

FACTORS AFFECTING SUPPLIER PERFORMANCE THROUGH THE BUYER-SUPPLIER  
COMMITMENT

Miss WarapornTungjitjarum

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บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)  
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ปัจจัยที่ส่งผลกระทบต่อผลการดำเนินงานของผู้ส่งมอบผ่านข้อมูลที่มีระหว่างผู้ซื้อ-ผู้ส่งมอบ

นางสาววราภรณ์ ตั้งจิตระเจิญ

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต

สาขาวิชาการจัดการด้านโลจิสติกส์

บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย

ปีการศึกษา 2555

ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย



วารสารณ์ ดั่งจิตจรเจริญ: ปัจจัยที่ส่งผลกระทบต่อผลการดำเนินงานของผู้ส่งมอบผ่านข้อผูกมัดระหว่างผู้ซื้อ-ผู้ส่งมอบ. (FACTORS AFFECTING SUPPLIER PERFORMANCE THROUGH THE BUYER-SUPPLIER COMMITMENT) อ. ที่ปรึกษาวิทยานิพนธ์หลัก : ศ. ดร.กมลชนก สุทธิวาทณฤพุมิ, อ. ที่ปรึกษาวิทยานิพนธ์ร่วม : รศ. ดร.พงศา พรชัยวิเศษกุล 141 หน้า.

วัตถุประสงค์ของการศึกษางานวิจัยในครั้งนี้ เพื่อต้องการทดสอบบทบาทของข้อผูกมัดระหว่างผู้ซื้อ-ผู้ส่งมอบในการปรับปรุงผลการดำเนินงานของผู้ส่งมอบ การศึกษาครั้งนี้นำเสนอข้อผูกมัดระหว่างผู้ซื้อ-ผู้ส่งมอบ โดยใช้พื้นฐานแนวคิดจาก 2 มุมมอง คือ ความสัมพันธ์ระหว่างผู้ซื้อ-ผู้ส่งมอบ และ การลงทุนแบบเฉพาะเจาะจง งานวิจัยครั้งนี้ใช้วิธีการเก็บข้อมูลแบบสอบถาม สำหรับผู้ผลิตเครื่องใช้ไฟฟ้าและชิ้นส่วนในประเทศไทย และทดสอบความสัมพันธ์โดยใช้ตัวแบบสมการโครงสร้าง การศึกษาในครั้งนี้ยังได้นำเสนอแบบจำลองซึ่งประกอบไปด้วยสองตัวกลาง นั่นคือ ข้อผูกมัดระหว่างผู้ซื้อ-ผู้ส่งมอบ และ การพัฒนาผู้ส่งมอบ

ผลลัพธ์ของงานวิจัยพบว่า การคัดเลือกผู้ส่งมอบส่งผลกระทบต่อการพัฒนาผู้ส่งมอบ การพัฒนาผู้ส่งมอบส่งผลกระทบต่อผลการปรับปรุงผลการดำเนินงานของผู้ส่งมอบ การพัฒนาผู้ส่งมอบส่งผลกระทบต่อข้อผูกมัดระหว่างผู้ซื้อ-ผู้ส่งมอบ และข้อผูกมัดระหว่างผู้ซื้อ-ผู้ส่งมอบส่งผลกระทบต่อผลการปรับปรุงผลการดำเนินงานของผู้ส่งมอบ อย่างไรก็ตาม ผลการศึกษาพบว่า การคัดเลือกผู้ส่งมอบไม่ส่งผลกระทบต่อผลการปรับปรุงผลการดำเนินงานของผู้ส่งมอบ และ ข้อผูกมัดระหว่างผู้ซื้อ-ผู้ส่งมอบ นอกจากนั้นข้อผูกมัดระหว่างผู้ซื้อ-ผู้ส่งมอบไม่ได้มีบทบาทในการเป็นตัวกลางส่งผ่าน จากการคัดเลือกผู้ส่งมอบไปสู่การปรับปรุงผลการดำเนินงานของผู้ส่งมอบ แต่การพัฒนาผู้ส่งมอบกลับมีบทบาทสำคัญในการเป็นตัวกลางส่งผ่านอย่างเต็มรูปแบบ จากการคัดเลือกผู้ส่งมอบไปสู่การปรับปรุงผลการดำเนินงานของผู้ส่งมอบ

ผลลัพธ์ของการวิเคราะห์องค์ประกอบสนับสนุนแนวคิดในการพัฒนาข้อผูกมัดระหว่างผู้ซื้อ-ผู้ส่งมอบ ซึ่งมีพื้นฐานจาก 2 องค์ประกอบหลัก คือ ความสัมพันธ์ระหว่างผู้ซื้อ-ผู้ส่งมอบ และ การลงทุนแบบเฉพาะเจาะจง และที่สำคัญยังพบว่า ความสัมพันธ์ระหว่างผู้ซื้อ-ผู้ส่งมอบ เป็นองค์ประกอบที่มีความสำคัญมากกว่าองค์ประกอบด้านการลงทุนแบบเฉพาะเจาะจง ในการยกระดับข้อผูกมัดระหว่างผู้ซื้อ-ผู้ส่งมอบ

สาขาวิชา: การจัดการด้านโลจิสติกส์.....ลายมือชื่อนิสิต.....

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ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม.....

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KEYWORDS : SUPPLIER SELECTION / SUPPLIER DEVELOPMENT / BUYER-SUPPLIER

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WARAPORN TUNGJITJARURN : FACTORS AFFECTING SUPPLIER PERFORMANCE THROUGH THE BUYER-SUPPLIER COMMITMENT. ADVISOR : PROF. KAMONCHANOK SUTHIWARTNARUEPUT, Ph.D., CO-ADVISOR : ASSOC. PROF. PONGSA PORNCHAIWISSESKUL, Ph.D., 141 pp.

The objective of this research is to examine the role of buyer-supplier commitment in supplier performance improvement. This study proposed the buyer-supplier commitment based on the two dimensions of buyer-supplier relationships and transaction-specific investment that should exist between buyer and supplier. The research uses survey data obtained on electrical products and components manufacturers in Thailand and testing the relationships with Structural Equation Modeling. This study proposes a model which combines the two mediators; buyer-supplier commitment and supplier development.

The results of study reveal that supplier selection has a positive impact to supplier development, supplier development positively impacts to supplier performance improvements, supplier development has a positive impact to buyer-supplier commitment and buyer-supplier commitment positively impacts to supplier performance improvements. However, the study found that supplier selection does not positively impact to supplier performance improvements and buyer-supplier commitment. Furthermore, buyer-supplier commitment does not act as a mediator from supplier selection to supplier performance improvements. Instead, supplier development fully mediates the impact of supplier selection on supplier performance improvements.

The result of factor analysis supports that buyer-supplier commitment was based on two key elements; buyer-supplier relationship and transaction-specific investment. Specifically, we found that buyer-supplier relationship is more crucial than transaction-specific investment to enhance the level of commitment between firms.

Field of Study : Logistics Management ..... Student's Signature.....

Academic Year : 2012 ..... Advisor's Signature.....

Co-advisor's Signature.....

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## Chapter I

### Introduction

#### 1.1 Rationale

In the highly competitive business environment, companies place greater reliance on their supply chain as a source of competitive advantage. Thus, purchasing and supply management has achieved a higher level of importance, with a greater dependence on suppliers (Kannan and Tan, 2002). Suppliers play strategic roles in organizations and are significantly engaged in creating competitive advantage with their actions having a positive impact on the organization's performance (Jabbour and Jabbour, 2009). Many companies face the problem of the supplier's inability to improve themselves (Krause et al, 2000). However, a number of studies have suggested strategies to improve supplier performance. Raising the rate of supplier performance expectations, worldwide sourcing strategy, early supplier design involvement, supplier performance improvement rewards and direct supplier development are all suggested to improve supplier performance (Monczka et al, 1993). It is essential for firms to utilize supplier management as concerns their suppliers as classified into three dimensions: effective supplier selection; innovative supplier development strategies; and meaningful supplier performance assessment mechanisms (Kannan and Tan, 2002). Supplier selection is an important task in purchasing management (Braglia and Petroni, 2000). Previous studies found that one of the key successes to maintain supplier performance comes from the supplier's need to be selected under the high quality criteria (Vonderembse and Tracey, 1999; Katsikeas, et al., 2004; Park and Chang, 2010; Prahinski and Benton, 2004). Supplier selection is an important strategy which can help a firm to screen incapable suppliers in order to meet customer requirements. With capable suppliers, firms can compete in a dynamic environment. Potential suppliers can offer a variety of supply options in terms of cost, quality and responsiveness. This is an important strategy in creating competitive advantage among competitors (Moser, 2006). Another important area of supplier management is supplier development. Krause and Ellram (1997b) defined *"supplier development as any effort of a buying firm with its supplier to increase the performance and/or capabilities of the supplier and meet*

*buying firm's supply needs*". Supplier development strategies include creating competitive environments among suppliers, supplier assessment, feedback communication, supplier certification programs, promised current and future benefits, site visits and training programs (Krause, 1997). Buying firms are involved in supplier development programs in order to help the firm meet the company's objectives (Krause and Ellram, 1997a). Several studies have supported supplier development strategies as having a positive effect on buyer and supplier performance improvements (Monzcka et al, 1993; Humphreys et al, 2004; Wagner 2006a; Modi and Mabert, 2007). Therefore, both supplier selection and supplier development are critical to encourage supplier performance.

Additionally, commitment is an important factor between members in the supply chain (Kwon and Suh, 2004; Xiao et al, 2010). Relationship commitment plays a significant role in positively impacting co-operative performance in the supply chain (Xiao et al, 2010). Much research on marketing and the supply chain has measured commitment in terms of continuance commitment, affective commitment, normative commitment and behavioral commitment (Kim and Frazier, 1997; Wu et al, 2004; Chung and Rowlinson, 2011; Salam, 2011). Based on the previous work, it was found that buyer-supplier relationship and transaction-specific investment are key elements of buyer-supplier commitment. Buyer-supplier relationship is an important factor and the buying firm needs to be closely involved with the supplier when the company implements supplier development strategies (Krause and Ellram, 1997a). Buyer-supplier relationship also positively impacts firm performance (Kannan and Tan, 2006; Li et al, 2007; Carr and Pearson, 1999). Morgan and Hunt (1994) defined "*relationship commitment as an exchange partner believing that an ongoing relationship with one another is so important as to warrant the maximum effort to maintain it*". Subsequently, buyer-supplier relationship is a key element of buyer-supplier commitment. In some research, commitment was based on transaction-specific investment (Williamson, 1985). The buying firm was directly involved in human and capital resources to improve their supplier performance (Li et al, 2007). Significant investment in equipment, internal



adjustments to specific suppliers, on-site consultation, education and training programs and temporary personnel transfers were activities undertaken to develop key suppliers (Rokkan et al, 2003; Wagner, 2006b). Previous studies indicated that buyer-supplier commitment significantly contributed to buyer-supplier performance (Krause et al, 2000; Li et al, 2007; Humphreys et al, 2004; Kannan and Tan, 2006). However, there has been little research which has tested the role of buyer-supplier commitment that is critical to the interface between a firm and its suppliers for the context of supplier selection and supplier development. Therefore, the objective of this study is to examine the role of buyer-supplier commitment based on the buyer-supplier relationship and transaction-specific investment.

## **1.2 Research Objectives**

To investigate the role of buyer-supplier commitment in supplier performance improvements.

## **1.3 Scope of the Study**

This study focuses on the electrical products and components industry in Thailand.

