RISK MITIGATION OF OUTSOURCING MANUFACTURING PROCESS: A STUDY ON THE SEMICONDUCTOR MANUFACTURING ORGANIZATIONS IN MALAYSIA

SIVARAMAN RUKUMANGATHA RAJAH

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DEDICATION

I lovingly dedicate this thesis to my dearest wife and beloved children

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First, I would like to thank the god for give me the life, sustenance, strength, and time to achieve my desired goals in life.

I would like to express my gratitude and appreciation to my thesis supervisor, Dr. Rajendran Muthuveloo, for his invaluable guidance, advice, and patience throughout the duration of this research.

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LIST OF ABREVIATION

TC: Technological Capabilities

BCM: Business Continuity Management

CC: Core competency

KM: Knowledge Management

MES: Manufacturing Enterprise System

OC: Organizational Culture

MSC: Multi-tier suppliers’ Chain

SS : Supplier Selection

RBP: Reward based on performance

ICL: Innovation and Continuous Learning

HCD: Human Capital Development

DOMT: Dedicate Outsource Management Team

TD: Training & Development

CCM: Cross Culture Management

RS: Reward System

SD: Supplier Dependency

BCD: Business Continuity Disruption

Q: Quality

LOTK: Leakage of tacit know how

ABSTRAK

Penggunaan perkhidmatan pihak ketiga daripada proses pembuatan semikonduktor menjadi sebahagian daripada strategi korporat sebuah organisasi yang didorong oleh kelebihan kos dan fleksibiliti dalam ketidakpastian. Walaupun manfaat, terdapat risiko dengan perkhidmatan pihak ketiga, iaitu gangguan perniagaan, kualiti dan pelepasan maklumat.

Kajian ini bertujuan untuk mengenal pasti sifat-sifat mengurangkan risiko dan mengkaji hubungan di antara sifat-sifat mengurangkan risiko dan risiko. Dua teori yang berpengaruh, “Transaction Cost economic (TCE)” dan “Resource Based View (RBV)” digunakan dalam kajian ini untuk menentukan motivasi perkhidmatan pihak ketiga, risiko perkhidmatan pihak ketiga, dan sifat-sifat pengurangan. Model “TOP (Technology, Organization, People)” digunakan untuk membentuk rangka kerja teori kajian ini. Pengurangan risiko dicadangkan untuk model ini adalah “Technological Capabilities (TC)”, “Organization Culture (OC)” dan “Human Capital Development (HCD)”.

Data kajian ini dikumpul melalui soal selidik berstruktur diedarkan di kalangan syarikat semikonduktor multinasional sebagai responden dan dianalisis untuk analisis faktor, ujian kebolehpercayaan dan analisis regresi. Hasil kajian ini menunjukkan bahawa sifat-sifat mengurangkan risiko mempunyai pengaruh penting dalam mengurangkan risiko yang dikaji. Kajian ini menyimpulkan bahawa sifat-sifat pengurangan akan dapat mengurangkan risiko penggunaan perkhidmatan pihak ketiga yang disebut. Dengan in organisasi boleh mengoptimumkan faedah kos dan fleksibiliti melalui penggunaan perkhidmatan pihak ketiga.

ABSTRACT

Outsourcing of semiconductor manufacturing process is becoming integral part of the corporate strategy of an organization which is driven by cost advantage and flexibility during uncertainty. Despite the benefit, there are various risk associated with outsourcing namely supplier dependency, business disruption, quality and leakage of know how.

This study aims to identify risk mitigation attributes and examine the relationship between the risk mitigation attributes and risk. Two influential theories, Transaction Cost economic (TCE) and Resource Based View (RBV) is use in this study to determine the outsourcing motivation, risk of outsourcing, and mitigation attributes. The TOP (Technology, Organization, People) model is use to form the theoretical framework of this study. The risk mitigation attributes proposed for this model is Technological Capabilities (TC), Organization Culture (OC) and Human Capital Development (HCD).

