderating variable of MVSCMCost. The results of the analysis are shown in table 4.16C.

A multiple regression model was tested whether the association between distance to IV-Total and inventory turn. Results indicated that inventory turn were both associated with higher IV-Total. Each of the simple slope tests revealed a significant positive association between inventory turn and MVSCMCost for higher levels of IV-Total.

Table 4.16F (Moderation 3B)

Inventory Management Strategies and Inventory Turn (INT) – Moderating effects of Financial Risk (Supply Chain Management Risk)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	.600[a]	0.360	0.343	0.46840	0.360	21.891	0.000
2	.607[b]	0.368	0.343	0.46829	0.009	1.037	0.312

Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total)$_a$

Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total), Zscore(IVTTL_MVFRSCM)$_b$

Table 4.16Fi

Results of stepwise Multiple Regression Model of Total IV & MV_FRSCM of the moderating dimension on INT

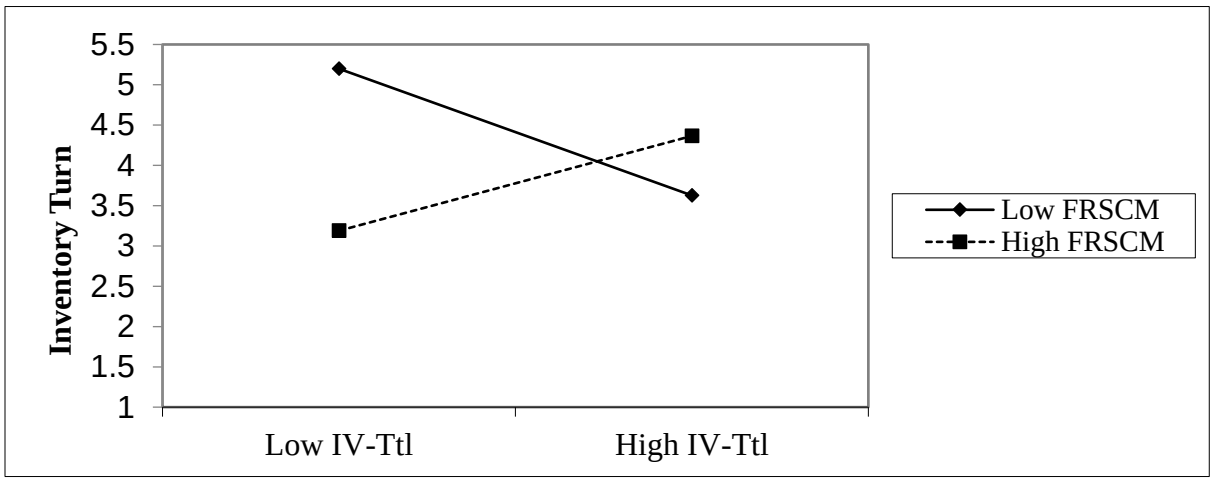
Model		Unstandardized Coefficient B	Std Error	Sig.	R^2
1	(Constant)	4.095	.050	.000	.360
	IV Total	.245	.054	.000	
	MV_FRSCM	.187	.054	.001	
2	(Constant)	4.095	.052	.000	.368
	IV Total	-.099	.342	.773	
	MV_FRSCM	-.318	.499	.525	
	IVTTL_FRSCM	.687	.675	.312	

a. Dependent Variable: DV_INT

b. Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total)$_a$

c. Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total), Zscore(IVTTL_MVFRSCM)$_b$

Figure: 4.10
Two-way interaction effects for unstandardized variable between IV-Total and Inventory Turn for FRSCM



To test the moderating effect of Financial Risks (SCM risk) on the relationship between inventory management strategies and inventory turn, a dimension of Supply Chain Management, a hierarchical regression analysis was conducted. The first model of the analysis took into consideration of the independent variable (IMS) and supply chain risk which is one of the dimensions of the moderating variable (Financial risk) with the inventory turn as a third dimension of the dependent variable (SCM).

The second model of the regression analysis added the interaction term of the IV and the moderating variable of MV-FRSCM. The results of the analysis are shown in table 4.16F.

A multiple regression model was tested whether the association between distance to IV-Total and inventory turn. Results indicated that inventory turn were both associated with higher IV-Total. Each of the simple slope tests revealed a significant positive association between inventory turn and MV-FRSCM for higher levels of IV-Total.

Table 4.16G (Moderation 4A)

Inventory Management Strategies and Inventory-Financial Risk (IFR) – Moderating effects of Financial Risk (Supply Chain Management Cost)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	.348[a]	0.121	0.099	0.94945340	0.121	5.372	0.007
2	.360[b]	0.130	0.096	0.95098478	0.008	0.749	0.389

Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total)$_a$

Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total), Zscore(IVTTL_MVSCMCost)$_b$

Table 4.16Gi

Results of stepwise Multiple Regression Model of Total IV & MV_SCMCost of the moderating dimension on IFR

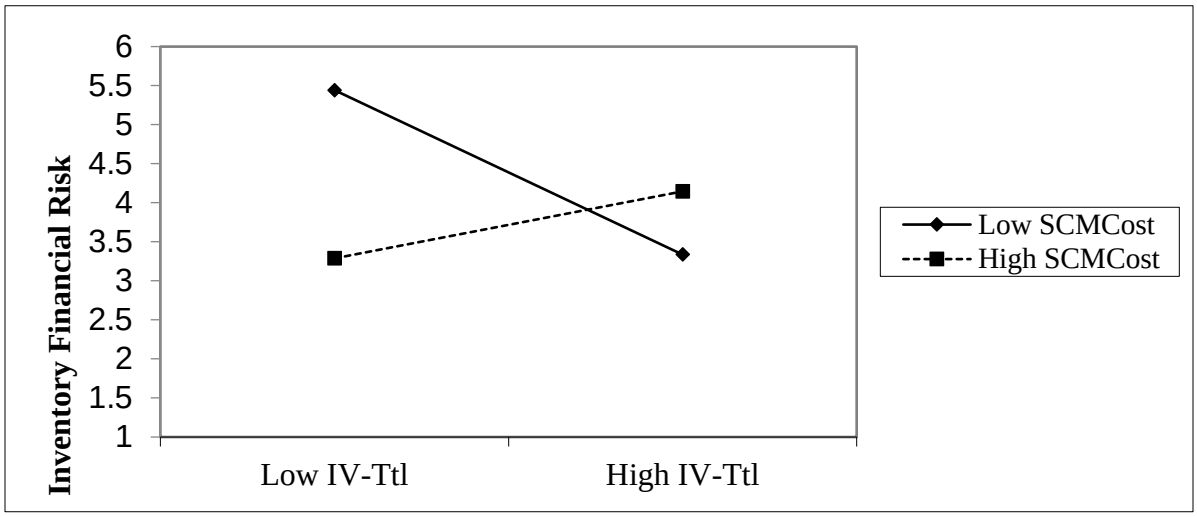
Model		Unstandardized Coefficient B	Std Error	Sig.	R^2
1	(Constant)	4.063	.065	.000	5.372
	IV Total	.123	.069	.077	
	MV_SCMCost	.145	.059	.039	
2	(Constant)	4.063	.056	.000	3.820
	IV Total	-.512	.508	.541	
	MV_SCMCost	-.336	.563	.549	
	IVTTL_MVSCMCost	.741	.856	.389	

a. Dependent Variable: DV_IFR

b. Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total)$_a$

c. Predictors: (Constant), Zscore(MV_SCMCost), Zscore(IV_Total), Zscore(IVTTL_MVSCMCost)$_b$

Figure: 4.11
Two-way interaction effects for unstandardized variable between IV-Total and Inventory-Financial Risk for SCMCost



To test the moderating effect of Financial Risks (SCM cost) on the relationship between inventory management strategies and inventory financial risks, a dimension of Supply Chain Management, a hierarchical regression analysis was conducted. The first model of the analysis took into consideration of the independent variable (IMS) and supply chain management cost which is one of the dimensions of the moderating variable (Financial risk) with the inventory financial risks as the fourth dimension of the the dependent variable (SCM).