## **1.4 Research Methodology**

A total of 800 surveys were sent by mail and email with a hyperlink to the online questionnaire starting from October, 2011. Finally, a reminder email was sent to non-respondents three weeks after the initial email with the rest of non-respondents being contacted by telephone during Jan – Mar, 2012.

## **1.5 Expected contributions**

This study develops the structural model for improving supplier performance. The results of this study will be useful for the academic, researcher, practitioner or people who interested in this model as an alternative approach to improve supplier

performance focusing on buyer-supplier commitment as an enabler in achieving significant performance improvement. In addition, this model provides a theoretical understanding of the relationship between buyer and supplier in working together according to three main aspects: buyer-supplier commitment, supplier development, and supplier selection.

## **1.6 Terminology and Definition**

Below is the terminology and definition used in this study.

1.6.1 “Buyer-supplier commitment” as a long-term relationship between the buying firm and the supplier in engaging their human or capital resources to enhance mutual business development.

1.6.2 “Buyer-supplier relationship” as a long-term relationship between buyer and supplier is related to the willingness of both parties to sacrifice their resources and time to retain the valuable relationship.

1.6.3 “Supplier development” as involving activities undertaken by buying firms to increase a supplier’s performance and capabilities to meet the firm’s short and long-term needs.

1.6.4 “Supplier selection” as a strategy to select a potential supplier who is capable of providing products and services that meet the firm’s requirements.

1.6.5 “Transaction-specific investment” as a buyer’s direct investment in human and physical asset specificity.

## Chapter II

### Literature Review

The objective of this chapter is to study the factors affecting supplier performance including the relationships among supplier selection, supplier development, buyer-supplier commitment and supplier performance. The literature review is provided as follows:

#### 2.1 Supplier Selection

As a supplier becomes a critical member in the supply chain, the firm must select suppliers that it can do business with over a long period. The available literature on supplier selection in purchasing and supply literature is substantial (Krause et al., 2001). Supplier selection is an important task of purchasing management (Braglia and Petroni, 2000). It adds value to a firm's output and direct contributions often impact the firm's profitability via the supplier selection process (Chao, et al, 1993). Choy and Lee (2002) also indicated that one of the critical activities in supply chain management is continuously tracking the performance of suppliers and building an effective supplier selection system. Supplier selection is important in reducing uncertainties and avoiding the consequences of non-performance upstream and downstream, such as delivery performance and production cost as well as uncertainties in terms of product mix and price (Ndubisi et al, 2005). Within a dynamic environment and globalization, cost reduction is crucial (Wu, 2008). Thus, selecting suppliers is increasingly important. To satisfy and meet the customer requirements, supplier selection is needed for the buying firm. The supplier screening process helps the buyer to reduce the risk of nonconforming performance such as late delivery or non-delivery. The screening work also ensures that supplier is responsive and responsible for daily business interactions

(Beil, 2010). Thus, a good supplier can help manufacturers to improve quality, cost and delivery performance (Goffin, 1997)

Therefore, it is important to identify the selection criteria relevant to management decision making. Supplier selection is essential in improving supply chain effectiveness and efficiency (Kumara et al., 2003). Over recent years, supplier selection has been researched extensively. Based on previous literature, supplier selection is defined as follows:

Beil (2010) defined *“supplier selection as the process by which the buyer identifies, evaluates, and enters contracts with suppliers”*.

Moser (2006) defined *“supplier selection as a part of supplier management and that which includes all activities necessary to select a specific supplier for basic materials, products or services on a long-term or short-term basis based on the supplier’s perspective capabilities and offerings in order to generate competitive advantages”*.

According to APICS (2009), *“supplier selection process is based on the definition of the user’s requirements for a material with a minimum a specification”*.

Ndubisi et al (2005) defined *“supplier selection strategy as the strategy adopted by the manufacturer to evaluate and select suppliers that fulfill the requirements of the manufacturer”*.

Based on the above definitions and past literature, this study defines *“supplier selection as a strategy to select a potential supplier who is capable of providing products and services that meet the firm’s requirements”*.

The literature on supplier selection in this research includes that on both selection techniques and the relative importance of selection criterion (Krause et al., 2001). The first category focuses on the basis of a set of criteria such as mathematical programming, data envelopment analysis, artificial intelligence models, statistic models,

total cost of ownership, and analytic hierarchy process (Micheli, G. et al.,2008).The study by Ho, W. et al. (2010) reviewed the multi-criteria decision making approach for supplier evaluation and selection from 2000–2008 comprising numerous individual approaches (*data envelopment analysis: DEA, mathematical programming, analytic hierarchy process: AHP, case-based reasoning, analytic network process, fuzzy set theory, simple multi-attribute rating technique and genetic algorithm*) and integrated approaches (*integrated AHP and DEA, integrated fuzzy and AHP, integrated AHP, DEA, artificial neural network and so on*) proposed to solve the problem of supplier selection. This research also found that the most prevalent individual approach employed by previous research was that of DEA, whereas the most popular integrated approach used was AHP-GP. Moreover, the most popular criteria used for the evaluation performance of suppliers was product quality, followed by delivery, price or cost, and others.

For the second category, extensive research has addressed the importance of each criterion. The criteria used for supplier selection impacts the buying firm's performance (Kannan and Tan, 2003). According to Dickson, (1966) cited in Choy and Lee (2002), there are 23 factors in awarding contracts to suppliers. He came up with the conclusion that the three most important criteria include quality, delivery, and performance (Ha and Krishnan, 2008). In addition, Droge et al (1991) demonstrated that those criteria most frequently used in supplier evaluation criteria by retailers are price and on-time delivery. Chao et al. (1993) studied the relative importance of selection criteria by purchasing organizations in China according to six aspects of supplier performance: reliable deliveries, product quality, price, professionalism of salesperson, service/responsiveness to customer's needs, and buyer-seller relationship. The result showed that Chinese purchasing managers viewed the most important factors to be

quality, price and delivery reliability. Ellram and Pearson (1993) conducted a survey of supplier selection and evaluation in the electronics industry and they found that quality and cost were the top two criteria for both supplier selection and evaluation (Chao et al, 1993). Vonderembse and Tracey (1999) suggested that managers should give an emphasis on a set of supplier selection criteria in multiple dimensions comprising product quality, product performance, and delivery reliability. Kannan and Tan (2002) conducted a survey on raw material and component manufacturers in the United States with the results revealing that due date performance and quality considered as the most significant selection criteria. Katsikeas et al. (2004) view categorized supplier evaluation attributes into the four key aspects of competitive pricing, reliability, technological capability, and service. They found that supplier reliability was the most highly rated by the participating distributor firms while also asserting that the key to supplier success came from attaining and retaining the desirable performance in the four aspects of attributes they identified. Therefore, this study focuses on the relative importance of selection criterion. Based on past literature, various criteria are considered as illustrated in Table 2.1

Sakar and Mohapatra (2006) put forward two main categories of the supplier's abilities: **performance** and **capability**.

**2.1.1 Performance** is defined "*as the demonstrated ability of a supplier to meet a buyer's short-term requirements in terms of cost, quality, service and other short-term criteria*". Various criteria are classified as performance factors such as price and cost, quality/reliability of the product, delivery lead time, after sales support and so on. The five factors of performance attributes are described below:

Table 2.1 Summary of criteria used in supplier selection from past literature

Supplier selection criteria	Used by
Price and cost	Droge et al (1991) ,Chao et al., (1993) , Ellram and Pearson (1993) , Krause et al (2001), Katsikeas, et al. (2004), Garfamy (2004)
Product quality	Dickson (1966), Chao et al., (1993) ,Ellram and Pearson (1993) , Vonderembse and Tracey (1999), Krause et al (2001), Kannan and Tan (2002)
Reliable deliveries	Dickson (1966), Droge et al (1991) ,Chao et al. (1993) , Vonderembse and Tracey (1999), Krause et al (2001), Kannan and Tan (2002), Katsikeas, et al. (2004)
Technical capability	Choi and Hartley (1996), Kahraman et al. (2003), Cheraghi et al. (2011)
Quality system	Choy and Lee (2002), Kahraman et al. (2003)
Service or responsiveness to customer's needs	Chao et al., (1993), Choi and Hartley (1996), Katsikeas, et al. (2004), Garfamy (2004)
Flexibility	Choi and Hartley (1996),Krause et al (2001), Garfamy (2004) , Micheli (2008)
Financial	Choi and Hartley (1996), Kahraman et al (2003)
Buyer-seller relationship	Chao et al. (1993), Choi and Hartley (1996), Kahraman et al. (2003)
Management and organization	Cheraghi et al. (2011), Kahraman et al. (2003), Choi and Hartley (1996)

2.1.1.1 *Price* has been widely used for traditional supplier selection. From previous literature, unit price was suggested as a priority in the selection criteria (Katsikeas et al, 2004; Weber, et al, 1991). With reference to the earlier work of the

Dickson study, net price was also rated as being of considerable importance. However, with increasingly competitive supply chains, firms compete in all aspects to gain the competitive advantage with price diminishing in importance (Choi and Hartley, 1996). However, the buying firm should not consider only price but also a variety of factors in order to meet the customer's requirements (Choy and Lee, 2002). Weber et al. (1991) also noted that much research considered net price as one component of the total cost of the supplier. Instead, total cost has been suggested for use as a criteria during supplier selection (Kahraman et al, 2003; Weber et al, 1991).

*2.1.1.2 Total cost* is associated with a product including all expenses such as purchase price, transportation cost, taxes and operational expenses (Kahraman et al, 2003). Total cost of ownership or total cost of acquisition is considered as an important factor in supplier selection. Total cost of acquisition includes the unit price of the material, payment terms, cash discount, ordering cost, carrying cost, logistical cost, maintenance cost and other more qualitative costs (Wisner et al, 2009). Previous studies stressed the importance of cost criteria as a key factor to be taken into consideration for selection decision (Wu, 2008; Abdullah and Maharjan, 2003; Kouteros et al, 2012) Therefore, cost is critical when firms select their suppliers.

*2.1.1.3 Delivery* is one of the most important requirements for supplier selection (Swift, 1995). Delivery refers to the ability to meet delivery deadlines and promises (Kannan and Tan, 2003; Choi and Hartley, 1996; Choi and Lee, 2002). With the increase of JIT strategies, delivery has been ranked as the most important criteria used in many firms (Weber, et al, 1991). Krause et al (2007) identified delivery performance as being composed of two attributes. First, reliability of delivery refers to the ability to deliver as promised. Second, delivery speed is defined in terms of short delivery times. Therefore, delivery is a critical condition when buyers consider the qualifications of a supplier. The



buying firm expects their selected suppliers to be able to provide on-time delivery in order to meet the customer requirements.

*2.1.1.4 Product quality:* Cheraghi, et al (2011) defined “*quality as conformance to requirements or fitness to use*”. They classified product quality into two major components: quality of conformance which is defined “*by the absence of defects, and quality of design which is evaluated by the level of customer satisfaction with characteristics and features of a product*”. Also, they noted that quality ranks among the top priority criteria for supplier selection. Similarly, quality ranked as extremely important in the criteria consideration by Dickson (1966). Specification conformance is considered as the attributes of functionality, compatibility, durability, packaging, shelf-life and end-use performance (Kahraman et al, 2003). The buying firm will favor the supplier who meets product reliability (Katsikeas et al, 2004). This ensures customer satisfaction which is the most important objective of the buying firms. Similarly to the delivery aspect, quality of product ranked among the most important criteria for JIT manufacturers for many years (Weber, et al, 1991).