Research data was collected via structured questionnaire circulated among multinational semiconductor company being the respondent and analyzed for factor analysis, reliability test and regression analysis. The finding of this study indicates that the risk mitigation attributes has significant influence in mitigating the risks studied. This research concludes that the mitigation attributes will be able to mitigate the mentioned outsourcing risk. As the risk mitigation attribute able to mitigate the risk, organization can optimize the cost benefit and flexibility through outsourcing.

Chapter 1

INTRODUCTION

1.0 Introduction

Outsourcing of semiconductor manufacturing process is becoming an integral part of corporate strategy of an organization. The strategy has been employ by several multinational corporations (MNC's) to be competitive in global business environment and to achieve long haul sustainability. The outsourcing strategy is driven by manufacturing cost and flexibility during uncertainty of market demand. Also, by outsourcing of manufacturing process, the organization can put more focus on core competency, innovation and rapid introduction of new products into market. The final manufacturing of semiconductor process is comprises of assembly and test operation as shown in figure 1.0. In general the final manufacturing will be the key process to outsource to reduce manufacturing cost and gain flexibility with outsourcing.

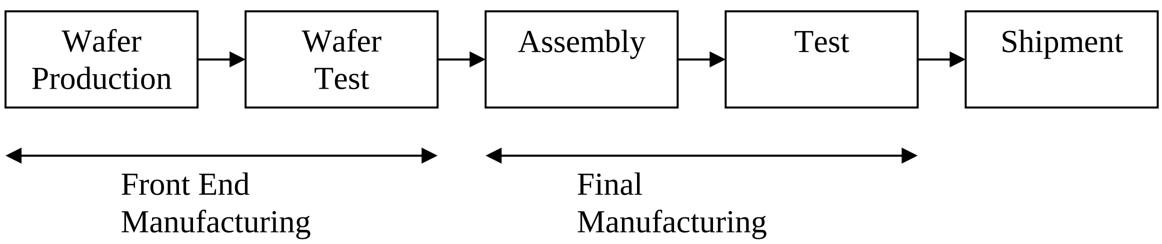

Figure 1.0: Semiconductor manufacturing process overview

The final manufacturing costs are proportionate to five M's that is man, machine, method, material and measure:

- **Man** is the organization employees who manages the manufacturing process that includes planning, execution of operation, lead and drive engineering activities, and accountable for manufacturing issues. Man is also responsible for manufacturing output, yield, quality and cost. The cost for man is varies very much to the experience, talent, and capability to manage the manufacturing operation to achieve the corporation goal (Heizer & Render, 2011).
- **Machine** is the automated equipments that use to carry out the manufacturing process such assembly and testing of the semiconductor components. The choice of equipments and technology has direct influence to the manufacturing throughput and cost of manufacturing. For example if the machine capacity unable to support the production demand then production delivery goal would not met. On other hand when state of art machine is use then cost of manufacturing will increase due to the cost of the equipment is also high. The organization has to balance between the capital investment and capacity requirement (Ron, 2009)
- **Method** is the sequence of manufacturing process flow, system, and production floor layout. This will have direct relation to the lean operation, cycle time, and complexity of the process. Here the cost is a function of the process flow, multiple process flow will cost higher compare to single process flow (Heizer & Render, 2011).
- **Material** is the raw materials that use to produce end products. The selection of material in semiconductor manufacturing industry is an important to ensure the high endurance and reliable of product. The cost of the material subject to the technology and availability of this material (Cavusgil, Knight, & Riesenberger, 2008).

- **Measure** is the systemic approach to gauge the effectiveness and efficiency of a process, and products. The outcome of the measure can be utilized to simplify processes that will eventual lead to a cost reduction (Ron, 2009).

Besides five M’s the other factor that influences the manufacturing cost are manufacturing location and economic of scale. The total manufacturing cost may be derived by summation of the five M’s cost, location cost and economic of scale.