The second model of the regression analysis added the interaction term of the IV Total and the moderating variable of MVSCMCost. The results of the analysis are shown in table 4.16G. A multiple regression model was tested whether the association between distance to IV-Total and inventory financial risks. Results indicated that inventory financial risks were both associated with higher IV-Total. Each of the simple slope tests revealed a significant positive association between inventory financial risks and MVSCMCost for higher levels of IV-Total.

Table 4.16H (Moderation 4B)

Inventory Management Strategies and Inventory-Financial Risk (IFR) – Moderating effects of Financial Risk (Supply Chain Management Risk)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	.519[a]	0.270	0.251	0.53671	0.270	14.406	0.000
2	.544[b]	0.296	0.268	0.53056	0.026	2.819	0.097

Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total)$_a$

Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total), Zscore(IVTTL_MVFRSCM)$_b$

Table 4.16Hi

Results of stepwise Multiple Regression Model of Total IV & MV_FRSCM of the moderating dimension on INT

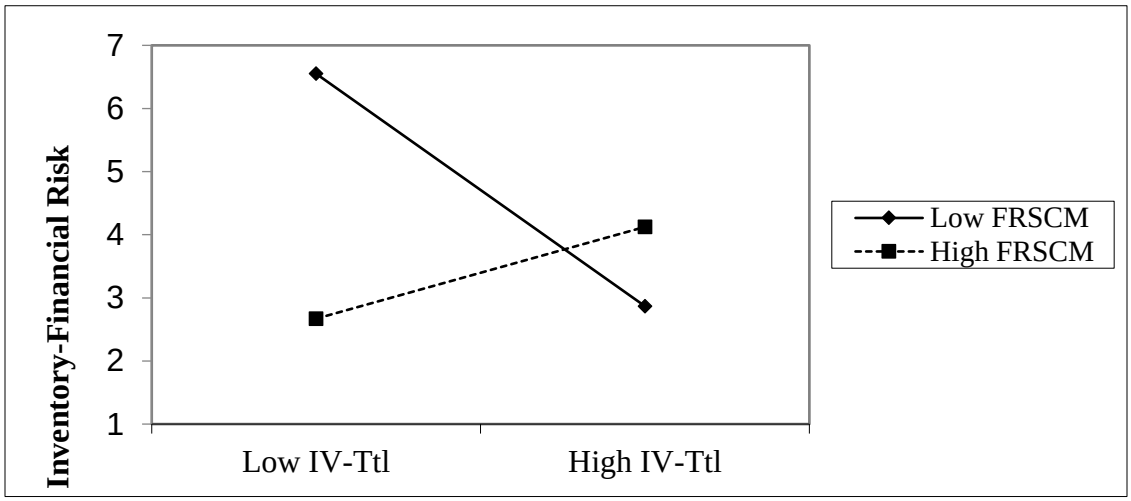
Model		Unstandardized Coefficient B	Std Error	Sig.	R^2
1	(Constant)	4.053	.060	.000	.270
	IV Total	.086	.062	.173	
	MV_FRSCM	.288	.062	.000	
2	(Constant)	4.053	.059	.000	.296
	IV Total	-.557	.388	.155	
	MV_FRSCM	-.656	.565	.250	
	IVTTL_FRSCM	1.284	.765	.097	

a. Dependent Variable: DV_IFR

b. Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total)$_a$

c. Predictors: (Constant), Zscore(MV_FRSCM), Zscore(IV_Total), Zscore(IVTTL_MVFRSCM)$_b$

Figure: 4.12
Two-way interaction effects for unstandardized variable between IV-Total and Inventory-Financial Risk for FRSCM



To test the moderating effect of Financial Risks (Supply chain management risk) on the relationship between inventory management strategies and inventory financial risks, a dimension of Supply Chain Management, a hierarchical regression analysis was conducted. The first model of the analysis took into consideration of the independent variable (IMS) and supply chain risk which is one of the dimensions of the moderating variable (Financial risk) with the inventory turn as the fourth dimension of the dependent variable (SCM).

The second model of the regression analysis added the interaction term of the IV and the moderating variable of MV-FRSCM. The results of the analysis are shown in table 4.16H.

A multiple regression model was tested whether the association between distance to IV-Total and inventory financial risks. Results indicated that inventory financial risks were both associated with higher IV-Total. Each of the simple slope tests revealed a significant positive association between inventory financial risks and MV-FRSCM for higher levels of IV-Total.

4.12 Summary of Hypotheses Testing

The main hypothesis are:

First, the main hypothesis is regarding the effect of IMS on SCM performance.

H_0: The Inventory Management Strategies variable do not significantly affect the Supply Chain Management performance

vs

H_1: The Inventory Management Strategies variable significantly affects the Supply Chain Management performance.

Second main hypothesis is regarding the moderating variable, Financial Risk consideration on the relationship between Inventory Management Strategies and Supply Chain Management performance.

H_0: Financial risk does not moderate the relationship between Inventory Management Strategies and Supply Chain Management performance

vs

H_1: The Financial Risk moderate the relationship between Inventory Management Strategies and Supply Chain Management performance.

From all the various tests performed and with the validity of the data, we can conclude from this study that inventory management strategies do affect significantly on the supply chain management performance. However, financial risk as the moderator do not have significantly moderating the relationship between the inventory management strategies and supply chain management performance except for one case between the IV-Total (IMS)

and FRSCM (one of the dimension of Inventory risks) on IFR, a dimension of DV (SCM Performance).

Table 4.17a
Summary of the result for main hypothesis testings

First, the main hypothesis is regarding the effect of IMS on SCM performance.		**Outcome**
H_0:	The Inventory Management Strategies variable do not significantly affects the Supply Chain Management performance	
	Vs	Reject H_0
H_1:	The IMS variable significantly affects the SCM performance.	
The second main hypothesis is regarding the moderating effect of Financial Risk consideration on		
H_0:	The Financial risk does not moderate the relationship between Inventory Management Strategies and Supply Chain Management performance	
	Vs	Fail to reject H_0
H_1:	The Financial Risk moderate the relationship between Inventory Management Strategies and Supply Chain Management performance.	

Table 4.17b

Summary of the result of sub- hypothesis testings between IMS and SCM

From the first main objective, a number of sub hypothesis are identified. They are twenty all together				
		Beta	P Value	Outcome
1	H_{1a}: The variable of stock holding practices and policy (representing the IMS) significantly affecting the on-time delivery factors (one of the factor under SCM performance)	0.164	>0.05	Fail to reject H_0
2	H_{1b}: The variable of safety stock practices and policy (representing the IMS) significantly affecting the on-time delivery factors (one of the factor under SCM performance)	0.04	>0.05	Fail to reject H_0
3	H_{1c}: The variable of invenory risks (write-off) practices and policy (representing the IMS) significantly affecting the on-time delivery factors (one of the factor under SCM performance)	0.327	<0.01	Accept H_{1c}
4	H_{1d}: The variable of inventory risk (shortage) practices and policy (representing the IMS) significantly affecting the on-time delivery factors (one of the factor under SCM performance)	-0.147	>0.05	Fail to reject H_0
5	H_{2a}: The variable of stock holding practices and policy (representing the IMS) significantly affecting the balance score card (one of the factor under SCM performance)	0.660	>0.05	Fail to reject H_0
6	H_{2b}: The variable of safety stock practices and policy (representing the IMS) significantly affecting the balance score card (one of the factor under SCM performance)	0.159	>0.05	Fail to reject H_0
7	H_{2c}: The variable of invenory risks (write-off) practices and policy (representing the IMS) significantly affecting the balance score card (one of the factor under SCM performance)	0.361	<0.001	Accept H_{2c}
8	H_{2d}: The variable of inventory risk (shortage) practices and policy (representing the IMS) significantly affecting the balance score card (one of the factor under SCM performance)	0.09	>0.05	Fail to reject H_0
9	H_{3a}: The variable of stock holding practices and policy (representing the IMS) significantly affecting the inventory turn (one of the factor under SCM performance)	0.149	>0.05	Fail to reject H_0
10	H_{3b}: The variable of safety stock practices and policy (representing the IMS) significantly affecting the inventory turn (one of the factor under SCM performance)	0.190	>0.05	Fail to reject H_0
11	H_{3c}: The variable of invenory risks (write-off) practices and policy (representing the IMS) significantly affecting the inventory turn (one of the factor under SCM performance)	0.281	<0.001	Accept H_{3c}
12	H_{3d}: The variable of inventory risk (shortage) practices and policy (representing the IMS) significantly affecting the inventory turn (one of the factor under SCM performance)	0.166	>0.05	Fail to reject H_0
13	H_{4a}: The variable of stock holding practices and policy (representing the IMS) significantly affecting the inventory financial risks (one of the factor under SCM performance)	-0.061	>0.05	Fail to reject H_0
14	H_{4b}: The variable of safety stock practices and policy (representing the IMS) significantly affecting the inventory financial risks (one of the factor under SCM performance)	0.304	<0.05	Accept H_{4b}
15	H_{4c}: The variable of invenory risks (write-off) practices and policy (representing the IMS) significantly affecting the inventory financial risks (one of the factor under SCM performance)	0.061	>0.05	Fail to reject H_0
16	H_{4d}: The variable of inventory risk (shortage) practices and policy (representing the IMS) significantly affecting the inventory financial risks (one of the factor under SCM performance)	0.055	>0.05	Fail to reject H_0