*2.1.1.5 Services* cover the after sales support and professionalism of services provided including the supplier representative’s competence, accuracy, responsiveness and accessibility (Kahraman et al, 2003; Choi and Hartley, 1996; Cheraghi, et al, 2011). Buying firms should always include service criteria in their supplier selection (Kahraman et al, 2003). A buyer will prefer the supplier that provides better customer service (Cheraghi, et al, 2011). Therefore, services are often included in supplier selection.

**2.1.2 Capability** is defined “*as the supplier’s potential that can be leveraged to the buyer’s advantage over the long term*”. Also, several criteria are classified as capability

factors such as the financial capability of the supplier, technological capability, quality systems, conflict resolution, contribution to productivity and so on.

*2.1.2.1 Quality system management* covers quality assurance, process improvement, quality planning and control, and quality manuals (Choy and Lee, 2002; Kahraman et al, 2003). The ISO 9000 is considered as “*a basic requirement to select a competent supplier able to provide conformity in the supplier’s process*” (Braglia and Petroni, 2000). Buying firms desire to examine the supplier’s quality process to ensure that selected suppliers can satisfy customer needs in terms of quality of products and services. Therefore, Quality management is a critical condition when buyers consider the qualifications of a supplier.

*2.1.2.2 Technical capability* refers to “*the ability to provide consistency in high quality product and services including technical support, future technological capability, and design capability*” (Choi and Hartley, 1996; Kahraman et al, 2003; Cheraghi, et al, 2011). The supplier’s technical capability has received much attention for purchasing criteria (Monczka et al, 1993; Ellram, 1990; Katsikeas et al, 2004; Cheraghi et al, 2011; Choy and Lee, 2002). The current technology which is not only concerned by buyers but they also considered about its future technological capability (Cheraghi et al, 2011). Therefore, firms often include this measure in their supplier selection.

*2.1.2.3 Flexibility* refers to “*the ability to change production volumes, the ability to setup new products on short notice and the ability to change production volumes rapidly*” (Choi and Hartley, 1996). According to Ndubisi et al, (2005), manufacturing flexibility refers to “*the speed and ease with which facilities can react to the changes in market conditions*”. They classified flexibility into three types: product flexibility, launch flexibility and volume flexibility. The flexibility of both parties allows for the adjustment to

each other's requirements and demands (Danny Pimentel Claro and Priscila Borin de Oliveira Claro, 2011). If a supplier is sufficiently flexible, buyers can respond to uncertainties rapidly. This results in reducing inventory holding and ordering frequency (Wu, 2008). Therefore, a flexible supplier can reduce the risk of uncertainty in supply and demand (Micheli, 2008).

2.1.2.4 *Finance* is considered as “an effective indicator of the supplier's firmness” (Kahraman et al, 2003). Having a supplier who has a strong financial background can result in the ability to maintain and develop the business in the long term. Buyers desire to have an ongoing relationship with their partners. Thus, financial stability is gaining in importance in the development of buyer-supplier partnerships (Cheraghi et al, 2011).

2.1.2.5 *Management and organization* is concerned with the good relationship between partners (Kahraman et al, 2003), management attitude (Cheraghi et al, 2011), compatibility across firms (Cheraghi et al, 2011), and good reputation (Choi and Hartley, 1996). According to Bennett and Gabriel (2001), “reputation is an imaged-related concept and involves the subjective judgment of an outsider on qualities of an organization in terms of its past performance”. Reputation also influences the buying firm's perception of the ability to deliver value outcomes to its stakeholders (Bennett and Gabriel, 2001). Therefore, a good reputation can impact the level of the confidence of the buyer toward the supplier involved in the long-term relationship building.

Table 2.2 summarizes the performance and capability factors adopted based on Sakar and Mohapatra (2006).

In summary, buying firms use various criteria to select their partners. Price, delivery and product quality are considered common factors used in selection decision (Weber et al, 1991; Dempsey, 1978). The selection of the appropriate supplier may

significantly reduce the purchasing cost and improve competitiveness (Faez et al, 2009). Therefore, buying firms expect better performance when they select the fit of the supplier's capability (Park and Chang, 2010).

Table 2.2 Summary of performance and capability criteria used in supplier selection

Capability factors	References
<ul style="list-style-type: none"> <li>Quality systems in operation at the supplier's place/quality philosophy</li> </ul>	Choi and Hartley (1996)
<ul style="list-style-type: none"> <li>Financial capability of supplier</li> </ul>	Weber et al. (1991), Choi and Hartley (1996), Swift (1995)
<ul style="list-style-type: none"> <li>Technological capability/R&amp;D capability</li> </ul>	Weber et al. (1991), Choi and Hartley (1996), Katsikaes et al. (2004)
<ul style="list-style-type: none"> <li>Reputation for integrity/believability and honesty/vendor's image</li> </ul>	Weber et al. (1991), Choi and Hartley (1996), Katsikaes et al. (2004)
<ul style="list-style-type: none"> <li>Breadth of product line/ability of a supplier to supply a number of items</li> </ul>	Swift (1995)
<ul style="list-style-type: none"> <li>Management and organization</li> </ul>	Weber et al. (1991)
<ul style="list-style-type: none"> <li>Production facilities and capability</li> </ul>	Weber et al. (1991)
Performance factors	References
<ul style="list-style-type: none"> <li>Price and cost</li> </ul>	Weber et al. (1991), Choi and Hartley (1996), Katsikaes et al. (2004), Swift (1995)
<ul style="list-style-type: none"> <li>Quality of product</li> </ul>	Weber et al. (1991), Choi and Hartley (1996), Swift (1995)
<ul style="list-style-type: none"> <li>Ability to meet delivery promise/ delivery lead time/ consistent delivery</li> </ul>	Weber et al. (1991), Choi and Hartley (1996), Katsikaes et al. (2004), Swift (1995)
<ul style="list-style-type: none"> <li>After sales support/technical support available</li> </ul>	Choi and Hartley (1996), Katsikaes et al. (2004), Swift (1995)

## 2.2. Supplier Development

A number of studies have addressed strategies that buying firms should implement and follow in order to increase the rate of supplier performance as per their expectations. Monczka et al (1993) suggested supply base strategies to enhance the supplier performance and capability by raising the rate of supplier performance expectations, worldwide sourcing strategy, early supplier design involvement, supplier performance improvement rewards and direct supplier development. Vonderembse and Tracey (1999) presented supplier involvement in two key areas related to supplier performance: product development and continuous improvement. Similarly, Carr et al (2008) found supplier involvement in product development to be positively consistent with the supplier's operational performance. Supplier development can be an active action taken by a buyer to create the competitive supplier's capability (Li et al, 2007). Several works have addressed that organizations' increasing involvement in supplier development programs to improve their supplier performance and building their competitive advantage (Modi and Mabert, 2007; Aller and Garcia, 2008). The review of related literature is as follows:

Krause and Ellram (1997b) defined *“supplier development as any effort of a buying firm with its supplier to increase the performance and/or capabilities of the supplier and meet the buying firm's short and/or long term supply needs.”*

Watts and Hahns (1993) asserted that *“supplier development involves a long term co-operative effort between the buying firm and its suppliers to upgrade the suppliers' technical, quality, delivery and cost capabilities, and to foster ongoing improvements”.*

Handfield et al. (2009) defined *“supplier development as any activity undertaken by a buyer to improve a supplier’s performance or capabilities to meet the buyer’s short and long-term supply needs”*.

Prahinski and Benton (2004) defined *“supplier development as activities undertaken by the buying firms in their efforts to measure and improve the products or services they receive from their suppliers”*.

Based on the above definitions and available literature, we can define *“supplier development as involving activities undertaken by buying firms to increase a supplier’s performance and capabilities to meet the firm’s short and long-term needs”*.

According to Krause et al (2000), supplier development strategy is divided into two groups:

**2.2.1 Externalized supplier development strategies** represent externalized activities that firms optimize the external market to encourage supplier performance improvements. These strategies encompass competitive pressure, supplier assessment and supplier incentives.

*2.2.1.1 Competitive pressure* is the strategy to create competition among suppliers in terms of quality, delivery or some area of supplier performance required by buying firms (Krause et al, 2000). Buying from a limited number of suppliers leads to the creation of competitive pressure for the supplier. Competition influences the way to do business. With the choice of alternative partners, firms have more bargaining power (Danny Pimentel Claro and Priscila Borin de Oliveira claro, 2011). This means the buying firm can switch to the second best partner in case something goes wrong with their selected partners. According to Govindan et al (2010), building competitive pressure by using multiple sources of supply can motivate the other suppliers to improve quality and help ensure the primary supplier does not reduce their performance. Competitive

pressure includes the use of few or many suppliers of the purchased items to create competition among suppliers (Krause and Ellram, 1997b). In addition, when intense competition arises, firms might switch to another supplier who provides lower cost even though quality is the first priority (Krause et al, 2000).

2.2.1.2 *Supplier evaluation* is the strategy to effectively evaluate and give feedback for supplier improvements and ensures that suppliers are perceptive of their current performance compared with the buying firm's expectations and its competitors including the motivation of suppliers to improve performance (Modi and Mabert, 2006). In their earlier work, Prahinski and Benton (2003) stress the importance of the supplier evaluation process with collaborative communication including the indirect influence strategy, formality and feedback. The indirect influence strategy includes education programs, EDI communication and information sharing. Formality of the evaluation process is related to supplier performance. Formal communication encourages the supplier to better understand the buying firm's expectations. Effective feedback communication between two parties creates a clear understanding of requirements and reduces any ambiguity. Communication between buyer and supplier should be two way and include the buyer's feedback to improve the supplier's performance (Govindan et al, 2010). This corresponds with Lascellers and Dale (2007) who noted that poor communication and feedback is a major barrier to supplier development. Many buying firms cannot communicate clearly with their suppliers. Buyers often use one-way communication without any feedback. This results in a lower rate of improved supplier performance as per the firm's expectations. Therefore, feedback communication is the key success factor of supplier development.

2.2.1.3 *Supplier incentive* is a strategy to encourage suppliers to improve their performance and includes increased business volume, priority consideration for future business and recognizing good supplier performance in the form of awards or certificates (Krause et al, 2000). The institute of supply management defined "*supplier certification as an organization's process for evaluating the quality systems of key suppliers in an effort to eliminate incoming inspections*" (Wisner et al, 2009). This may

imply a willingness between buyer and supplier to share goals, commitments, and risks to improve their relationship. Wisner et al, (2009) also noted that a supplier certification program might provide incentives for suppliers to deliver parts or components straightly to the point of use in the buying firm's area and resulting in reducing costs related to incoming inspection and storage of inventory. To encourage suppliers, firms are able to offer incentives such as the achieved cost savings sharing, higher volumes, promised business and awards (Govindan et al, 2010).

**2.2.2 Internalized supplier development strategy** involves a direct investment of resources of the buying firm in the supplier, that is, direct involvement strategy.

*2.2.2.1 Direct involvement* is the strategy engaging buying firms in supplier development activities such as the training and education provided for a supplier's personnel, assigning buying firm's personnel to the supplier site, allowing representatives from suppliers to be a part of our product design teams (Vonderembse and Tracey, 1999) including investments in capital and equipment in supplier operations (Monczka, et al., 1993)

Humphreys et al. (2004) classified supplier development activities into two groups as follows:

- Transaction-specific supplier development represents the direct involvement of the buying firm in developing suppliers which encourage the buyer to make direct investments in physical assets or human capital, the buyer's expectations of supplier performance improvement and joint action between firms.
- Infrastructure factors of supplier development represent the factors that support the environment for using transaction-specific supplier development.
  - Strategic goals: effective supplier development from the determination of the long term strategic goals
  - Effective communication: promote regular contact to motivate effective communication between firms and suppliers
  - Long-term commitment: the buying firm favors doing business with their partners in a long-term relationship. Therefore, the commitment between



both parties may motivate the supplier to improve and change their operation as per the buyer's requirements.