Besides cost, an uncertainty of market demand leads to vertical product differentiation with homogenous consumer. In principle the demand is dictated by consumer need and wants at given time. The supply of an organization will need react to the demand from the consumer by assessing to the available capacity at that time. This mean there will be cases organization may not meet all what consumer wants simply because of capacity limitation. To avoid the unhappiness of their customer, the organization will install more capacity than its requirement to accommodate any surge in demand from consumer. However this is costly investment for the organization to absorb, as the capacity may be fully utilized when there is demand but it will be underutilize when the demand is drop. The fluctuation in demand will affect the manufacturing cost as the capacity is fixed cost and whether there is demand or not the capacity cost become part of manufacturing cost. On the other hand if there is no capacity to accommodate the expected demand from consumer this will give negative perception to the consumer that the organization do not have ability to scale the capacity to meet the demand. If this persists then consumer may look for other alternative supplier who can support the demand and this will pave way for competition.

The other issue with uncertainty of demand is product variety that will ensure the capacity remain utilized when there is drop in demand on one type of product but demand remain on the other type of product. The product variety can help to reduce the manufacturing cost as the available capacity is utilized however the overall profit margin may be affected. The profit will be lower if demand swing to low margin product and idle capacity is utilized for low margin products. The profit of the product is computed by subtracting the average selling price (ASP) with manufacturing cost.

By outsourcing the manufacturing process ideally the organization will have tremendous cost saving and this will pave way to improve profits. It also provides flexibility in capacity to react to the market demand during uncertainty. The organization manpower is the intelligence resource can put more focus on core competency and innovation to remain competitive and sustainable in challenging and competitive business environment.

As described above there are various advantages in outsourcing of manufacturing process, but the question is do the organization materialize the lower cost and flexibility in manufacturing by outsourcing? In principle an organization want to outsource manufacturing process, has to invest in outsourcing company to ensure its product meet the desire quality, yield and target cost. If the product does not meet any of these requirements it can lead to loss of business. This suggests there are risks associated with outsourcing of manufacturing process and if the risk is not mitigated it will be costly for an organization.

Subsequent sections in this chapter will discuss on the risk associate with outsourcing begins with motivation of the study, problem statement, research objective and research questions. Definition of independent and dependant variable will be included to assist the understanding of the research. The significance of the research and overview of subsequent chapters will be provided at then end of this chapter

1.1 Motivation of Study

As mentioned, there is risk associated with outsourcing of manufacturing process. The common risks are product quality, yield, and throughput which are considered as product level manufacturing risks. When product manufactured within organization the mentioned risk is periodically monitor, control and adequate measures taken to ensure quality and timely product ship to customer. It is difficult for organization to monitor and control of product level risks when the product is outsourced (Ron, 2009). According to John (2010) to manage the outsourcing risks the organization has to invest in dedicated supplier management team that will be located at outsource manufacturing location. Besides the product level risk, other risks associated with outsourcing is business continuation disruption, delivery misses, leakage of proprietary information, supplier dependency and opportunism (Santhosh, 2009). Failing to address these risks it will cost the organization loss of business and pave way for more competitors to compete in the same business segment.

Indeed outsourcing will help the Semiconductor Manufacturing Organization in Malaysia to lower the manufacturing cost but the outsourcing risk has to be mitigated properly to leverage the outsourcing advantages. The motivation of this study is to investigate on how to mitigate the outsourcing risks for Semiconductor Organizations in Malaysia to leverage lower cost advantage and flexibility offers by outsourcing and to remain competitive in global business environment and to achieve long haul sustainability.

1.2 Problem Statement

Outsourcing of manufacturing process will reduce the manufacturing cost for an organization however there are various risks associated with outsourcing that potential to tarnish organization reputation and lead to loss of business (Belcourt, 2006). Outsourcing creates supplier dependence, risks of leakage of tacit know how, and loss of knowledge based capabilities (Heide & Weiss, 1995; Stremersh et al. 2003). The consequence of supplier dependence is it increases switching cost which makes it difficult to change supplier (Heide, 1994). Dependence on supplier put intellectual property (IP) in jeopardy as the supplier involvement increases and this threat increases when outsource on global scale due to differences in regulation on IP protection.