Table 4.17c
Summary of the result of sub- hypothesis testings of moderator in the relationship.

From the second main objective, also a number of sub-hypotheses are identified to be tested and			P Value	Outcome
1	H_1:	The financial risks (SCM Risk) variable moderates the relationship between IMS and On-Time Delivery, first dimension of SCM performance.	0.548	Fail to reject H_0
2	H_2:	The financial risks (SCM Cost) variable moderates the relationship between IMS and On Time Delivery, first dimension of SCM performance.	0.851	Fail to reject H_0
3	H_3:	The financial risks (SCM Risk) variable moderates the relationship between IMS and Balance Score card, second dimension of SCM performance.	0.931	Fail to reject H_0
4	H_4:	The financial risks (SCM Cost) variable moderates the relationship between IMS and Balance Score card, second dimension of SCM performance.	0.112	Fail to reject H_0
5	H_5:	The financial risks (SCM Risk) variable moderates the relationship between IMS and Inventory Turn, third dimension of SCM performance.	0.312	Fail to reject H_0
6	H_6:	The financial risks (SCM Cost) variable moderates the relationship between IMS and Inventory Turn, third dimension of SCM performance.	0.588	Fail to reject H_0
7	H_7	The financial risks (SCM Risk) variable moderates the relationship between IMS and Inventory Financial Risk, fourth dimension of SCM performance.	0.097	Accept H_7 : Moderate
8	H_8:	The financial risks (SCM Cost) variable moderates the relationship between IMS and Inventory Financial Risk, fourth dimension of SCM performance.	0.389	Fail to reject H_0

Table 4.18
The summary of the main hypothesis

	Hypothesis	**Decision**
1	The Inventory Management Strategies variable significantly affects the SCM performance.	supported
2	The Financial Risk moderate the relationship between IMS and SCM performance.	Not supported

From the results of all the testings, the null hypothesis for the relationship between IMS and SCM is rejected as there is a significant relationship between both the variables. As for the null hypothesis of the moderation of the relationship between IMS and SCM, the null hypothesis is accepted as most are not significant even thought there is only one interaction between the IV total and FRSCM which shows a low value of moderation on the relationship.

4.13 Chapter Summary

As mentioned at the beginning, this chapter describes the collection of data and the methodology use in this research. It covers the research design and the population of the study including the various tests the data are subjected, to determine the validity of the data. The data were tested using the factor analysis and regression to determine the significant of the variables in this study and to determine the reliability of the data and indirectly, the singnificant of inventory management strategy on the supply chain management performance. Similar tests were conducted on the moderating variables to test on their significant to the relationship between inventory management strategy and supply chain management performance.

The key results of the findings are tabulated in table 4.17a, 4.17b and 4.17c. The relationship between IMS and SCM performance is significant while the financial risk only moderate for the interaction between IV-Total and FRSCM against Inventory-Financial risks.

CHAPTER 5

DISCUSSION, RECOMMENDATION AND CONCLUSION

5.1 Introduction

The main objective of this chapter, which is the final chapter, is to summarize the results and to offer discussions apart from giving the conclusion of this research study. This chapter elaborates the research outcomes and suggests the possible research direction in the future. As stated in the title of this chapter, this chapter also offers recommendations and conclusion of the study. The contraints, issues and limitations of this research study are also discussed as such details can be the learning materials for future undertaking and reference.

To recap, the purpose of this research study is to determine, as well as to examine, the relationship between the inventory management strategy and how it impacts the supply chain management performance of the manufacturing facilities in the aerospace industry. It is a fact that, in line with the generic strategy as suggested by Michael Porter, in order to meet the cost strategy, multi-national organizations and corporations in the United States of America and those in Europe are moving their operation to a new location that can offer a lower total cost of productions, to remain competitive and continue to stay in business. With this important strategy, there is increase of company going international especially with the advancement in the information technology as well as improvement in the logistic transit time.

It is a concern, within the context of the manufacturing sector that most organizations have shifted their manufacturing operation to Asian or developing countries where cost of labour is lower if their processes are manual or labour intensive in nature. They either set-up their own facility or outsource to third parties which is the most contemporary trend lately. However, it is important to note that for the aerospace industry, due to the complexity in the approval registered local suppliers, the main source of the raw materials or semi finished raw materials are still being imported (shipped) from their original countries, namely in the United States of America and Europe. Both of these two giant aeroplane companies have a very strict requirements for approving the suppliers. For example, in order to qualify as a new supplier in the aerospace industry can easily take from 5 to 20 years, depending on the nature and purpose of the materials. With the escalating labour cost, both in the United States of America and in Europe, the move provides an immediate saving and thus enables for a much competitive pricing.

To minimize any additional cost in relation to the transfer of their manufacturing operation, in particular the movement of materials or products, the area of logistics has become the next important focus. Apart from the transit time which is very critical, the freight cost is another important element in the product costing. In order to maintain cost competitiveness, most organizations opt for the ocean freight in comparison with the air freight. However, the long transit time is definitely a challenge, especially when coupled with the high risk of delays. The long transit time means that organization will be holding additional inventory and normally this is equal to inventory holding amount or value of at least the transit time itself. Therefore, the risk of any delays has a direct impact on the

performance and hence, the rating of the order fulfilment. Such target becomes a common and an important criteria in the company performance measurement. If there is a continuous poor performance in the order fulfilment (on-time delivery as is commonly known), it can result in having unsatisfactory customer and finally in losing the customer on a permanent basis.

This research is focusing on the importance of inventory management strategies in relation to SCM performance. Example, no matter how robust the supply chain management process is, without inventory, there can be no activities taking place including order fulfilment. Hence and as the consequences, the company is not able to fulfil the delivery of an order and failing the expectation of the customer. Delays can be costly even though the organization can opt for air freight instead of the routine sea freight. In such cases of delays, shipping by air freight is definitely a better option if compared to losing the customer confidence and the business. Important to note in the aerospace industry, delays can cost the aeroplane companies huge losses resulting from the penalty claim by their customer. In order to mitigate such risk or losses in business, both the aeroplane companies, The Boeing Company and the Airbus Corporation will impose similar terms and condition on their suppliers. Each back to back contract of business may help in terms of finances but the aeroplane companies still having the risk of losing their reputation.

The concern for material or inventory (Chou, 2012) has become more obvious, especially when the demand for aeroplane increases two to three folds over the last 5 years. This has put tremendous pressure in the industry's supply chain as none of their raw materials

suppliers are able to provide an accurate forecast to work on their capacity expansion. To increase the complexity, any increase in capacity attracts huge investment and even after the new facility is ready, it still needs to go through the qualification process by the technical and quality team from the giant aerospace companies. This was the feedback received from the industry players during the data collection. This is in line with the concerns Kleindorfer and Wu (2003) who suggest huge investment is possible with capacity increment.

Recently, the demand trend in aerospace industry indicated that demand is greater than supply or capacity, and thus having the inventory available means better fulfilment performance, which is highly impacted by the supply chain management performance. According to one of the respondents during a discussion, the supplier delivery performance is a serious concern and poses a huge challenge to the giant aerospace companies in meeting their customer delivery expectations. Moreover, the results from the study show that over the years, many orders were cancelled due to poor performance and in some cases, no delivery performance.