- Top management support: top management is a key to driving and encouraging the purchasing management on the allocation of resources within a supplier's operation
- Supplier evaluation: supplier evaluation is a key process to motivate supplier performance. Effective supplier evaluation could provide valuable information and specify the areas of weakness for supplier performance improvements
- Supplier strategic objectives: with long-term partnerships, both buyers and suppliers who desire to grow in business together need to have a mutual recognition of strategy and philosophy in the future.
- Trust: with the increased reliance on selected suppliers, the buying firm needs to build trust to safeguard themselves from risk and uncertainty. Therefore, trust from the buyer would encourage buyer involvement in asset specificity on joint action between buyer and supplier.

However, this study considers internalized strategies and infrastructure factors of supplier development as part of the commitment between buyer and supplier and this is discussed in the next section. Therefore, this research follows the study of Krause et al (2000) by focusing on the externalized supplier development strategy including competitive pressure, supplier evaluation, and supplier incentives.

Based on Hartley and Choi (1996), buying firms have two objectives behind supplier development programs. The first reason is to reduce costs and improve product quality and delivery performance. Second is to educate suppliers on a systematic process for continuous improvements. Buyers expect their suppliers to be self-sufficient without them and after such programs. This strategy improves supplier performance along the process of information sharing and financial support. Therefore, the purchased volume will be decreased for the supplier who fails to meet the firm's objectives, and may be replaced by alternative suppliers. Thus, supplier development is

an essential factor for firms. Krause and Ellram (1997) outline three important perspectives of supplier development. First, it is a basic task of purchasing functions to develop productive and reliable supply sources. Second, supplier development can help the firm meet the strategic objectives. With the efficient supplier, they can provide products and services to meet the customer's requirements such as quality and product development. Third, the performance and competency development of domestic suppliers could make contribution to the country as world industrial supply bases. In sum, the involvement of buying firms in supplier development programs can result in performance improvements. With capable suppliers, firms will achieve a competitive edge over their competitors.

### 2.3 Buyer-Supplier Commitment

Various works have studied and explored the commitment in relationship marketing and supply chain management. The review of related literature is as follows:

Dwyer et al. (1987) defined *"commitment as an implicit or explicit pledge of relational continuity between exchange partners"*.

Anderson and Weitz (1992) defined *"commitment as the desire to develop a stable relationship, the willingness to make short-term sacrifices to maintain the relationship, and confidence in the stability of the relationship"*.

Morgan and Hunt (1994) defined *"relationship commitment as exchange partners believing that an ongoing relationship with one another is so important as to warrant the maximum efforts to maintain it – that is the committed party believes the relationship is worth working on to ensure that it endures indefinitely"*.

Prahinski and Benton (2004) defined *"supplier commitment as the degree to which the supplier feels obligated to continue business with the particular buying firm."*

Prahinski and Fan (2007) defined “*supplier commitment as “the degree to which the supplier feels loyalty, expects longevity and considers the relationship as a long-term partnership.”*”

More specifically, this study defines “*buyer-supplier commitment as a long-term relationship between the buying firm and the supplier in engaging their human or capital resources to enhance mutual business development”*”.

Various literatures have studied and explored the commitment in relationship marketing and supply chain management. Commitment is defined as that given above by Anderson and Weitz (1992): “*the desire to develop a stable relationship, a willingness to make short-term sacrifices to maintain the relationship, and a confidence in the stability of the relationship”*”. The business partner takes a significant role in maintaining the ongoing relationship for long-term success (Morgan and Hunt, 1994). The supplier considers the relationship as a long-term partnership with a loyal business partner (Prahinski and Fan, 2007). Therefore, it is considered to be essential for the supplier to continue business operations with the commitment of meeting or even exceeding the buying firm’s needs (Prahinski and Benton, 2004). Based on several works, each commitment type is mainly measured in terms of emotional and continuance relationship as in the following table:

Table 2.3: Research on Commitment Measures in the Marketing and Supply Chain

Study Context	Conceptualized Commitment	Commitment Measures	Focus Industry	Authors
The effect of trust and interdependence on relationship commitment: A trans-Atlantic study	Channel member's intention to continue the relationship	<p><i>Affective commitment</i>: "the desire to continue its relationship because it likes the partner and enjoys the partnership".</p> <p><i>Calculative commitment</i>: "the need to sustain a relationship given the significant anticipated termination of switching costs relevant to leaving".</p>	Automobile dealers in the United States and Netherlands	Geyskens et al (1996)
Measurement of distributor commitment in industrial channels of distribution	The extent of a distributor's business ties with its focal supplier	<p><i>Continuance commitment</i>: the desired duration of a channel relationship.</p> <p><i>Behavioral commitment</i>: the extent to which special support is provided.</p>	Different industries in the United States	Kim and Frazier (1997)

Table 2.3: Research on Commitment Measures in the Marketing and Supply Chain (Continued)

Study Context	Conceptualized Commitment	Commitment Measures	Focus Industry	Authors
		as needed in a channel relationship <i>Affective commitment</i> : “the level of unity showed existence in a channel relationship”		
Trust and commitment influences on customer retention: insights from business-to-business services	Commitment is the desire for continuity manifested by the willingness to invest resources into a relationship	<i>Calculative commitment</i> : “an anticipation of high termination or switching costs associated with leaving from the relationship”. This results from a calculation of costs and benefits. <i>Affective commitment</i> : “a generalized sense of attention and attachment to the other party” (Konovsky and Cropanzano,1991)	Different industries in Greece	Gounaris (2003)

Table 2.3: Research on Commitment Measures in the Marketing and Supply Chain (Continued)

Study Context	Conceptualized Commitment	Commitment Measures	Focus Industry	Authors
The influencing factors of commitment and business integration on supply chain management	Members are willing to make short-term sacrifices to maintain their long-term and stable relationship	<p><i>Affective commitment</i>: “the feeling of belonging and the sense of connection with the organization”</p> <p><i>Continuance commitment</i>: “perceived both financial and non-financial costs of leaving and the lack of alternatives”.</p> <p><i>Normative commitment</i>: “the members feel obliged to remain in an organization with dependence on generalized cultural expectations” (Allen and Meyer, 1990)</p>	Taiwan manufacturing	Wu et al (2004)

Table 2.3: Research on Commitment Measures in the Marketing and Supply Chain (Continued)

<p>The impact of power and relationship commitment on the integration between manufacturers and customers in a supply chain</p>	<p>An investment in transaction-specific assets, which are difficult or impossible to redeploy when a relationship is terminated</p>	<p><i>Normative relationship commitment</i>: “a mutual, ongoing relationship over an extended period of time which is based on mutual commitment and sharing” (<i>Ellram, 1991</i>).</p> <p><i>Instrumental relationship commitment</i>: “the situation (Brown et al., 1995) when one party agrees to be influenced by the other party in expectatin of having favorable interactions between each other”.</p>	<p>Manufacturing companies in China</p>	<p>Zhao et al (2007)</p>
<p>Channel power, commitment and performance</p>	<p>The channel relationship commitment</p>	<p>-“The desire to develop a stable channel relationship”</p>	<p>Television manufacturer dealer</p>	<p>Sheu and Hu (2009)</p>

Table 2.3: Research on Commitment Measures in the Marketing and Supply Chain (Continued)

Study Context	Conceptualized Commitment	Commitment Measures	Focus Industry	Authors
Toward sustainable channel relationship	confidence of source member in building and maintaining a long-term corporation relationship	<ul style="list-style-type: none"> <li>- “The confidence in stable channel relationship”</li> <li>- “The willingness to make sacrifices in the short-term to retain channel relationship”</li> </ul>	channels in Taiwan	
Trust, relationship commitment and cooperative performance: supply chain management	The wish of the supply chain members to maintain a valuable relationship in the co-operative process	<i>Economy commitment</i> : “the trading members are willing to do their best to maintain the valuable relationship for their own interest”. <i>Emotional commitment</i> : “the efforts members made to maintain their relationship for their common values and affection”.	Four Chinese industrial sectors: Household electrical appliances, Textiles, Information Technology and Food	Xiao et al (2010)



Table 2.3: Research on Commitment Measures in the Marketing and Supply Chain (Continued)

Study Context	Conceptualized Commitment	Commitment Measures	Focus Industry	Authors
		<p><i>Continuance commitment</i>: “the efforts members made to pursue common goals and benefits in the long term which reduces opportunism”.</p>		
<p>Supply chain sustainability: A relationship management approach</p>	<p>Refer to Allen and Myer (1994), commitment link with turnover; employees who are strongly committed are those who are least likely to leave the organization.</p>	<p><i>Affective commitment</i>: “the degrees of emotional attachment to the organization <i>Normative commitment</i>: acceptance of organisation’s values”. <i>Continuance commitment</i>: “the cost of leaving the organisation outweighs the cost of staying”.</p>	<p>Australian construction industry</p>	<p>Chung and Rowlinson (2011)</p>

Table 2.3: Research on Commitment Measures in the Marketing and Supply Chain (Continued)

Study Context	Conceptualized Commitment	Commitment Measures	Focus Industry	Authors
Supply chain commitment and business process integration	SCM commitment is a promise or agreement to do something in the future in supply chain relationships	<p><i>Affective commitment</i>: “the feeling of belonging and the sense of connection with the organization”.</p> <p><i>Normative commitment</i>: “the members feel obliged to remain in an organization with dependence on generalised cultural expectations”.</p> <p><i>Continuance commitment</i>: “the perceived both financial and non-financial cost of leaving the organization, as a result of a lack of alternatives”.</p>	Different industrial sectors in Thailand: Agriculture, Hunting and Forestry, Manufacturing, Wholesale and Retail Trade, Automotives, Personal and Household	Salam (2011)

As presented in Table 2.3, each commitment type mainly measures some aspect of emotional and continuance relationship described. However, the commitment has also been based on the development of **transaction-specific investment** (Williamson, 1985). Specific investments by buyers encourage suppliers to have commitment in the business relationship (Ghijssen et al, 2010). The buying firm needs to play a significant role and engages human or capital resources in maintaining the relationship such as making a direct investment in their suppliers to customize equipment and tools, and provide personnel to the supplier's facilities or specialized training programs (Li et al, 2007; Dwyer et al, 1987; Krause, 1997; Lai et al, 2005).

More specifically, much literature has described commitment in terms of the **buyer-supplier relationship** (Ellram, 1991; Morgan and Hunt, 1994; Burnes and New, 1996, Burnes and Whittle, 1995; Spekman et al, 1998; Prahinski and Benton, 2004; Wagner, 2006) and **transaction-specific investment** (Williamson, 1985; Dwyer et al, 1987; Monczka et al ,1993; Cannon and Perreault, 1999; Krause, 2000; Prahinski and Benton, 2004; Ghijssen et al, 2010).

The table below summarizes the buyer-supplier commitment based on the two dimensions of buyer-supplier relationship and transaction-specific investment.