The transfer of knowledge is essential to bring up the capabilities of supplier but the risk is leakage of tacit know-how through suppliers to competitors (Dutta & Weiss, 1997). The management of tacit know-how by supplier is questionable as the same facility shared among multiple organizations (Williamson, 1991). Outsourcing leads to quality risk as the quality of product is unpredictable if the quality requirement is not follows by suppliers. Past researchers finding revealed that about 50 percent of the product related quality problem is due to supplier issue (Monczka, et al. 2001).

Business disruption is one of the outsourcing risk that make an organization unable to deliver the customer order due to its supplier do not abide by agreed delivery commitment. The researcher suggests they are four risks associate with business disruption that is supply, demand, operational, and security risks (Manuj & Mentzer, 2008). Outsourcing can help the organization to manage the uncertainty in market demand by getting more capacity allocation from vendor however for some reason if the vendor cannot commit to required capacity it will have great impact to the delivery commitment. This will make the customer to perceive that this organization is not a reliable supplier.

There are several risks associated with outsourcing, some of the risk as highlighted above, as of scope of this research the following risks are considered as key outsourcing risks for this study. These risks are derived from past researches studied on decision of outsourcing and its implication (David A., Nukhet, & Cornelia, 2009; Andrea, & Esteban, 2011):

- Supplier Dependency
- Business Disruption
- Quality
- Leakage of tacit know how

The focus of the study is to assess the implication of above mentioned risks among Semiconductor Organization in Malaysia and identify mitigation attributes to mitigate the mentioned outsourcing risks.

1.3 Research Objectives

As discussed in previous section in this chapter they are various advantages in outsourcing of manufacturing process, namely cost and flexibility during uncertainty of economic. However this advantage will not achieve if risks highlighted in problem statement is not mitigate with risk mitigation attributes. Thus, the research objective of this research is:

1. To determine risk mitigation attributes and elements to mitigate the risk associated with outsourcing of manufacturing process.
2. To test the risk mitigation attributes and elements to identify it's significant in mitigating the outsourcing risks.
3. Formulate the risk mitigation attributes into a model for ease of deployment part of the organization corporate strategy.

1.4 Research Questions

To achieve the research objective, this study tries to answer the following research questions:

(1) What is the relationship between risk mitigation attributes over outsourcing risks?

(2) What is the relationship between risk mitigation elements and outsourcing risks?

(3) How does the risk mitigation model can mitigate the outsourcing risks?

(4) What are possible risks that may be encountered by outsourcing of manufacturing process?

1.5 Definition of Key Terms

1.5.1 Outsourcing

Outsourcing is defined as shifting a transaction that previously managed internally to an external supplier (Lacity & Hirschheim, 1993b; Barthe´lemy, 2001).

1.5.2 Outsourcing Risk

Risk associated with outsourcing includes loss of control, quality issue, supplier lack of competency that will lead to loss of business and tarnished reputation of organization (Bertrand, & Francois, 2003)

1.5.3 Risk Mitigation

Risk Mitigation is a systemic approach to alleviate from potential risk that is associated with corporate direction that leads to adverse effect to the organization, one of example of corporate direction is business outsourcing (Andreas, Ulf, 2004).

1.5.4 Supplier Dependency

Supplier dependency is referring to organization that depended to one supplier and no alternative supply source for its business continuation when the supplier halts operation (Quaelin, & Duhamel, 2003).

1.5.5 Business Disruption

Business disruption is inability to resume business when the supply chain is disrupted (Ila, John T, 2008).

1.5.6 Quality

Quality refers to product that meets the customer requirement in the form functionality, quality and reliability (Jason, Terry, 2004; Burt et al, 2003).

1.5.7 Leakage of Tacit Know how

Transfer of internal know how to external supplier in order to enable the capability of external supplier (David, Nukhet, et al, 2009).

1.5.8 Technological Capabilities

Technological capabilities are the organizational core competency or strength to manage and administer the organization transaction (Andrea, Esteban, 2011).

1.5.9 Organization Culture

Organization culture refers the organizational management style, culture, performance based, result orientated and accountability (B.Kayis, M.Zhou, et al, 2006).