As Engardio (2001) suggested that inventory is also a risk to the suppliers, in many occasions the risks have been disguised with initiatives such as Just-In-Time and flexible manufacturing, this study found that goods in transit is an important part of inventory management and therefore, the control of such inventory is important for continuous operation of the manufacturing facilities. However, these initiatives also have risks and therefore, risk assessment and risk management become critical to the company. In general,

the higher the amount of goods in transit, it signifies a low inventory turns. Such finding is supported by industry players involving in composite manufacturing in Malaysia, ACM and CTRM.

Another variable of concern is the product shelf-life. Most manufacturing organizations have raw materials and products with specific shelf-life. Such materials, for example, the adhesive and paint, are also subjected to expiry and thus, they are at risk when there is a change in demand. The suppliers of these materials normally impose a minimum order quantity (MOQ), which required the buyers to purchase and hold additional stock even if the materials may not be used for a specific period of time. This simply means, buying at the minimum quantity and not be able to consume prior to the expiry date may result in scrapping the balance of the materials. In this instance, having the inventory in the system does necessarily not mean the materials are to be used in the production. Insights from this study show that, although planning tools such as material requirement planning (MRP) and enterprise resource planning (ERP) are commonly used in most companies, but the shelf life is not normally considered in most of the software applications and is difficult to manage in real life situation. In the aerospace industry, shelf life of materials is found to be a significant element in the inventory management strategy thus affecting the supply chain management performance greatly.

In this research, a study on the financial risk as moderator is also concluded, pertaining to the relationship between the inventory management strategies and supply chain management performance. Contrary to Simons's (1999) finding, that is financial risk is an

important part of the relationship between any business activity or transaction, this study found that financial risk is not the absolute moderator of the relationship between inventory management strategy and supply chain management in the aerospace industry. The tests on the interaction of the inventory management strategies and the dimensions of the financial risk as the moderator on the dimensions of the supply chain management prove that is insignificant apart except one which show a slight level of influence as the moderator. Thus, the claim to have a robust for a financial risk contingency plan that shall put the company in better position is secondary in this study. Thus, the direct relationship between inventory management strategy and supply chain management is more significant and crucial for this industry in terms of the supply chain management performance.

Organizations or suppliers in the aerospace industry may not decide to or change their shareholder(s) simply although the industry requires heavy investment and slow return on investment. This is contrary to the suggestion by (Kleindorfer, 2003) who have done their study in the non-aerospace industry. The finding does not trigger for the need to include financial risk as moderator where the financial stability and capability are hypothesized and tested to reveal the continue investment support to the business. In this study, it is found that financial risk, although in reality may be important, only has a moderating effect on one set (out of eight sets) of the financial risk regarding the relationship.

It is undeniable fact that financing the operation is an important part of business. Most businesses, when they are not able to sustain the current operation financially, are more likely to reduce the amount of inventory holding. Although only one set of the moderating

relationship is proven significant in this study, however six out of eight direct relationship between financial risk and supply chain management are proven significant. This reflects the high importance of financial risk in the industry to the supply chain management. This explains the high risk to the business as any problem related to the order fulfilment shall affect the profitability of the business.

For example, an increase in the demand, in the case of Boeing 737 from 36 ships-set to around 62 ships-set a month over a period from 2015 -2017, has resulted in many of the suppliers in trouble as they are either, do not have the space or capacity or the fund to continuous support to the business. Moreover, such increase in demand also resulted in similar risks to the business. Such exposures can easily impact the internal supply chain and hence, the on-time delivery performance is mainly affected by the shortage of inventory. On-time delivery is a delivery performance and determines if the committed delivery has been met. This measurement also has a direct impact on the customer service level. With this explanation, the financial risk is argued to be a 'note to review' moderator of the relationship between inventory management strategy and supply chain management performance. Further discussions are to follow later.

5.2 Overview of the research findings

This study, as mentioned earlier, is to investigate the impact of inventory management strategies (IMS) on the supply chain management (SCM) performance in an aerospace environment in Malaysia. From the analysis of the data collected together with all the testings and validations, there is definitely a significant relationship between IMS and SCM

performance. The significant level is < 0.001 with p= 0.000 and chi square = 714.355. Without having the effective IMS, it is argued here that there will have a direct negative impact on the SCM performance and hence, order fulfilment shall be affected. Such chain reactions will ultimately affect the company performance and finally, its reputation globally.

In this study in the aerospace industry, only three out of original four hypothesized dimensions of the independent variable are found to be listed in the set of data after factor analysis. The storage policy is found as the insignificant contributor with only one element (question) included in the data set of the factor analysis (rest of the elements are further eliminated and treated as the outlier). Thus, the storage policy dimension is omitted from the model.

However, the dimension of inventory risk is divided into two different dimensions by the factor analysis. These dimensions are further labelled as the accounting for the write-off (write-off) and another is about the shortages of inventory. Thus, all together, there are four dimension again to represent the inventory management strategy to affect the supply chain management. The dimensions are finalized as the following:

i. Stock holding
ii. Safety stock
iii. Inventory risk (write-off)
iv. Inventory risk (shortage)

The dimensions within the supply chain management remained as the initial four groups as analysed using factor analysis. The elements fit well in the dimensions and thus no rename is done. This shows that the questionnaires (elements) of these dimensions are highly reliable and suitable in this study.

Using the 'new' dimensions of the inventory management strategy, the findings reveal another interesting finding where every dimension of the supply chain management is affected by certain dimensions of the inventory management strategy. This means that there is a direct significant relationship between the designed dimension of the independent variable with the counterpart dimensions in the dependent variable. It is observed that each of the dimensions of the dependent variable has only a significant relationship with one dimension of the independent variable. This finding simply implied that the independent variable is very specific influence towards the dependent variable.

Among the dimensions, only safety stock and inventory risk (write-off) are significant to the dimension of the dependent variable from the regression analysis. Out of these two, the financial risk (write off) is the most common. The significant relationships between the dimension are summarized as the following:

i. Balance score card (SCM) affected by inventory write-off (IMS).
ii. On-time delivery (SCM) affected by inventory write-off (IMS).
iii. Inventory turn (SCM) affected by inventory write-off (IMS)
iv. Inventory financial risk (SCM) affected by safety stock (IMS).

The results revealed that inventory write-off and safety stock are the important dimensions of the inventory management strategy in influencing the specific dimension of supply chain management performance.

In the case of the balance score card, the focus areas are internal business process, learning and innovation, customer and stakeholders and, lastly is financial. This simply proven that the study is accurate as any management of risks, including the inventory risk (write-off) will be significant and has direct influence on the outcome of the financial, which represent one of the four quadrants in the balance scorecard.

The financial risk (write-off) is also significant to the on-time delivery (OTD) dimension of supply chain management. Such risk may affect the inventory level, which shall affect the performance of the on time delivery and supply chain management performance as a whole. Poor performance in the OTD will affect the customer confidence apart from resulting in lower revenue generation and this shall affect the financial performance.

On the other hand, the finding also shows that the inventory risk (write-off) is significant to inventory turn, another dimension in the supply chain management. The inventory turn is a measure of inventory against the sales, and therefore, the bigger the value the better is the rating. In this context, any write-off means there is a high probability that sales revenue may be impacted and shall reduce the value of the inventory turn. Such ratio is important and indicate the effective usage of the company resources, especially in terms of the raw materials.

Within the context of inventory-financial risk, a dimension in the supply chain management, the right level of safety stock is significantly connected to the inventory-financial risk. It is important to cushion and mitigate any issues related to inventory. Such issues could be due to supplier, quality or logistics and the on-time delivery measurement will definitely be affected. Although the level of safety stock may differ item to item depending on the ordering lead time, shipping lead time as well as the usage quantity, but having the optimum level will reduce the tendency for over stock which causes write-off or under stock which may impact the supply chain performance. This is in line with the suggestion by Chen and Yu (2001a).