Table 2.4: Table summarizing the buyer-supplier relationship between commitment and relationship, and commitment and transaction-specific investment (Continued)

Buyer-Supplier relationship	Definition, Conceptualization and Research Findings	Authors (Year)
Commitment and Relationship	<i>"Relationships are built based on mutual commitment"</i>	Berry and Parasuraman, 1991, cited in Morgan and Hunt, 1994
	<i>"Relationship commitment as an ongoing interrelationship is believed by partners that it is so significant as to be maintained with the greatest effort; that is, the committed party realizes that the relationship is worth working on to ensure its sustainability"</i>	Morgan and Hunt, 1994
	<i>"Commitment is the belief that encourage trading partners to willingly dedicate themselves to maintain this relationship"</i>	Dion et al, 1992 cited in Spekman et al, 1998
	Partnership as <i>"..a mutual, ongoing relationship involving long-term commitment an information sharing, and the risks and rewards of the relationship"</i>	Ellram, 1991
	A long-term commitment;  Both customers and suppliers are equally proactive;	Burnes and Whittle, 1995

Table 2.4: Table summarizing the buyer-supplier relationship between commitment and relationship, and commitment and transaction-specific investment (Continued)

Buyer-Supplier relationship	Definition, Conceptualization and Research Findings	Authors (Year)
Commitment and Relationship	<p>Key processes and activities are integrated by both parties;</p> <p>“There is a commitment to developing and sustaining a mutual and close relationship”</p> <p>“An existence of evidence and well-structured framework for determining cost, price and profit for both parties”</p> <p>“Based on win-win philosophy operates – both parties should gain benefits from the partnership approach”</p> <p>“Both parties are committed to continuously improving all areas of their activities”</p>	Burnes and Whittle, 1995 cited in Burnes and New, 1996
	<p><i>“The partnership as reflecting a long-term commitment of both parties to work together to improve the quality, cut the cost and enhance the reliability of their supplied products”.</i></p>	Burnes and New, 1996
	<p>Ali et al (1997) demonstrated Jaguar’s commitment to Nippondenso by entering into a long-term contract and involving their supplier early in the process of developing new products.</p>	Ali et al, 1997

Table 2.4: Table summarizing the buyer-supplier relationship between commitment and relationship, and commitment and transaction-specific investment (Continued)

Buyer-Supplier relationship	Definition, Conceptualization and Research Findings	Authors (Year)
Commitment and Relationship	Lai et al (2004) explored the significance of the relationship with suppliers and their commitment. It found that <i>“relationship stability as perceived by supplier firms is positively related to supplier commitment to quality”</i> . Therefore, relationship stability becomes more critical to commitment to quality of a supplier. Thus, commitment is a key element in developing the relationship between buyers and suppliers.	Lai et al, 2004
Commitment and transaction	<i>“Commitment is subjected to investments in the transaction cost”</i>	Cannon and Perreault, 1999; Heide and John, 1990 cited in Prahinski and Benton, 2004
-specific investment	<i>“Buyer’s specific investments indicate a more steady relationship and supplier’s motivation”</i> . <i>“Uncertainty is minimized and suppliers’ commitment to the buyer-supplier relationship is encouraged the buyer’s commitment stimulates the supplier’s commitment of the supplier”</i> .	Ghijsen et al, 2010

Table 2.4: Table summarizing the buyer-supplier relationship between commitment and relationship, and commitment and transaction-specific investment (Continued)

Buyer-Supplier relationship	Definition, Conceptualization and Research Findings	Authors (Year)
	<p><i>“To develop the key suppliers, the buying firm needs to play a key role and engages human resources or capital in a specific supplier, comprising onsite consultation, education and training programs, temporary personnel transfer, as well as provided equipment or capital”</i></p>	Wagner, 2006
Commitment and transaction-specific investment	<p>Commitment can be measured by 3 criteria:</p> <ul style="list-style-type: none"> <li>- Inputs: The parties provide considerable inputs into the association (Blau, 1964 cited in Dwyer et al, 1987). Significant economic, communication, and/or emotional resources may be exchanged</li> <li>- Durability: There should be some durability of the association over a certain period of time. <i>“The parties can be involved in enhancing their long-term investment in the relationship”</i>.</li> </ul> <p>Williamson(1983) argues that the exchange of the hostages (bilateral exchange of transaction-specific human or physical assets) communicates credibility of commitment to the relationship, and thus supports expanded alliance and exchange</p>	Dwyer et al, 1987

Table 2.4: Table summarizing the buyer-supplier relationship between commitment and relationship, and commitment and transaction-specific investment (Continued)

Buyer-Supplier relationship	Definition, Conceptualization and Research Findings	Authors (Year)
Commitment and transaction-specific investment	- Consistency: <i>“Inconsistency input of the party reflects low commitment and leads to a declined reliance on the outcomes of the exchange”</i> . <i>“A key distinction of the commitment phase is that the parties intentionally engage resources in retaining the relationship”</i> .	Dwyer et al, 1987

From the above, *buyer-supplier relationships* and *transaction-specific investment* are key elements in the commitment between the buying firm and supplier.

2.3.1 The **buyer-supplier relationship** has been described according to various aspects (Kannan and Tan, 2006). Saccani and Perona (2007) classified the buyer-supplier relationship based on the extent of interaction between firms and the level of cooperation between firms. They identified four types of relationships: traditional relationships (a low level of interaction between firms), operational relationships (effective operational planning, information sharing, and specific techniques for operation performance), project-based partnership (intensive information exchange and cooperation in designing and developing products or processes), and evolved partnerships (a high level of cooperation and interaction activities). Crotts et al (1998) defined three types of buyer-supplier relationships: adversarial (price based competition), interlocked (exclusive members of particular groups), and cooperative



(cooperative relationships with long-term business partners). With reference to previous studies, the relationship between firms has shifted the focus away from a traditional toward a collaborative relationship (Carr and Pearson, 1999 and Daugherty, 2011). The key attributes characterizing the buyer-supplier relationship are described below:

*2.3.1.1 Building a long-term relationship* is critical for mutual business success (Cooray and Ratnatunga, 2001). A long-term relationship between business partners is related to the willingness of both parties to sacrifice their resources and time in supplier development (Krause and Ellram, 1997a). Similarly, Heide and John (1990) defined continuity as the perception of the bilateral expectations of future interaction. Dwyer et al. (1987) proposed a framework for developing buyer-seller relationships by using a comparison between discrete transactions and relational exchange. They categorized the relationships into five phases: (1) awareness, (2) exploration, (3) expansion, (4) commitment and (5) dissolution. In Scanzoni's work (1979), three criteria (inputs, durability and consistency) are measured during the commitment stage. Buyers and sellers engage resources which include the exchange of human and physical assets for encouraging the continuity of the relationship. Haugland (1999) suggested that *"relationship investment – referring to the emotional attachment of the buyer-supplier relationship – is essential for building a long lasting relationship"*. This means that the buying firm desires to develop the key supplier who is willing to continue in long-term business relationships. It is important to expect on how long the relationship with a supplier (Hartley and Choi, 1996). The length of relationship influences the buying's firm behavior leading to a more collaborative relationship (Danny Pimentel Claro and Priscila Borin de Oliveira Claro, 2011). In strategic alliances, commitment concerns a partner's intention to continue in a relationship (Cullen et al, 2000). Therefore, continuity of

relationship provides positive benefits for the partners such as the firm being able to see the potential returns and the need to avoid switching costs (Cullen et al, 2000).

2.3.1.2 *Communication and information sharing* is critical in managing the supply base. The manager needs to understand the key role of information including identifying what information is required by the buyer as well as being able to communicate effectively with specific suppliers (Handfield and Nichols, 2004). Cannon and Perreault (1999) defined "*information exchange as the expectations toward information sharing that may be useful for both parties, including relevant cost information and supply forecasts*". The information exchange acts as a relationship connector in a particular buyer-supplier relationship (Cannon and Perreault, 1999). Both buyer and supplier are perceived favorably in joint planning, sharing of demand forecasting and the exchange of technical information (Ellram and Hendrick, 1995). Intensive exchanges of information such as sharing of internal information of cost and quality levels build good cooperation between buyer and supplier (Sánchez-Rodríguez et al, 2005). Also, sharing information was found to impact the increased commitment in a business relationship (Anderson and Weitz, 1992). Communication which includes information sharing leads to developing trust in the buyer-supplier relationship (Jena et al, 2011). Therefore, information sharing between exchange partners is critical to developing the buyer-supplier relationship.

2.3.1.3 *Joint problem-solving* is a key success factor of buyer-supplier relationship outcomes if the buying firm desires to get the benefit of a closer relationship with a particular supplier (Campbell, 1997). Similarly, Claycomb and Frankwick (2010) suggested that "*joint problem-solving is important to suppliers in the expansion phase of buyer-supplier relationship development*". The buying firm needs greater assistance and understanding from suppliers when they face a difficult situation (Ellram and Hendrick, 1995). This means that the buyer recognizes the benefit of cooperative

seeking joint solutions between business partners. Mutual solutions are likely to be found when firms engage in joint problem solving with their specific partners (Danny Pimentel Claro and Priscila Borin de Oliveira Claro, 2011). This action would lead to collaborative activities between two firms in order to resolve their conflicts and problems such as joint operation planning, joint design and development of a new product. With the increase in such joint activities, both buyer and supplier move into a closer relationship (Li et al, 2007).

*2.3.1.4 Mutual benefit sharing* between partners was critical to the success of partnership relations (Ellram, 1991). In addition to create the success of business relationships, Burnes and Whittle (1995) suggested that partnership must have a clear framework for defining cost, price, and profit. According to the Beyond Monitoring Working Group (2010), it is suggested that *“both buyer and supplier agree on mutual benefit sharing, including cost reduction, reduced risk and increased efficiency and productivity”*. These are important considerations in the building of the cooperative relationship between buyer and supplier.

**2.3.2 Transaction-specific investment** has been defined *“as a buyer’s direct investment in human and physical asset specificity”* (Humphreys et al, 2004). Similarly, Li et al (2007) classified transaction-specific investment into two categories as follows:

*2.3.2.1 The buying firm invests directly in the particular supplier.* Specific investments by buying firms include tools, equipment, operating procedures and systems that are tailored for specific suppliers (Heide and John, 1990).

*2.3.2.2 The buyer invests in supplier training or providing technical support to the supplier.* In addition, the buying firm also invests in adaptations in the process, product, or procedure specifically for the particular supplier (Cannon and Perreault,

1999). For example, Xerox required adaptations of production lines for specific suppliers in order to enhance their performance (Heide and Stump, 1995). Suppliers are unable to improve themselves (Krause et al, 2000). Therefore, human support by the buying firm is mainly critical for supplier performance. Several studies have suggested that the buyer should engage in personnel assistance for the specific supplier, such as conducting training programs, providing technicians for the supplier plant or implementing site visits (Krause et al 2000; Humphreys et al, 2004; Krause and Ellram, 1997b; Hartley and Choi, 1996).

Based on the example raised by Lohita and Krapfel (1994), transaction-specific investment also includes the implementation of Electronic Data Interchange (EDI). All standard business forms are directly transmitted through the other company electronically such as purchase orders, shipping notices and invoices. This results in reduced cycle time and improves the speed of business transactions. Xerox and Whirlpool involve their suppliers in the primary stages of product development which requires the buyer and suppliers to invest in design and engineering assets. Buyer-specific investments play a critical role in creating the competitive advantage (Ghosh and John, 1999). However, based on the transaction cost concept by Williamson (1985), transaction-specific investments cause the investor to be under a lock-in situation. Therefore, there exists a risk for management who decide to make further investments with key specific suppliers.