1.5.10 Human Capital Development

Human capital development is process of identify, train, and develop talents to be responsible and accountable in a given task either as individual contributor or management (Rajendran, Ganesan, 2011).

1.6 Significant of the Study

The chosen research topic is important subject for organization who has plan to outsource their manufacturing process or for organization already engages in outsourcing of manufacturing process. The significance of the study from this research will help organization to identify the key area focus to mitigate the risk in outsourcing which will allow them benefited from low cost advantage and capacity flexibility. Organization with structured risk mitigation plan can lower their business and cost risk associated with outsourcing. In another word it is costly for an organization to repair their tarnished image and pay for quality issue at their end customer.

As of Malaysia's manufacturing context of point, as per mentioned in the 10^{th} Malaysia plan, Malaysia is gearing to become high income earning nation. To achieve this, Malaysia organization have to transform from manufacturing centric to service centric. This mean an organization with manufacturing operation have to find alternative partners or supplier to manufacture their product in order to remain competitive and emphasis focus on core competency development and innovation to scale to achieve leap growth. This also will attract more new fables company to open their offshore management office in Malaysia since it has vast experience in managing manufacturing operation.

1.7 Chapter Organization

The organization of remaining chapter in the thesis is organized into five chapters. The first chapter provides the background of the research, objective and it's significant. Chapter two will cover the literature review related to the research problem statement, research objective and underlying theories. Chapter three will define the methodology, instrument design, theoretical framework, sample collection and unit of analysis. Chapter four shows the analysis of the result and findings. Chapter five discuss the result and finding presented in chapter four, review the implication of the findings, limitation of the study, future recommendation and conclusion of the research.

Chapter 2

LITERATURE REVIEW

2.0 Introduction

This chapter discusses past literature review related to this research problem and research objective. Research problem discussion will be focuses on risk of outsourcing and research objective focuses on risk mitigation attributes. In addition, two influential underlying theories for outsourcing will be presented and describe the relation to the research topic. The theories are transaction cost economics (TCE) and resource based view (RBV). According to Williamson (1985) the TCE and RBV theory contribution is significant for understanding of outsourcing strategy, and the same view articulate by Stump and Heide (1996) stating that both TCE and RBV enlighten the effectiveness and efficiency in organization relationship. The theoretical framework of this research and hypothesis development will be presented at end of this chapter.

2.1 Transaction Cost Economics (TCE)

TCE stated that internal economic exchange has to be manage within organization and external economic exchange has to be manage by external vendor or outsourcing. As such the organization investment determination should depend to whether the economic exchange is managed internally within organization or not (Nicola, Marco, 2007). Transaction characteristic will determine the efficient governance structure such as market, hierarchy or partnership. The key factors can lead to transactional difficulties are bounded rationality, opportunism, small numbers bargaining, and information impactedness (Ronan, 2008).

- **Bonded Rationality** refers to the cognitive limitations of the human mind, this limitation cause's difficulty in understanding the rationale of the decisions.
- **Opportunism** refers to decision makers give emphasis to their own interest and unfairness when make decision.
- **Small numbers bargaining** refers to buyer alternative source of supply to meet its requirement.
- **Information impactedness** refers to presence of subject matter information between supplier and buyer, and one of the parties may be more knowledgeable.

The mentioned transactional difficulties and cost associated to it will increases when these transactions characterized by asset specificity, uncertainty and infrequency.

The asset specificity is referring to level of customization that associated with the transaction. If asset-specific is high, the investments costs have little or no value beyond the transaction (Ronan, 2008). The asset specificity can be in the form of physical asset (product or service customization), human asset (knowledge worker) or site (location). TCE has potential for opportunistic behavior when an exchange requires either party to make investment. As such investments create quasi-rents that are subject to hold-up problem (Klein et al., 1978). If asset specificity and uncertainty is low and transaction frequency is high, the transaction will be governed by markets. In contrast when uncertainty and asset specificity is high it will lead to transactions difficulties, as such the transaction need hierarchical governance as it's costly to redeploy specific assets from alternative supply chain. However various studies investigated the influence of the asset specificity on firm boundaries and supported that high asset specificity will leads to hierarchical governance (Rindfleisch & Heide, 1997). In which, this kind of transaction potential to create supplier dependency risks and business disruption risks. A conner (1991) critique about TCE is that TCE emphasizes on the firm existence to reduce the opportunistic potential that arises with asset-specific investment and argued that TCE viewed the firm as prevention mechanism of unfavorable opportunism.