The rest of the dimensions that are not significant to affect any of the dependent variable are stock holding and inventory risk (shortage). One of the explanations of the stock holding is that, in the context of aerospace industry, simply having the stock do not necessarily mean there is without issues as the materials in the stock may be expired or no longer can be used due to the deterioration in quality caused by improper storage condition but not remove physically and from the system.

Another dimension that does not have any significancy with any of the dependent variable is the inventory risk (shortages). With the availability of inventory system such as enterprise resource planning (ERP), most of the ordering or replacement triggers are from the system itself unless there is a problem on the integrity of data or the program itself. However, such issues normally are minimized as the system is fully tested prior to the implementation. Is important to note that shortages occurrences are very few as many

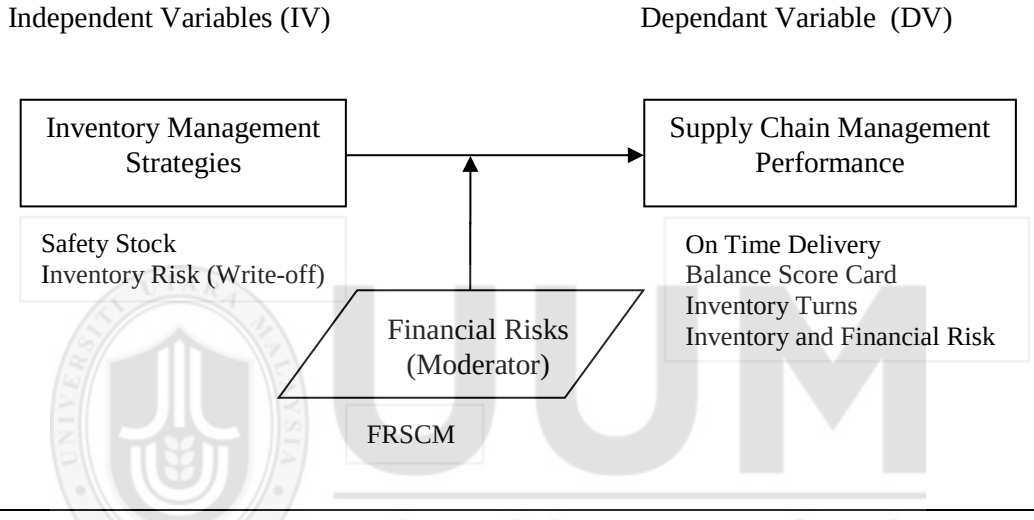
suppliers are imposing the minimum order quality (MOQ). Although shortage is regarded as an inventory risk, but such shortages normally should not happen in this industry as the industry usual practice is about having more instead of just a sufficient or shortage of items. The third reason is, unlike the semiconductors or electronics industry, the volume of materials required in the aerospace industry especially in Malaysia is still relatively small. Again, important to note that there is an obvious gap as suppliers for the raw materials are unable to supply in such a small quantity in accordance with the required quantity by the airlines and, decided to impose minimum order quantity (MOQ).

For the testing of the moderator of the relationship, which is the financial risk, the data collected and the results of the analysis show that only one dimension, which is SCM risk, is moderating significantly the relationship between the dimensions tested. Therefore, the financial risks of SCM (FRSCM) moderate the relationship between the inventory management strategy and supply chain management.

One interesting and important point to note from this moderating testing is that most of the dimensions in the moderating variables that indicate the moderating factors have the direct significant relationships to the SCM performance. This indicates that there is a possibility for future research to test the relationship between financial risk as the independent variable to SCM performance.

The model for this research framework with the significant variables, as the final model, is summarized as the following diagram 5.1, with different dimensions as compared to the initial model mentioned again in diagram 5.2.

Figure 5.1
Final Research Model



In this final research model, only two dimensions of the inventory management are significant to the four dimensions of the supply chain management while only one dimension of the financial risks as the moderator is marginally affecting the relationship in terms of inventory risk (FRSCM) which is between the moderator and the inventory-financial risk of supply chain management. .

5.3 Discussions of the Research Findings

Referring to the results based on the statistical analysis in Chapter 4, the objectives of this study have been achieved. The IMS variables impacting the SCM performance in the case of aerospace industry have been identified. Similarly, the significant dimensions of

financial risk consideration as the moderating factors are also being revealed. Considering the aerospace industry as a new industry in Malaysia, the discussions later take into consideration this fact and the 'unique and new' environment faced by the players in the industry.

The first hypothesis supports the relationship between IMS and SCM performance, with 3 of 4 of its dimensions at the initial stage.

For all dimensions in the IMS being examined, it is found that in every dimension in the SCM performance (i.e. OTD, balance scorecard, inventory turns and, inventory and financial risk) there is a direct significant relationship between each dimension to only at least one of the dimension in the independent variable. This implies that each dimension is important and should be made available in the SCM performance for testing the effect of IMS on SCM performance. This supports the thesis proposition or hypothesis, indicating that the dimension of IMS (as mentioned) to influence the SCM performance.

As mentioned in the earlier chapter 1, this is probably a new or first attempt of testing the relationship between IMS and SCM performance in the aerospace industry in Malaysia, Insights from the respondents show that many of them would like to have the report as it this can be a new learnings to them.

With regard to the examination on the effect of financial risk consideration, although the findings appear that this variable only moderate weekly the relationship between IMS and

SCM, but this is an important study and further research can be conducted for better understanding. The test as the moderating variable was with the intention to confirm that this variable is affecting the decision process between IMS and SCM performance. Thus, the findings show that there is little significant to the relationship except for the dimension of SCM risk to inventory-financial risk which is a dimension of the dependent variable.

Kleindorfer (2008a) who has suggested the importance of financial risk in his study regarding physical and financial risk in supply management has proven that this research finding on financial risk consideration is relevant, although only partially, but without the financial risk consideration will affect the overall SCM performance and result in negative sustainability in the businesses. When we refer to the concept of risk, there is always risk in all business activities, including in SCM. These risks always or associated with financial risk of having the financial impact. For example, risk with the supply activities, product and logistic. These all involve with cost and will have an impact on the company financial performance. The research finding on this matter should be further investigated.

5.3.1 Stock Holding and SCM Performance

The results of the related hypotheses show that the stock holding, in general, is not significant with SCM performance in the aerospace industry in Malaysia. The least p-value is given by the effect of balance score card at t=1.550 where the highest is at t= -0.528 for inventory-financial risk. As for this research, although it is hypothesized to be significant, the arguments provided indicate that the hypothesis not to be rejected, meaning that the

stock holding is not a significant factor to the SCM performance. This was proposed as this dimension has been a focused in many industries.

Why stock holding is not relevant in this industry? The fact that the findings support this statement can be explained by the following reasons;

i. The quantity of parts involved in the aerospace industry is relatively small compared to other industries, example semi conductors or electronics.
ii. Suppliers of raw materials in aerospace normally impose MOQ and therefore, companies involved in the aerospace will receive parts more than needed in terms of quantity.
iii. As the parts are relatively expensive, and traceability is important in aerospace, record keeping become very important with attention from many divisions.
iv. Due to complexity in the process and production for the aerospace industry, some form of ERP system normally is in place and hence, capable to trigger to order parts below the requirements based on demands and schedules.

5.3.2 Safety Stock and SCM Performance

The results of the related hypotheses show that the safety stock is significant to inventory-financial risks in the SCM performance a study done in the aerospace industry in Malaysia. The least p-value is given by the effect of inventory-financial risks t=2.444 where the highest is at t= 0.336 for the variable of on-time delivery. As for this research, as hypothesized to be significant, the results provided indicate that the hypothesis is rejected, meaning that the safety stock is significant to the SCM performance.

Why safety stock is only relevant to inventory-financial risks in this industry? The fact that this study support this statement can be explained by the following reasons;

i. Safety stock is to cushion any uncertainty in the supply due to various reasons, example bad quality, delay in delivery, missing or damage during transportation.

ii. Safety stock act as a triggering point for re-order and hence, is important in terms of the order fulfilment.

iii. Lead time for ordering is very long and any shortage will be detrimental to the order fulfilment and may subjected to penalty claims from the customer which may impact the organization financially.

iv. Safety stock quantity normally taken into consideration of the lead time of order and logistics.