Based on previous literature, this study divides commitment types according to the buyer-supplier relationship and transaction-specific investment. Buyer-supplier commitment is categorized into two dimensions. First, the buyer-supplier relationship refers to the buyer's great effort to have a long-term relationship with their supplier (Anderson and Weitz, 1992; Morgan and Hunt, 1994; Cooray and Ratnatunga, 2001;

Krause and Ellram, 1997b; Haugland, 1999), including information sharing and communication (Ellram and Hendrick, 1995; Sánchez-Rodríguez et al, 2005), benefit sharing (Ellram,1991), and joint problem-solving (Campbell, 1997; Claycomb and Frankwick, 2010; Ellram and Hendrick, 1995). Second, transaction-specific investment refers to the buying firm's effort to develop their supplier by engaging in human and capital resources which includes direct investment in equipment and tools (Li et al, 2007), specific adaptations to particular suppliers (Kampstra et al, 2006; Heide and Stump, 1995; Cannon and Perreault, 1999), technician support at the supplier site (Li et al, 2007), and specialized training (Krause, 1997).

#### **2.4 Supplier Performance**

Based on the earlier work of Schmitz and Platts (2004), it was found that supplier performance measurement is used as a communication tool between the OEM and its supplier in the automotive industry. This implies that it is important to understand and select the supplier performance measures in order to help the buyer manage their supply base. The implementation of supplier evaluation can impact improved supplier performance across a variety of dimensions (Tracey and Tan, 2001; Prahinski and Benton, 2004; Schmitz and Platts, 2004; Narasimhan et al, 2001). Performance measurement is the evaluation of effectiveness and efficiency of firms. Effectiveness refers to accomplishment of goals are accomplished. Efficiency is a measure to evaluate how well resources are utilized (Mentzer and Konrad, 1991). According to a number of studies, supplier performance is measured by various criteria. Several key competitive factors are broadly used to assess the supplier performance. For example, product quality, delivery performance, price, physical distribution, services, flexibility, and relationships are considered to be important factors for assessment (Simpson, et al., 2002; Prahinski and Benton, 2004; Modi and Mabert, 2007; Humphreys et al, 2004; Gil

and Ramaseshan, 2007). Supplier performance improvement is used as the key indicator of the success of supplier development strategies (Watts and Hahn, 1993). Humphreys et al (2004) noted that *“supplier performance improvement gives an emphasis on the buyer's perception on the supplier's improvement in quality, delivery, cost, inventory, lead time and the rate of new product launch”*.

Based on the review of previous work and field interviews with purchasing managers in the electrical appliances industry, this study focuses on the buyer's perception of the supplier's improvement in the aspects of cost, product quality, and delivery which are critical supplier improvement areas.

**2.4.1 Cost reduction** is measured in terms of purchase price, and operational expenses comparing a supplier's cost against other suppliers based on the baseline or target price (Kahraman et al, 2003; Krause et al 2007; Handfield et al, 2009). As suppliers are capable reducing their costs, their customers be partially benefited in the form of lower prices (Krause et al, 2007). Therefore, cost reduction is a critical measurement for the firm in electrical product manufacturers, which is very crucial in cost competitiveness (Choi and Krause, 2006).

**2.4.2 Product quality performance** is critical for supplier quality measurement. The buying firm can evaluate a supplier's product quality performance against previously specified objectives, tracking the improvement rates (Handfield et al, 2009). This study can be assessed based on the number of incoming defects and the number of complaints about product quality from the customer (Simpson, et al.,2002; Prahinski and Benton, 2004; Modi and Mabert, 2007). An effective system of measurement also helps indicate a buyer's quality requirements and encourage effective communication among both parties (Handfield et al, 2009).

**2.4.3 Delivery performance:** A buyer can assess how well a supplier responds to delivery requirements through two main criteria: (1) reliability of delivery, which involves the ability to deliver according to due date commitments, and (2) delivery speed, which includes short delivery times or delivery speed requirements (Krause et al, 2007; Handfield et al, 2009). This study measures delivery performance in terms of the percentage of on-time deliveries and the development period from design until production (Simpson, et al., 2002; Prahinski and Benton, 2004; Modi and Mabert, 2007).

Supplier performance measurement should consist of the methods and systems to collect and provide information in order to continuously evaluate, rate and rank supplier performance. The buyer should also meet with suppliers on at least an annual basis to review actual performance results and identify improvement opportunities in order to achieve both the company's and customer's requirements (Handfield et al, 2009).

## Chapter III

### Hypothesis and Model Development

This chapter develops the hypothesis tests by considering the effects of supplier selection, supplier development and buyer-supplier commitment toward supplier performance improvements. Then, the conceptual model is developed and proposed.

#### 3.1 Supplier selection

The subject of supplier selection has received much attention in the literature. Studies have investigated the linkages between supplier selection and supplier performance, buyer-supplier commitment and supplier development.

##### 3.1.1 Supplier selection and supplier performance

Several studies have examined the impact of supplier selection on supplier performance. Vonderembse and Tracey (1999) found that the level of supplier effort increases substantially when they are selected according to well-defined criteria and this leads to enhancing their performance. In addition, Katsikeas, et al. (2004) found that supplier reliability is most highly ranked by distributor firms and also that the key to supplier success came from achieving and maintaining the right performance in the four attributes of competitive pricing, reliability, technological capability, and service. Kannan and Tan's (2002) observation suggested that American manufacturing companies emphasized the use of soft criteria like the supplier's strategic commitment to a buyer which had a greater impact on performance such as supplier capability. Correspondingly, Ellram (1991) suggested that soft factors in terms of a shared, ongoing relationship with a long-term commitment had a greater impact on performance than others. Therefore, supplier selection can be an important process leading to the



supplier's ability to meet the buyer needs. Park and Chang (2010) concluded that the companies whose own capabilities match their supplier selection criteria can expect better supply chain performance from supply chain management practice than companies that don't match. The study by Tracey and Tan (2001) indicated that higher levels of firm performance resulted from selecting and evaluating the supplier based on supplier's performance criteria such as reliable delivery and product quality performance. Therefore, selection criteria were important to a buying firm that is affected by the supplier's performance (Prahinski and Benton, 2004). When the supplier is selected under good selection criteria, they had the ability to manage their operations to meet the buying firm's objectives (Kannan and Tan, 2002). Therefore:

H1: Supplier selection is positively related to supplier performance improvement

### **3.1.2 Supplier selection and buyer-supplier commitment**

The buying firm uses several criteria to select the right supplier to be their partner. Both the buyer-supplier relationship and transaction-specific investment are related to the supplier selection. Supplier selection is antecedent to buyer-supplier integration (Kalkoffen et al, 2007). Supplier selection is a key enabler in motivating the successful relationships between buyer and supplier (Kannan and Tan, 2006). This implies that selection criteria is important to achieve the buying firm's performance. As a number of firms rely on outsourcing, many supplies are outsourced (Choy and Li, 2003). However, not all suppliers are good partners. Therefore, the criteria used to select suppliers is critical. Much literature has suggested that selection of supplier is positively associated with the collaborative relationships between buyer and supplier. The study by Koufteros et al. (2012) revealed that selecting suppliers based on quality is related to supplier partnerships and supplier development. The results indicated that the buying firm requires a long-term relationships and continuous improvement with suppliers

including technical assistance and training. This means the buying firm needs to put effort into the strategic supplier selection process for closer partnership relationship and development. This result corresponds to the observation made by Kannan and Tan (2006) that supplier selection positively affects the success of the buyer-supplier relationship. The result also implied that the supplier selection criteria reflect the supplier's ability to be a good partner including the commitment between firms to work together in creating value within the supply chain. In addition, Cousins and Lawson (2007) found that the sourcing strategy of critical products had a significant impact on collaborative supplier relationships. The result of a survey indicated that the buying firm needs to consider an appropriate relationship in order to achieve firm performance. The buying firms need to invest in their resources and technologies including the mutual commitment between buyer and supplier in order to increase the beneficial outcomes. Therefore, supplier selection can encourage the increase of supplier relationships and buyer-supplier commitment. Choi and Hartley (1996) stressed that the importance of supplier selection comes from the commitment of resources while simultaneously impacting many activities such as inventory management, production planning and control, cash flow requirements and product quality. Therefore:

H2: Supplier selection is positively related to buyer-supplier commitment

### **3.1.3 Supplier selection and supplier development**

Supplier selection is a key process in supplier development (Abdullah and Maharjan, 2003). This process first involves the screening and selection of the right suppliers in order to achieve the company's objectives. The importance of supplier selection relates to the influence of supplier development (Koufteros et al, 2012). Supplier selection means supplier evaluation. When selecting suppliers, buyers need to consider suppliers who are willing to contribute their expertise in achieving the firm's

objectives. Therefore, the selected supplier tends to improve itself toward meeting the successful business goals. Supplier selection and evaluation also facilitates the final selection of new suppliers including the identification of the development areas in which they must work together in the future (Hahn, et al, 1990). Therefore:

**H3:** Supplier selection is positively related to supplier development

## **3.2 Supplier development**

### **3.2.1 Supplier development and buyer-supplier commitment**

According to Krause et al (2000), supplier development strategies positively impact the direct involvement which relates to transaction-specific investments by the buying firm (Williamson, 1985). Therefore, the buying firm can use supplier evaluation feedback and rewards to improve the supplier performance via asset specificity; such as the direct investment in tooling and equipment, dispatch of technicians to serve the specific supplier, as well as specialized training (Li et al, 2007; Dwyer et al, 1987; Krause, 1997; Lai et al, 2005). This result corresponds to the observation by Wagner (2006b) that indirect supplier development plays a critical role toward direct supplier development. When the supplier receives evaluation feedback from the buying firm for improvements, the firm needs to provide suggestions or personnel to the supplier site (Krause et al, 2000; Prahinski and Benton, 2004). Such action by the buying firm motivates the direct involvement of their potential suppliers including financial resources (Wagner, 2006b). Incentives are important to develop and improve supplier performance. The buying firm provides incentives to motivate suppliers who desire the increased volume of business and priority consideration for future business (Krause et al, 2000). Therefore, this supplier is more likely to continue business operations and open their facilities, extend their resources investment, including greater commitment to

joint knowledge transfer (Modi and Mabert, 2007). Moreover, as a result of competitive pressure, business partners need to have more integrated activities, information, and processes to achieve business objectives (Spekman and Carraway, 2006).