2.2 Resource Based View (RBV)

Resource Based View (RBV) defined that the firm is unique bundle of assets and resources. If the theory is employ can create competitive advantage according to (Peteraf, 1993). The criteria for resources to create competitive advantage include value, scarcity, imitability and organization. According to (Conner, 1991; Barney, 1991), resources and capabilities are valuable if they were utilized it to develop opportunities and counter threat in the business environment. Rarity is referring to potential number of competitors possess valuable resource is low and then it is unlikely to be a source of competitive advantage. The imitability is referring to the easiness of competitors to replicate a valuable and rare resource possessed by an organization. The outcome of the analysis is to determine the sustainability of the competitive advantage in the resource. Argument by Barney (1991) cited in (Ronan, 2008), an organization must have the capacity to make use of its resources and capabilities. An organization standard includes a number of elements, the reporting structure, management control systems and compensation policies.

RBV is an important to the study of outsourcing, as better-quality performance achieved in organizational activities relative to competitors who performed activities internally. One of the main concerns with RBV is how an organization's capabilities can be develop that effect its competitive position and performance. Langlois and Robertson, 1995 argument cited by (Ronan, 2008) that firm boundaries can be determined by comparing internal capabilities with competitor capabilities. Hence, outsourcing decision is influence by organization capability to invest in technological capability development, and sustaining a better-quality performance position in relative to competitors. The activity do not require resources and capabilities internally, this activity should be target candidate for outsource. In addition organizations can access complementary capabilities from external providers where they can gain no advantage from performing such activities internally. The main focuses of RBV are organization competitive advantage, and production skills that will influence the outsourcing decision. Organization plan to outsource their processes to gain advantage of cost, service and quality, has to develop internal capabilities to effectively manage the outsourcing vendors to ensure minimize outsourcing risks.

2.3 Outsourcing

Outsourcing is defined as shifting a transaction that previously managed internally to an external supplier. This involves transfer of staff to the vendor (Lacity & Hirschheim, 1993; Barthe'lemy, 2001). Outsourcing considered as strategy to reduce costs, however it only be achieve in specific conditions, such as external supplier must have access to economies of scale, and experience in managing the manufacturing efficiently than the outsourcer. This definition is also supported by

(Friedman, 2006) indicates that that collaboration and outsourcing is well accepted business model by various business segments as it can reduce the operating cost for organization. The motivation of outsourcing is driven by cost reduction, however at present the motivation also driven by flexibility in technology selection, reduce in professional staffing issue and can increase focus on core competency development and strengthening (Chou, et al 2010).

The outsourcing strategy has been employ by various MNC's that focuses on manufacturing, information technology (IT) and business process outsourcing (BPO). The main reason for this organization to outsource some of its process is because these processes are structured tasks and also non-core business activities. The drivers for rapid outsourcing initiative include (Chou, et al 2010):

- Cost pressure on U.S. and European MNC's
- Cost decline on communication and computing
- Internet reliability and contents improvement
- Outsourcing vendors with better capabilities at competitive cost.
- Access to low-cost high-quality employees, especially for labor-intensive tasks.
- Outsourcing business model that been proven by successful pioneers such as GE and American Express.

Organization employs outsourcing is to achieve operational effectiveness, and the scope of outsourcing is not limited to certain function but various functions and activities that can substantially add value for organization. This is referred as strategic outsourcing which introduced by Quinn and Hilmer (1994). However to be considered as strategic outsourcing, the outsource process must have unique characteristic of specific organization in industry, otherwise the outsourcing advantage would no longer valid as most organization will converge the same business model (Porter, 1996).