5.3.3 Inventory Risk (write-off) and SCM Performance

The results of the related hypotheses show that the inventory risks (write-off), in general, is significant with on-time delivery, balance score card and inventory turn of the SCM performance in the aerospace industry in Malaysia. The least p-value is given by the effect of balance score card at t= 3.425 where the highest is at t = 0518 for the variable of inventory – financial risks. As for this research, as is hypothesized, the result provided indicate that the hypothesis to be rejected, meaning that the inventory risks (write-off) is significant to the SCM performance.

This finding again proved that inventory management strategy is an important factor in the supply chain management performance. The inventory risk (write-off) is expected to be different for the different individual items in terms of their storage condition as well as the shelf-life, the order lead time and the quantity needed. The quantity is also dependent on the volume of demand and also to cater for the expected increase in demand from time to time arises.

Why inventory risks (write-off) is relevant in this industry? The fact that the findings support this statement can be explained by the following reasons;

i. The inventory risks (write-off) is when any inventory need to be written-off from the system and physically due to whatever reasons. This is normally done after approval from management with recommendation from the material review board (MRB) which is widely practiced in most industries.

ii. Inventory risk (write-off) affects the inventory and financial risk as any obsolete inventory due to engineering change, expiry of shelf life or deterioration due to the mechanical life of the materials caused by unsuitable storage condition, will impact inventory level and causes financial lost.

iii. Inventory risk (write-off) may affect the order fulfilment process if the existing inventory is from the same batch or having the same reason(s) for the write-off.

iv. Inventory risk (write-off) is significant to the three (out of four) dimensions of the SCM performance and therefore, must be focused and given the necessary attention.

5.3.4 Inventory Risk (Shortages) and SCM Performance

The results of the related hypotheses show that the inventory risk (shortages) is not significant with SCM performance in the aerospace industry in Malaysia. The least p-value is given by the effect of the inventory turn at t = 1.637 where the highest is at t= .489 for the variable of inventory-financial risks. As for this research, it is hypothesized to be significant, however, the findings provided indicate that the hypothesis cannot be rejected as the inventory risk (shortage) is not significant to the SCM performance.

Why Inventory risk (shortages) is not relevant in this industry? The fact that the output support this statement can be explained by the following reasons;

i. Although any kind of risk can affect the financial standing of an organization and finance is one of the quadrants in the balance scorecard, but in this study, inventory management strategies is also a precedent in determining the supply chain management performance

ii. Inventory is an asset to any organization, but it can also be a liability when their purpose is no longer valid or needed. However, with all the monitoring and controls for inventory in all the companies, shortages occurrence is near to impossible

iii. Another reason why inventory risk related to shortages may not be relevant in the aerospace industry is the existence and availability of MRP or ERP in most companies. Such system is to ensure that materials are purchased on time and following all the requirements and condition pre-set in the system. And assuming that there is accuracy of data entry and integrity of information.

iv. Inventory risks (shortages) can be mitigated through activity like frequent cycle counting and in-place of inventory control system knows as Kanban or the two-bin system.

5.3.5 Financial Risk as the Moderator

The results of the related hypotheses show that the financial risk is only partial, with a low significance level as a moderator of the relationship between IMS and SCM performance in the aerospace industry in Malaysia. During the factor analysis, the moderator was divided into SCM risk and SCM Cost. The SCM risk dimension is significant with inventory turn and inventory-financial risk of the SCM performance while SCM Cost is significant to on-time delivery, balance score card and inventory turn. As for this research, it is hypothesized to be significant, and the result provided indicate that the hypothesis is negative, meaning that financial risk as moderator is only has low moderating the relationship between IMS and SCM performance.

Why financial risk as moderator is not relevant in this industry? The fact that the output support this statement can be explained by the following reasons;

i. Although financial risk is an important part of any business and is part of the process in SCM but, the decision involving inventory and supply chain cannot totally be influenced on the part of finance as operation and order fulfilment will take priorities.

ii. Inventory is classified as assets in the accounting report and any losses or scrap, will impact the Profit and Lost (P&L) statement directly. Therefore, any

mitigation of the financial risk is an internal management responsibility, but such roles should not influence the decisions on inventory management strategies which is proven to impact the supply chain management performance.

iii. Any lost or shortage of inventory may directly affect the SCM performance in terms of order fulfilment or making it more costly to transport the materials in an expedite mode of transport. However, financial concerns, although important, are given less priority as the business decision such as inventory management strategies take precedents. Such business decisions affect the supply chain management performance and hence, impact the fulfilment of order and thus, meeting the expectation of customer which is the top priority in the aerospace industry

iv. Normally the level of inventory keeping is monitored closely by the finance department as the figures are reported in the monthly statement. Therefore, finance should be aware of any possible risks and the actions needed, example making the necessary accrue. In any case, with the close monitoring from the finance department, the financial impact should be minimum and hence, strategic decision on inventory management will be more relevant and given the priority to ensure high performance of SCM in the aerospace industry.

With the increasing rate of globalization and contemporary complexity in business today, the companies were no longer able to operate or manage like in the past. Information flow becomes very critical especially with more organizations going international, technology advancement playing a critical role to enable such diversification of business becomes

possible and a reality. Expansion in business is possible through exploring areas across geographical and continents, however, the existing business model may no longer valid or at least may not be relevant with larger and more coverage of new areas or location.

The case of one system fits all may no longer possible or valid. Risk and exposures whether in terms of technology, information or financial will definitely change accordingly too. Business model normally may change due to the different customer requirement and this is mainly determined by the different culture in different locations. The need for faster and better logistic infrastructure will definitely assist in moving the materials across the globe which is never been thought possible in the past. Above is a typical of aerospace industry and simply explain the need for a robust supply chain management.

With more offices and facilities, there is definitely a need to increase the working capital in terms of inventory holding and this will similarly increase the impact on financial risk which is a concern to management. The increase in inventory holding cannot be avoided and cash will be tied down. As inventory is considered an asset, any reduction or lost in inventory will impact the financial standing directly. Risk management needs to be implemented to mitigate the exposures in business as financial risk may affect many business decisions and activities including inventory level, which may impact the supply chain management performance and therefore, the company performance. However, as proven in this study, decision in the aerospace industry on inventory and supply chain management will take precedents as such decision is directly related to customer

satisfaction. Financial concerns shall not influence the strategic decision on inventory and supply chain management.

Strategic operational decision will prevail and take priority of risk in financial for business in order to grow and move to the next level. This is important due to the obvious facts that risk will increase as business expands, but any decision and concern coming from financial may create negative impact to the operation, including customer fulfilment which is very critical to any organization.

5.4 Implication, Recommendation and Suggestion for future study

The implication of this research is very encouraging as the data collected not only has high validity and also, tested positive for normality. The results imply that there is a significant relationship between the inventory management strategy and supply chain management performance. And the regression test on the financial risk as moderator, the finding is that the moderator variable is only partially with low significant in moderating the relationship between the inventory management strategy and supply chain management performance.

In this study, it is confirmed that the financial risk is not significant as a moderator variable for the relationship between the inventory management strategy and supply chain management performance. Due to degree of risks involved, especially if is impacting financial, in normal cases, decision outcome could change or different from what it should be if financial is not part of the decision making process. Inventory is an asset to any organization and to maintain the inventory means company operating funds will be tied

down. Therefore, a strong and stable financial or healthy operating fund is still necessary to sustain the operation of most industries.

The implication of this study confirms that the relationship between inventory management strategy and supply chain management performance with low level of moderation of the financial risk. This is especially true in the aerospace industry where the need to fulfil the delivery and customer expectation take precedent over the financial risks concern, even though operation requires high investment as well as the working capital to sustain the business (Kleindorfer and Wu, 2003). Demand is never an issue in the aerospace industry, unlike the electronic or similar where the demand changes from time to time. The demand in the aerospace is rather consistent, but of late, is on the increasing trend. Due to the low profitability of the business, companies in the aerospace need to improve the supply chain performance example the on-time delivery apart from the quality to avoid a reduction in their profitability.

The findings very well explain the need of the business in the aerospace where inventory is prime importance and having the working capital to support the right level of inventory is mandatory. However, as most of the stock items are subjected to shelf-life and the condition of the storage, the inventory management strategies plays an important role to ensure that raw materials are ordered and stored in the right storage environment and to be used within the stipulated validity by the suppliers.