From a buyer-supplier relationship perspective, supplier development is a key enabler to encouraging high level of buyer-supplier relationship (Krause and Ellram, 1997a). Carr and Pearson (1999) indicated that supplier evaluation systems have a positive impact on the buyer-supplier relationship. Therefore, when the supplier is unable to perform as per the firm's expectations, the buying firm needs to communicate these problems and clarify the buying firm's objectives for supplier performance improvements. This results in greater cooperation and commitment to the supplier (Prahinski and Benton, 2004). Suppliers are more willing to be involved in a development program when they believe that the buyer takes the long-term relationship seriously (Hartley and Choi, 1996). Similarly, Wagner (2006a) found there to be indirect supplier development to have a positive effect on supplier relationship improvement. Therefore:

**H4. Supplier development is positively related to buyer-supplier commitment**

### **3.2.2 Supplier development and supplier performance**

The buying firm implements a supplier development program to motivate their supplier performance and the competitive capabilities of the supplier (Krause and Ellram, 1997b; Li et al, 2007). Various strategies are presented in several purchasing and supply literature in order to improve the potential supplier. According to Monzcka et al (1993), these include raising supplier performance expectations, early supplier design involvement, direct supplier development as well as supplier performance improvement rewards. Krause and Ellram (1997b) specified a variety of activities to

develop supplier performance and/or capabilities which included introducing competition into the supply base, evaluating the supplier through formal and informal channels, raising performance expectations, recognizing good supplier performance by rewarding them with increased business volume in the future, training and providing education for the supplier's personnel, and directly investing in the supplier's operations. The results indicated that the suppliers who exceed performance expectations placed more intensity of effort and emphasis on communication with the supplier in terms of formal evaluation and feedback, future business rewards, site visits and the supplier's personnel training which reflected better improvements in on-time delivery, short cycle time and completely received orders. Humphreys et al (2004) examined the relationship between supplier development and performance in the Hong Kong electronics industry. The study found that effective communication and supplier evaluation as part of its infrastructure factors were positively associated with buyer-supplier performance improvements. Wagner (2006a) found that indirect supplier development has a positive effect on product and delivery performance improvements. Therefore, supplier development strategies are critical to encourage supplier performance improvements. Therefore:

H5. Supplier development is positively related to supplier performance

### **3.3 Buyer-supplier commitment**

#### **3.3.1 Buyer-supplier commitment and supplier performance**

Direct involvement activities are key enablers to improving supplier performance. Suppliers are unable to improve by themselves (Krause, et al 2000). Transaction-specific investment in the supplier is considered an action taken by the buying firm to improve their supplier performance and capabilities (Li et al, 2007). Therefore, the

buying firm needs to implement direct involvement activities to enhance performance improvement such as sending engineering personnel to the supplier firm for technical problem solving or specialized know-how training (Krause et al, 2000; Li et al, 2007). The study by Dyer (1996) suggested that transaction-specific investment by the buying firm motivates supplier performance improvement in the production process and cost reduction. Similarly, studies conducted by Humphreys et al (2004) indicated that transaction-specific supplier development significantly contributed to buyer-supplier performance improvement. Therefore, specific investment by buying the firm motivates better supplier performance.

There are many benefits to forming strong relationship between buyer and supplier. Sacconi and Perona (2007) summarized the potential of partnerships which improve both buyer and supplier performance, i.e. cost reduction, reduced time, lower risks, higher quality, increased customer and supplier loyalty as well as joint investment. Li et al (2007) indicated that effective joint collaboration between the buying firm and supplier has a direct and positive impact on operational effectiveness including product quality and cost. In addition, a closer relationship resulted in greater cooperation in the production and design between firms in order to reduce or eliminate non-value added activities (Li et al, 2007). Managing the relationship with the supplier positively impacts the buying's firm performance which is reflected in overall product quality (Kannan and Tan, 2006). Therefore, a collaborative relationship between two parties impacts on the firm's advantages in competitive environments (Ha and Krishnan, 2008).

Moreover, Krause et al (2007) found that the commitment between buying firms and suppliers is important to establish performance goals, and provides value to buying firms. Therefore, buyer-supplier commitment is a critical element for supplier performance improvement. Therefore:

H6. Buyer-supplier commitment is positively related to supplier performance

### 3.4 The role of buyer-supplier commitment and supplier development

The buying firm is directly involved in the human and capital resources to improve their supplier performance (Li et al, 2007). Significant investment in equipment, internal adjustments to specific suppliers, on-site consultation, education and training programs and temporary personnel transfer have been activities held to develop the key suppliers (Rokkan et al, 2003; Wagner, 2006b). However, there is little research which has tested the effect of supplier selection on supplier performance via the role of buyer-supplier commitment and supplier development. Therefore, the objective of this study is to examine the role of buyer-supplier commitment and supplier development. Therefore:

H7. Effects of supplier selection on supplier performance are mediated by buyer-supplier commitment (H7a) and supplier development (H7b)

### 3.5 Model development and proposed model

Based on the above assumptions, the research model is as shown in Figure 3.1

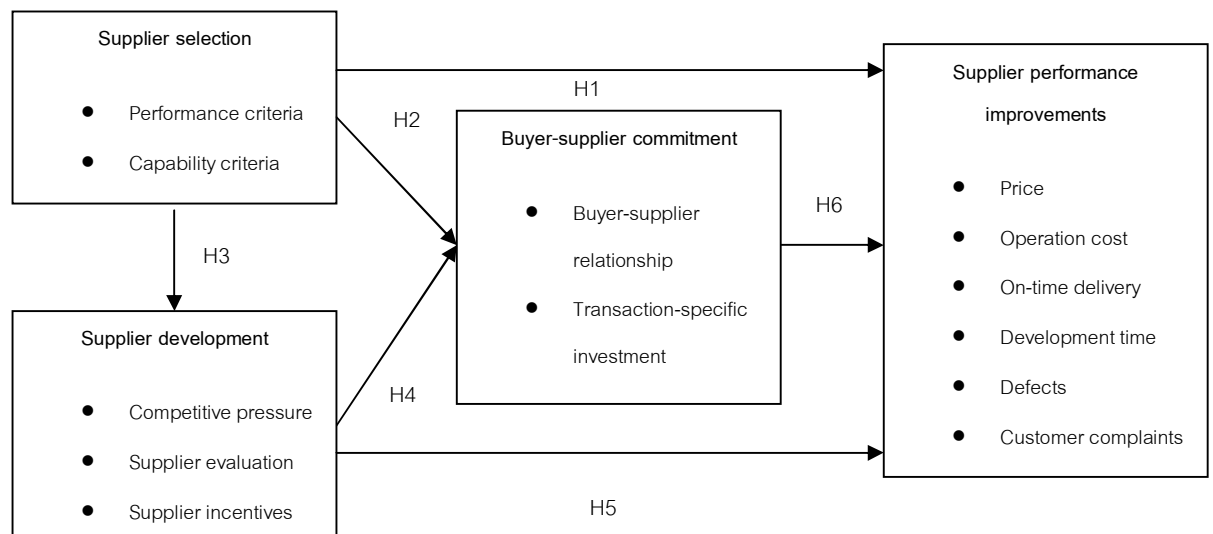


Figure 3.1 The conceptual model

In conclusion, this study has developed seven hypotheses to test the correlations among the four constructs of supplier selection, supplier development, buyer-supplier commitment and supplier performance improvements. Also, buyer-supplier commitment and supplier development were proposed as mediators to test the role of both constructs from supplier selection to supplier performance improvement.



## Chapter IV

### Research Methodology

This chapter describes the method of the study and covers the target population, data collection and questionnaire design. This research studied the causal relationship and tested relationships using Structural Equation Modeling (SEM).

#### 4.1 Population and sample

##### 4.1.1 Target population

This study focused on electrical appliance manufacturers in Thailand. Table 4.1 demonstrates the number of enterprises in the industry. According to Electrical and Electronics Institute, there were 2,017 factories in Thailand as of October, 2011 (Office of Industrial Economics, 2012 : online). Electrical appliance manufacturing got the highest ranking in the industry as illustrated in Table 4.1. Approximately 198,415 persons were employed in the industry as illustrated in Table 4.2. Thai small enterprises are the main producers in Thailand.

Table 4.1 Number of Thai electrical and electronics factories as classified by size, as of October, 2011

Number of Factories	Small	Medium	Large	Total
Electrical	553	147	100	800
Electronics	435	187	153	775
Trader	138	11	5	154
Supporting Service	35	2	1	38
Non-Specified	104	33	30	167
Software Computer	74	5	4	83
Total	1,339	385	293	2,017

Table 4.2 Number of employees in the Thai electrical and electronics industry as classified by size as of October, 2011

Number of Employees	Small	Medium	Large	Total
Electrical	42,830	43,516	112,069	198,415
Electronics	38,315	61,488	237,148	336,951
Trader	3,710	1,122	730	5,562
Supporting Service	1,126	72	21	1,219
Non-Specify	8,509	5,848	12,282	2,639
Software Computer	2,197	250	710	3,157
Total	96,687	112,296	362,960	571,943

Although large enterprises comprise the minority, there has been a lot of investment in this industry. According to the Customs Department, the Thai electrical and electronics industry contributed 24% of Thailand's total export value and reached 53,070 million USD in 2011 (Electrical and Electronics Institute, 2012 : Online). Most of the major investments in this industry are foreign or joint-venture companies which accounted for 57% with the remaining 43% being local (E & E Intelligence Unit, 2012 : online)

According to the Customs Department, Thailand's major electrical appliance products during Jan – July, 2012, in terms of export value, were air conditioners, refrigerators, main distribution boards and circuit breakers which accounted for 2,251.81 million USD, 1,311.19 million USD and 1,116.91 million USD, respectively. Asia is the main destination for Thai exporters, accounting for 17.99%, followed by Japan (14.24%) and the United States (12.45%). Thailand's major electrics industry in terms of export values were HDD assembly and components, integrated circuits and micro-

assembly, and telegraphs, which accounted for 11,595.58 million USD, 3,939.28 million USD and 727.85 million USD, respectively (Electrical and Electronics Institute, 2012 : Online).

In sum, there is significant investment and export value in this sector. Therefore, the electrical and electronics industry plays a significant role in encouraging and raising Thailand's export revenues.

#### 4.1.2 Sample size

The sample comes from the target population detailed in 4.1.1. Structural Equation Modeling requires a large sample sizes to estimate the parameters by using the maximum likelihood method (Blunch, 2008; Hair et al, 2010). There are no clear rules for the total number of the sample size and it varies for SEM (Shammout, 2008; Zeidan, 2006; Hair, 2006). Bentler and Chou (1987) suggested that *"the minimum sample size required a ratio of five responses per free parameter"*. In addition, Hair et al (2003) recommended a minimum sample size of 150-400. Furthermore, Garver and Mentzer (1999), and Hoelter (1983) proposed *"a critical sample size of 200"*. Therefore, any number above 200 would provide sufficient data for the analysis.

Thus, this study has 36 observed variables, 7 factor loadings between first and second-order latent variables and another 6 for the correlations among latent factors. Actual sample size of this study was 274 responses. This sample size corresponded to Hair et al (2003) who proposed the sample to range between 150 to 400 observations.

Approximately 800 company profiles were collected from official government websites and official association websites as of 2012 as follows:

- Electrical and Electronics Institute ([www.thaieei.com](http://www.thaieei.com))

- The Department of Export Promotion ([www.depthai.go.th](http://www.depthai.go.th))
- The Department of Industrial Promotion ([www.dip.go.th](http://www.dip.go.th))
- The Customs Department (<http://www.customs.go.th>)
- The Office of Industrial Economics (<http://www.oie.go.th/>)
- Industrial Estate Authority of Thailand (<http://www.ieat.go.th>)

#### 4.2 Data collection

To test all hypotheses, all data was collected through a questionnaire of Thai electrical appliances manufacturers, Original Equipment Manufacturers (OEM) and component suppliers in the electrical appliances business in Thailand. Only current and critical suppliers as defined by the buying firm were selected for this study. The target sample was randomly selected from a list of 800 relevant manufacturers and the questionnaire was sent to all of them. A total of 800 questionnaire surveys were sent by mail and email with a hyperlink to the online questionnaire in October, 2011. Finally, a reminder email was sent to the non-respondents three weeks after the initial email and those who still failed to respond were contacted by telephone during Jan – Mar, 2012. The main reason behind the late responses was that many companies were facing the flood crisis in the country during Oct – Dec, 2011. Two hundred and seventy four usable surveys were returned within Mar, 2012 (34.25% response rate).

A total of 274 usable companies were classified into five categories: radio and components, air-conditioning and components, refrigerators, televisions/videos/stereos and components, and other electronics part.

#### 4.3 Questionnaire design

A survey instrument was developed to collect data for this study. Respondents were asked to rate the importance of each item in the list of survey items. The importance of the items was measured by a ten-point Likert scale (9 = highly significant and 0 = not important). The questionnaire was composed of five parts. Respondents were asked about their supplier selection criteria, supplier development strategies, supplier performance and buyer-supplier commitment in four parts. The last section described the company's profile and respondent's data. Multiple choice and open-ended questions were in the last section. The survey was pretested with four purchasing managers in the industry who were asked to review the questionnaire to improve the validity and clarity.