Based on past literatures various researches stated that the motive of outsourcing are operation cost reduction (Lacity & Hirschheim, 1993), focus on core competencies (Quinn and Hilmer, 1994), capital investment reduction (Kakabadse, 2002), leverage on external competencies (McFarlan & Nolan, 1995), and fixed cost conversion variable cost (Alexander & Young, 1996). To be successful in outsourcing, the organization first need to identify which business processes can be outsource to leverage on the competency and specialization available at outsourcing vendors and this platform also can be use improve the competency of internal resources (Alexander & Young, 1996).

2.4 Outsourcing Risk

Past researches indicated that risk associated with outsourcing is high and it can be costly price for an organization if it is not identify and rectify. There is evidence showing that outsourcing involves high risk such as loss of competencies and lead to costly failure (Santhosh, 2009). This mainly due to inadequate effort put to apprehend the consequences of outsourcing and the cost is high to reverse the outsourcing decision. In some cases it could take an average of eight to nine month to select, qualify, and approve new vendors. The key challenge of outsourcing is how to manage the short term cost saving while keep in view of long run perspectives for competencies and reputable suppliers, which related to quality of service (Quaelin, & Duhamel, 2003). In nutshell, outsourcing means a loss of direct control over quality, timing and service provision.

Quaelin, and Duhamel (2003) analyses the outsourcing risk in two step first by ranking the importance of the various decision criteria of outsourcing and second by classification of the main decision criteria. Quelin (2003) adopted the definition from Aubert (1998) to define the outsourcing risks as negatives consequences for organization. The key risks analyzed by Quaelin (2003) are risk of dependence on supplier, supplier deficient capabilities and Loss of know how. The risk of dependence express the organization fear not having alternative supply chain when supplier fail to deliver the commitment and the risk of not able to control the quality of its product. The risk of supplier deficient capabilities expresses that supplier insufficient knowledge and resource to manage the product effectively.

Jason and Terry (2004), argued that quality issue becoming major concern when outsourcing since the quality is unpredictable. Based on (Manuj & Mentzer, 2008) business disruption is highlighted as one of the outsourcing risk that created delivery issue for organization. Based on outsourcing risks highlighted by past researches above, for the scope of this study the following risks identified as key problem of outsourcing:

- Supplier Dependency
- Quality
- Leakage of Know How
- Business Disruption

2.4.1 Supplier Dependency

Supplier dependency is related to an organization that is too dependant to supplier to manage its manufacturing operation and there is no alternate supply source for its operation when there is disruption in supply.

According to (Alexander & Young 2003), the risk with supplier dependency is it will cause disruption to business continuity if the organization do not have alternative supply source to continue its business operation. One of the issues related to this risk is supplier fails to deliver the expected service in timely fashioned and organization incapable of monitor the quality of the product or service. As there is no alternate supply source it obviously difficult to switch vendor or to do it internally (Quaelin, & Duhamel, 2003). The implication with this risk is in long run the organization takes risk of no longer possessing required know-how to manage, analyze and control the suppliers to ensure there is no business disruption.

The other risk is the supplier capabilities to ensure sustainability during financial crisis, 'an absence of internationalization' and lack of knowledge of client activities. These risks clearly reflect the supplier financial strength, its international collaboration and its historical experience. Outsourcing generally is subject to long term agreement which is not possible to evaluate all future contingencies, supplier capability and capacity to adapt to the organization requirement both geographically and technically (Aubert et al., 1998).

2.4.2 Quality

The cost is high for an organization if the quality is compromise or unable to control to manage the quality. The quality risk become major concern as quality of product is unpredictable if the quality measure is not follows by suppliers. Quality of the material purchased is vital to the success of most manufacturers, past researchers finding revealed that about 50 percent of the product related quality problem is due to supplier issue (Crosby, 1984).

As more organization increases the use of outsourcing so they focus on their core competency internally, the need to ensure the quality throughout the supply chain of supplier is becoming very crucial as described by Modarress et al., (1999) in their research cited by (Jason, Terry, 2004). To ensure the supplier meet the desire quality requirement, organization is working closely with their key suppliers to help them enhance their quality control, and capability. The same quality concern was raised by (Quaelin, & Duhamel, 2003), stating that the problem with outsourcing is how to manage short term cost savings and long term perspective of competencies and reputable supplier, both are linked to quality of the service.