Companies involving with high technology industry including aerospace must realise that inventory can also be a liability if there is a need to write-off any part of inventory. Write-off could be due to the material out of the shelf life or the condition of the storage is not maintained or become obsolete due to the change in design for example. Many organizations like Compaq and Hewlet Package, dealing with computer went out of business due to the lost contributed by their inventory holdings. Such losses can easily wipe off the profit gained from many years ago. The risk in holding inventory is important and therefore, any inventory management strategy, the finance must be part of the team to help in monitoring and trigger to the organization. Some of the mitigation to avoid shortage of inventory and at the same time, no over stock is to reduce the logistics lead time and also, increasing the delivery frequency by reducing the shipment batch sizes.

Another important implication of the findings, which can be viewed to contribute knowledge to the academician for future reference as well as for the organization and the top management in the aerospace industry especially in Asian countries. The findings are consistent with most of the related literatures, articles and professionals working in the similar industry. From the study, we also noted that materials management tools such as material requirement planning (MRP) or enterprise resource planning (ERP) are not sufficient to deal with materials subjected to both, shelf life and storage condition. Shared information is important to improve the supplier's order quantity decisions in a serial system with known auto aggressive demand process as stated by Lee et al. (2000). The economic order quantity (EOQ) needs to further review to include the fluctuation in demand and taking into the condition of the shelf life in order to remain relevant in the

future. Until the tools are improved for such materials planning task, is important for organizations to recruit human resources equipped with the knowledge and skills to manage this area of business which is very crucial. Most management tends to overlook the difference or uniqueness, and continue with the assumption that inventory management is similar in every industry and companies. For example, in the aerospace industry, due to the limited number of suppliers and in most cases, only sole supplier existed, this has brought the management of the supply chain to another level of complexity where relationship with suppliers becomes an important part of the dealing.

In the data analysis exercise to check the validity of the moderator elements, the findings are interesting as some of the elements in the moderator variable are significant and have direct relationships with the dependent variable. Such finding could also suggest a new research in the future to determine the relationship between the element of financial risks with supply chain management in the aerospace or other high technology industry. Such study may determine if financial or working capital has an impact with the decision in the supply chain management and at which level is significant. The question like "Will the company be able to continue to sustain with continuous investment or can the company can be self sustaining and rely on their own borrowing" can be answered.

From the analysis, future research can consider for the similar relationship between inventory management and supply chain management with supplier lead time or/and logistics transit time as the moderator. This study will be interesting with the continuous transfer of business to Asean countries from United States of America and Europe. In this

study, is important to note that if there are changes in the supplier lead time or the logistics lead time will influence the relationship between the inventory management and supply chain management from the globalization perspective (Chen & Yu, 2001a). Another area of study for future research from the finding of this research is to examine or investigate the risk management in different supply chain or in different industries and make use of the contingency perspective. It will be interesting to note that the findings can result in different findings and solution for different industry. In short, although supply chain management and inventory management may sound similar to most of the people, but in reality, the application and details may totally different and hence, requires a different focus and attention. Therefore, supply chain management will continue to be an area of interest to many, as this is relatively new compared to knowledge of operation and management for example.

Therefore, the opportunity for future research can consider on risk management involving inventory management and in different industry. This will help in better understanding of the subject matter and determine the optimal inventory level to maintain to reduce the risks. The inventory holding level has, to some extend depending on the business models. Business model such as "Make-To-Stock" will see a high level of inventory at finished goods and lesser in the raw materials typically. The other business model, "Make –To-Order" will be different as there may be no or little of finished goods inventory, but higher in the raw materials inventory to stand-by for incoming orders which customers are expecting short delivery lead time. Assessing the risks and keeping the minimum or "acceptable" risks is necessary and is termed calculated risks as covered in earlier chapters

and normally a company will need to undertake to avoid non performance, maintain competitiveness and the company's profitability to sustain their operation. This is inline with Svensson (2002).

There are few areas of restriction which form part of learning while performing this research. The first is the limited number of companies in Malaysia involving in the aerospace sector as many may view there is risk in this aerospace business. The biggest concern or limitation is the need for heavy investment in contrast with the profit level, hence the return of investment (ROI) is very much longer compare to most of the other investments. Due to this factor, many small medium enterprises (SMEC) have concerns to venture into the aerospace sectors. The next limitation is that most of the employees in Malaysia are not exposed in this sector and do not have a good grasp of the supply chain knowledge and skills to manage the business paving employment opportunity for foreigners to be employed and to lead important positions in the organization in Malaysia. The exposures and transfer of knowledges and skills to local employees are critical to manage the salary expenses in the long term. Therefore, having employees that are fast learners and thirst for knowledge are important criteria in the recruitment exercise.

As the business is highly competitive, the third limitation is many organizations do not encourage their employee to share information and resulted most respondents ended up using their personal emails. Such restriction not only reduce the rate of growth in the aerospace industry but also reduce the opportunity to share best practices which is important for such new and growing sector in Malaysia. The forth limitation is that most

departments, especially in top management and finance are treating inventory management similar to the industry they were in the past but in reality is totally different. The number of suppliers in most industry will comprises of two or more and normally they are located thereby or in the same country or continent. However, the supplier base in the aerospace industry is often sole supplier and located in United States of America or Europe depending which aeroplane company. The fifth limitation is supply chain management is still a fairly new function in most companies in Malaysia. Usually only the large multinational organization will set-up the supply chain division to manage the end to end process and business.

To ensure sufficient human resources in the area of logistic and supply chain in the near future, University Utara Malaysia which is located in the northern part of Malaysia has established a faculty for logistics and involving themselves with other supply chain international bodies is definitely very encouraging for the continue progress of this country. The faculty will be able to train and generate students equipped with the necessary knowledge to support the high technology as well as the aerospace industry in areas related to logistics and supply chain management.

5.5 Conclusion

In conclusion, the outcomes of this research study confirm that inventory management strategy is mandatory for the success of the supply chain management and its performance. This will ultimately affect the company's profitability and performance. Without the right inventory, production process scheduling will be affected and order fulfilment will not be

possible. This will result in low performance measurement for on-time delivery and the company performance as a whole. If such negative trend continues, this will greatly impact the customer satisfaction index and putting at risk of losing customers. The end to end process is commonly undertaken by supply chain management and from the study, inventory management strategy is significant and do impact the supply chain management performance.

The result of this research has helped enlighten the need for an inventory management strategy to support the supply chain management performance as expected and seen by experts working in the aerospace industry. Such findings also are the evidences to the existing and the new companies venturing into the aerospace industry to take a serious view of inventory management and the related strategies.

From the testing done on the moderating variable, the result is not significant and hence, important to note that decision involving inventory management strategies and supply chain management must be given the utmost importance. Having the necessary fund to support the companies' operation in the aerospace is very important. This is especially so if the companies need to recover from any major catastrophe or stoppage in production. For this reason, the company must prepare a business continuity management (BCM) procedures just in case of any major issues preventing the company to operate or perform shipment in the normal circumstances.

From the above, the objectives of this research are met, and thus, providing the very satisfying outcomes. The questionnaires received positive responses and this is partly due to the fact that questionnaires were forwarded to people in the aerospace industry and they understand the business and the purpose of the questions. There is no further modification of the questions about this research.

Again, the findings of this research is that the model with the variables are valid and significant. The independent variable, inventory management strategy relation to supply chain management performance as the dependent variable is significant. Further testings also prove that the moderating variable, financial risk is only partially significant in moderating the relationship between the inventory management strategy and supply chain management performance. This provides a framework for the industry to have a better focus on the inventory management strategy and the need to establish a supply chain management division as well as to link such processes with the expectation from customers. To the academician, this not only contribute to new knowledge in the aerospace field and also, created areas for further research in the near future.