Quality improvement training and supplier certification program can help the supplier to be aware of the quality requirement and responsible for the quality of the products they manufactures. The requirement from organization is the supplier has to build the quality mindset throughout the supply chain and adheres to the quality requirement at all time (Modarress et al., 1999).

2.4.3 Leakage of Tacit know how

Outsourcing of manufacturing process to a supplier requires to transfer internal know how in order to develop the capability of supplier in short period of time to begin the operation. The consequence of this transfer is the risk of leakage of tacit know-how and loss of knowledge based capabilities (David, Nukhet, et al, 2009; Stremersch et al., 2003). This suggests there is no controls over the transfer of tacit know how as this may expose to competitor through the supplier since the supplier will support more than one customer in at a time.

Intellectual proprietary (IP) is in jeopardy when an organization decides to outsource manufacturing of their flagship product at supplier sites. This threat is becoming worries when collaborating on a global level due to different IP protection across markets, cultural distance, and geographical. This main cause of this risk is the inability of an organization to select, negotiate and monitor the behavior of their suppliers (Andrea & Esteban, 2011) or to effectively transfer the required know-how.

2.4.4 Business Disruption

Business disruption is inability to resume business when the supply chain is disrupted. This risk is closely link with supplier dependency where when an organization is too depended on supplier on its manufacturing execution, it will be difficult for the organization to get supply if the supplier do not meet the delivery commitment.

Researcher suggests four categories of risks for business disruption that is supply, demand, operational, and security risks (Manuj and Mentzer, 2008):

- Supply risk is the disruption of supplies that affects the ability of the focal organization to meets its end customer demand (quantity and quality).
- Operations risk is the disruption of supply chain that affects focal organization ability to produce supplies, ensure quality and meet the delivery target.
- Demand risk is the incapability of the supplier to support the demand variance in volume that committed by focal organization.
- Security risk is an outcome related to adverse events that threaten human resources, operations integrity, and information systems.

2.5 Risk Mitigation of Outsourcing

Risk Mitigation is a systemic approach to alleviate from potential risk that is associated with corporate direction that leads to adverse effect to the organization, one of example of corporate direction is business outsourcing. The mitigation is regarded as proactive measure that is employ to identify risk, risk assessment, risk treatment and risk monitoring (Andreas, Ulf, 2004). In this article, the finding suggests that whenever corporate make a decision to outsource any part of its supply chain, a focus team have to form to identify the potential risk of outsourcing the business. Upon identification of the risk it, risk assessment have to carry out to understand the impact to the organization. Based on the risk assessment outcome, prevention action has to implement to mitigate the risk and finally the implemented action need to monitor to ensure its effectiveness.

There are various studies have been conducted to mitigate risk that associated with outsourcing. The need for the risk mitigation is become important because is unavoidable for an organization for not outsource their manufacturing process. Organization adopts outsourcing strategy is to leverage on the cost reduction and flexibility benefits. By do so it will allow the organization to focus on development of its core competency.

Based on RBV, TCE theories and past literatures findings above, among the key factors in risk mitigation are technology capabilities, organization culture, and human resource development. This factors plays vital role in mitigate the risk of outsourcing. Subsequent section will discusses the previous research finding on these key factors.

2.5.1 Technological Capabilities

Technological capabilities play an important role in mitigates the risk of outsourcing as per the finding by (Andrea, Esteban, 2011). The emerging literature also acknowledges the role of organization capabilities and contractual hazards in governance decisions (Mayer & Salomon, 2006). It is expected that organization with accumulation of technological capabilities will able to expand its capability to administer transactions. According to Berry (2006), each organization has different abilities to absorb and transfer knowledge, and these skills will help them to select the right supplier for outsourcing of manufacturing process. The hypothesis of technological capabilities (Berry, 2006):

Hypothesis 1: As firm's technological resources and capabilities increase, its propensity to outsource R&D services also increases.