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APPENDIX – QUESTIONNAIRE

QUESTIONNAIRE ON

INVENTORY MANAGEMENT STRATEGY, FINANCIAL RISK CONSIDERATION AND SUPPLY CHAIN MANAGEMENT PERFORMANCE

I am conducting a research project at the PhD level on the relationship between the inventory management strategies and supply chain management performance in manufacturing industry, with particular emphasis in high technology and aerospace sector. This research intends to address the effect of inventory management strategies on the supply chain management and also to look into the moderating effect of financial risks in the mentioned relationship (Berling & Rosling, 2005). This thesis provides importance reference to the manufacturing sector in dealing with high technology.

The data collected is highly confidential and shall be used solely for the research purposes. The data reported will be in the summarized form and thus in no way personal information can be identified.

Your valuable time is very much appreciated. There is no absolute right or wrong answer to the questions and thus please take your time to answer the questions to the best of your knowledge.

SECTION A

This section intends to get information on the respondents' demographic background (the contextual factors). Tick the box which best describe about you.

1. Gender

☐ Male ☐ Female

2. Nationality

☐ Malaysian ☐ Others. Pls specify _____

3. Level of education

☐ High school ☐ College ☐ Degree & above

4. Employment

☐ Full time ☐ Part time

5. Position Level in the organization

☐ Executive & below ☐ Manager ☐ Top management

6. The organization that you work

☐ Non –High tech ☐ High tech Industry ☐ Aerospace and related

7. Is your Organization keep inventory /stock (of any nature) ?

☐ Yes ☐ No ☐ Not sure

8. Do your company have supply chain management or similar function or department ?

☐ Yes ☐ No

9. Have you been involved in Inventory directly or indirectly ?

☐ Yes ☐ No

10. Do you think Inventory management is important to your organization ?

☐ Yes ☐ No

If yes, (10a) then do you think Supply Chain Management performance is related to inventory ?

☐ Yes ☐ No

11. If there is financial risks involvement, do you think it will affect the decision on the Supply Chain Management decision in terms of inventory management ?

☐ Yes ☐ No

12. Will you be interested to have a copy of this research ?

☐ Yes ☐ No

If Yes, pls provide the following details :

Name :

Position :

Company :

Email :

Mobile No :

SECTION B

This section is to measure the performance of the **Supply Chain Management.** Please circle one answer in each line across.

Definition of scale:1 Strongly disagree. 2. Disagree. 3. Neutral. 4. Agree. 5. Strongly agree.

On Time Delivery (OTD) Performance					
1. OTD measurement is very critical to your Customer(s).	1	2	3	4	5
2. OTD is company key KPI to measure performance and critical to management.	1	2	3	4	5
3. Customer can penalize your company for delay in shipment eg incurred additional cost of shipping via express air freight.	1	2	3	4	5
4. Continuous not meeting OTD will push customer to consider alternative supplier(s).	1	2	3	4	5
5. Inventory is necessary to meet Customer's delivery expectation	1	2	3	4	5
Balance Score Card (BSC) – Financial, Customer, Internal Business and Learning & growth					
6. Company performance is measure via BSC or similar, KPI matrix on monthly basis.	1	2	3	4	5
7. Financial Position in terms of Profit & Lost including Balance Sheet are main tools for management	1	2	3	4	5
8. Customer Satisfaction index is monitor and normally shared in meetings with employees	1	2	3	4	5
9. To stay competitive, Organization will seek cost improvements through internal processes eg Value Stream Mapping.	1	2	3	4	5
10. Organization will review the Training Need Analysis (TNA) of their workforce on yearly basis to encourage continuous learning	1	2	3	4	5

11. BSC or KPI performance is directly or indirectly affected by availability of inventory.	1	2	3	4	5
12. Lack of inventory will also lower the Customer service level in long run	1	2	3	4	5
Inventory Turns					
13. One of the most important measurements in terms of inventory is the inventory turn. The higher the value, the better is the performance.	1	2	3	4	5
14. Organization will normally set a maximum level of inventory for the different categories	1	2	3	4	5
15. Sales performance largely is depended on the level of inventory	1	2	3	4	5
16. Companies are always looking into alternatives to reduce inventory holding	1	2	3	4	5
17. Most companies are pushing the inventory management to their suppliers eg VMI	1	2	3	4	5
Financial Risk factors					
18. Companies will accrue amount which is equivalent to the risks of inventory holding	1	2	3	4	5
19. Companies will need to pay Air or Express Freight due to backlog in order fulfilment	1	2	3	4	5
20. Stock count variances will need to be adjusted to reflect the correct inventory in the system	1	2	3	4	5
21. Due to Financial risks aspect, Supply Chain Management decision may compromise	1	2	3	4	5
In relation to Inventory & Financial Risks					
22. Supply Chain Management performance is directly or indirectly affected by availability of inventory to fulfil the customer's order.	1	2	3	4	5
23. Inventory is needed for order fulfilment as well as to improve Customer service level	1	2	3	4	5

24. Inventory must always be available to support production and Supply Chains management	1	2	3	4	5
25. The level of inventory and the performance of SCM is affected by risk factor perceived by Financial controller or Accounting manager.	1	2	3	4	5

SECTION C

This section is to suvey the importance of **Inventory Management strategy** in relation to Supply Chain Management performance. Please circle one answer in each line across. *Definition of scale: Strongly disagree. 2. Disagree. 3. Neutral. 4. Agree. 5. Strongly agree*.

Stock holding					
1. All companies have policy on the level of stock to maintain to ensure smooth operations	1	2	3	4	5
2. Companies will have least or optimum level of stock to fulfil customer requirements.	1	2	3	4	5
3. Companies are always looking into ways to reduce their stock holding level eg JIT	1	2	3	4	5
4. It is quite common in companies that storage space is limited	1	2	3	4	5
5. Variances between physical actual inventory and system/ book is common	1	2	3	4	5
Safety Stock					
6. Warehouse will always have safety stock level clearly indicated in their process	1	2	3	4	5
7. Safety Stock is necessary to cover incoming shipment delay	1	2	3	4	5
8. Safety Stock is necessary to cover Quality issuse	1	2	3	4	5
9. Safety Stock is necessary to cover supplier's inability to ship complete per requirements	1	2	3	4	5

Storage Practise					
10. Materials are categories to the type of storage type and condition eg open, close, coldroom and temperature/humidity controlled	1	2	3	4	5
11. FIFO implementation is very important for all warehouses	1	2	3	4	5
12. For temperature sensitive items, not storing at the right requirements will results in scraps	1	2	3	4	5
13. Intergrity of Inventory accuracy between actual physically inventory to the system can be a challenge	1	2	3	4	5
Inventory Risk					
14. Scrapping inventory due to absolescene, shelf life or overstock are possible occurrence	1	2	3	4	5
15. Organization always have materials with shelf-life and need special monitoring	1	2	3	4	5
16. Occurrence of no inventory and affected production and delivery is not unusual	1	2	3	4	5
17. Scrapping materials due to wrong storage condition is not unusual	1	2	3	4	5
18. The difference between the actual physical and the book/system figures can impact P&L	1	2	3	4	5
19. It is quite usual that 60 - 75% of the product cost come from material cost.	1	2	3	4	5

SECTION D

The following statements describe the impact of Financial Risks as moderator in the relation between Inventory Management Strategy and Supply Chain Management performance. Please circle one answer in each line across. *Definition of scale: Strongly disagree. 2. Disagree. 3. Neutral. 4. Agree. 5. Strongly agree.*

1. Effective Supply Chain can ensure high percentage Order Fulfilment with least possible cost	1	2	3	4	5
2. Supply Chain processes maybe compromise if involved financial risk or high investment	1	2	3	4	5
3. Financial decision is normally included in any change of processes in the supply chain	1	2	3	4	5
4. Inventory policy decision eg level of stock normally include advice from Finance Dept	1	2	3	4	5
5. Finance in most cases make decision based on numbers instead of business needs	1	2	3	4	5
6. To scrap items from Store, Finance/ Accounting approval is required	1	2	3	4	5
7. Storage above the usual or targeted level normally create concerns to the Finance	1	2	3	4	5
8. Finance department may rate the inventory risk in terms of aging	1	2	3	4	5
9. Inventory needed to support production and order fulfilment but is influenced by availability of working capital.	1	2	3	4	5
10. Supply Chain performance can be affected with wrong decision from financial aspect.	1	2	3	4	5

THANK YOU