#### 4.4 Measurements

Three measures were used in this study.

**4.4.1 Content validity** is supported by an extensive review of past literature and in-depth interviews with four electronics manufacturing executives to provide insights into the electrical products and components supply chain, as well as a pre-test of the survey with 15 suppliers of the electrical products and components industry and two experienced researchers, providing suggestions on wording and format modifications.

**4.4.2 Construct validity** was measured by two indicators:

**4.4.2.1 Convergent validity** refers to *"the degree to which multiple methods of measuring a variable provide the same results"* (Churchill, 1979). Based on Hair (2010), there are two common ways to assess convergent validity. First, factor loading size is considered to estimate the relative amount of convergent validity. High loading on a factor indicates high convergent validity. The rule of thumb suggests that standardized loading estimates should be 0.5 or higher, and ideally 0.7 or higher.

Similarly, Chau (1997) suggested that factor loadings higher than 0.5 with a significant t-value  $> 2.0$  would provide good evidence of convergent validity. Second, average variance extracted (AVE) is one indicator to assess the convergent validity. AVE can be calculated using standardized loadings. The rule of thumb suggests that an AVE of 0.5 or higher provides adequate convergence. In other words, an AVE of less than 0.5 indicates more error remains in the items than variance explained by the latent factor structure imposed on the measure.

**4.4.2.2 Discriminant validity** refers to the evidence that which a construct is truly distinct from other constructs. Based on the recommendation of Hair et al (2010), there are two ways for assessing discriminant validity. First, the correlation between any two constructs can be fixed as equal to one. If the fit of the two-construct model is significantly different from that of the one-construct model, then discriminant validity is supported. However, this method does not provide strong evidence of discriminant validity sometimes due to high correlations of 0.9 that still produce significant differences in the fit between the two models. Second, the model can be tested by comparing the average variance extracted for any two constructs with the square of the correlation estimate between these two constructs. To provide good evidence of discriminant validity, the average variance extracted should be greater than the squared correlation estimate. The last technique is consistent with the recommendations of Fornell and Larcker (1981). Before evaluating the structural model, discriminant validity has to meet a satisfactory level of validity and reliability. The result of the average variance extracted must be greater than the square correlation between the constructs which provide support for discriminant validity.

**4.4.3 Reliabilities:** Cronbach's coefficient alpha was used to assess the scale reliability. Cronbach's alpha values should be above the acceptable level of 0.7

(Nunnally, 1978). In addition, the composite reliability coefficient (CR) is often used to assess the reliabilities in SEM models. High construct reliability indicates that internal consistency exists which means that the measures all consistently represent the same latent construct (Hair et al, 2010). The CR of the four constructs – supplier selection, supplier development, buyer-supplier commitment and performance improvements – should exceed the threshold of 0.6 as suggested by Bagozzi and Yi, (1988)

#### 4.5 Model evaluation

**4.5.1 Structural Equation Modeling (SEM):** According to Bryne (2010), “*SEM is a statistical methodology that takes a confirmatory method to test the causal relationship in structural equations*”. The hypothesized model can be tested in simultaneous analysis. In SEM, the maximum likelihood estimation (MLE) is the preferred method to estimate parameters (Blunch, 2008). The structural model is tested to define the relations among the unobserved variables or unobserved variables and observed variables both directly and indirectly. This study followed the two-step approach suggested by Anderson and Gerbing (1988). The first step is to verify the confirmatory factor analysis and the second step is to test the measurement model. If the first step satisfies the acceptable fit, the second step is applied. Then the structural model will test the relationships of the hypothesis.

**4.5.2 Confirmatory factor analysis (CFA)** was first used to assess the convergent and discriminant validity of the measurement model. The confirmatory factor analysis resulted in the elimination of several individual items because of low factor loadings or high residuals (Bryne, 2010). According to Hair et al (2010), “*CFA is then applied to test the extent to which a researcher’s a-priori, theoretical pattern of factor loadings or pre-specified constructs represent the actual data*”. Thus, CFA is use to either confirm or reject the preconceived theory.

**4.5.3 Exploratory factor analysis (EFA):** Few studies have been conducted on buyer-supplier commitment through the combination of the buyer-supplier relationship and transaction-specific investment. Then, EFA was performed to the new scale development. The number of factors of new constructs is based on the theoretical and empirical evidence (Prahinski and Fan, 2007). *“EFA explores the data and provides the researcher with information about how many factors are needed to represent the data”* (Hair et al, 2010). Principal component analysis was used in EFA to reduce the number of correlating variables to a smaller number of uncorrelated variables (Blunch, 2008). Varimax rotation is used to obtain the simpler component structure; each variable has a large loading on one of the components and only a small loading on the other (Blunch, 2008). After Varimax rotation, two components were extracted. PAF resulted in buyer-supplier commitment being divided into two dimensions: buyer-supplier relationship and transaction-specific investment. Buyer-supplier relationship is associated with the length of relationship, communication, information exchange, devoting time for problem solving and benefit sharing. Transaction-specific investment is related to the company’s own investment, joint investment, sending technicians to the site and training.

#### **4.5.4 Goodness-of-fit statistics**

Model evaluation fit was assessed based on multiple fit indices. In this study, the overall model could be tested using the likelihood ratio chi-square (CMIN) test, chi-square/df (CMIN/DF), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). Fit measures can be classified into three types (Blunch, 2008) as shown below.

**4.5.4.1 Absolute fit measures** are a direct measure of how well the model specified by the researcher reproduces the observed data (Hair et al, 2010).



- Chi-square ( $\chi^2$ ):  $\chi^2$ -test depends on sample size. If the sample size is sufficiently small, we always accept H0. However, if it is sufficiently large, we always reject H0 (Blunch, 2008). Therefore, it is necessary to use several fit indices to overcome the problem of  $\chi^2$ -test (Hair et al, 2010).
- $(\chi^2)/d.f.$  : Usually a value of CMIN/df near 1.00 is considered a good fit (Blunch, 2008).
- Goodness-of-fit index (GFI): GFI is a measure of the relative amount of variance and covariance in S that is explained by  $\Sigma$ . A value of indices ranging from 0 to 1.00, with a value close to 1.00 indicates a good fit (Bryne, 2010).
- Adjusted goodness-of-fit index (AGFI): AGFI is adjusted from the GFI by the number of degree of freedoms compared to the number of parameters (Blunch, 2008). According to Hair et al (2010), AGFI penalizes more complex models and favors those with a minimum number of free paths. However, AGFI values are typically lower than GFI values in proportion to model complexity.
- Root mean square error (RMSEA): RMSEA is one of the most widely used measures that attempts to correct the tendency of the  $\chi^2$ -test in case of reject models with a large sample size (Hair et al, 2010). RMSEA takes into account the error of approximation in the population, a value of less than 0.05 indicates a good fit, and values as high as 0.08 represent reasonable errors of approximation in the population (Brownne and Cudeck, 1993). Lower RMSEA values indicate better fit. Hair et al (2010) suggested that RMSEA should report a value between 0.03 and 0.08.

4.5.4.2 **Relative fit measures or incremental fit indices** refer to how well the estimated model fits relative to some alternative baseline model (Hair et al, 2010)

- Normed fit index (NFI): NFI is calculated on how large a part of the way from the independence model to the perfect fitting model, the value ranges from 0 to 1.00. Usually, values larger than 0.95 indicate a good fit (Blunch, 2008). One disadvantage is models that are more complex will necessarily have higher index values and artificially inflate the estimate of the model fit. This has resulted in less use of this measure for model fit estimation (Hair et al, 2010).
- Comparative fit index (CFI): CFI has been modified from the norm fit index (NFI) by taking the degree of freedom into consideration. Usually, values larger than 0.95 indicate a good fit (Blunch, 2008). CFI is widely used because it's relative but not complete, and insensitive to model complexity (Hair et al, 2010).

#### 4.5.4.3 Parsimony adjusted measures

- PRATIO (parsimony ratio): PRATIO is defined as a factor by taking parsimony into consideration when the model has been adjusted. Usually, a value larger than 0.60 is satisfactory (Blunch, 2008).
- PNFI (parsimony normed fit index): PNFI adjusts the normed fit index (NFI) by multiplying it by the PR. Higher values indicate better fit (Hair et al, 2010).

From the above measures, this study uses absolute fit measures and relative fit measures to estimate the fit of model. All fit indices used are summarized below in Table

Table 4.3 Structural measurement model fit indices and recommended values

Fit statistics	Recommended values
Chi-square ( $\chi^2$ )	P value > 0.05
Chi-square / d.f.	$\leq 2$ (Tabachnick and Fidell, 2007)
RMSEA	$\leq 0.05$ good fit (Browne and Cudeck, 1993)
GFI	$\geq 0.9$ (Bagozzi and Yi, 1988)
AGFI	$\geq 0.8$
NFI	$\geq 0.95$ good fit
CFI	$\geq 0.95$ good fit (Hu and Bentler, 1999)

#### 4.5.5 Modification indices

When the model does not satisfy the fit indices, modification indices are observed for the error correlations. According to Hair et al (2010), modification indices of 4.0 or greater suggest the adjustment of the model by freeing the corresponding path to be estimated. However, modifications should be done based on theory and content rather than statistical decisions only (Anderson and Gerbing, 1988; Kline 2005)

In conclusion, this research used structural equation modeling (SEM) to examine all seven hypotheses. Data was collected by survey of firms in the electrical appliance industry as the target sample. Goodness-of-fit statistics assessed the model including the convergent validity and discriminant validity

## Chapter V

### Data Analysis and Results

This chapter provides a description of the data analysis, including the test of non-response bias, validity and reliability test of the measurement model, and the results of the structural equation modeling. All measures were accessed to test the hypothesis.

#### 5.1 Data preparation

##### 5.1.1 Handling missing values

It is important to consider the method of solving the problem of missing data if more than 10 percent of the data items are missing (Hair et al, 2010). However, four cases in the current study with less than 10 percent of total data were eliminated due to the significant amount of data missing. Therefore, only 274 complete surveys were usable for data analysis.

##### 5.1.2 Non-response bias

According to Armstrong and Overton (1977), the t-test is used for non-response bias between early and late respondents. Of the sample of 274 firms, the first and the last 50 responses were used to compare the difference between two groups. The results of the t-test in Table 5.1 indicate that there is no statistically significant difference.

#### 5.2 Descriptive statistics

##### 5.2.1 Respondents' demographic information

This study collected 274 electrical appliance manufacturing company's respondents. The responding companies represent a number of electrical products and components, as illustrated in Table 5.2. The respondents were employed in a variety of

electrical product and component businesses. Most of the respondents were manufacturers of electronic parts for other products (52.6%) including small electronic parts for rice cookers, vacuum bottles and electric fans, followed by 90 in air-conditioning and components (32.8%), 24 in TV/video/stereo and components (9.9%), 14 in refrigerators (5.1%), and 2 in radio and components (0.7%).

Table 5.1 t-test of means for initial 50 and last 50 responses

Constructs	Reply	N	Mean	SD	t-value	D.f.	Sig
PER	Early	50	8.220	0.748	0.504	93.872	0.615
	Late	50	8.135	0.926			
CAP	Early	50	7.495	1.133	-1.069	88.288	0.288
	Late	50	7.705	0.802			
COM	Early	50	6.930	1.775	-0.549	95.182	0.584
	Late	50	7.110	1.492			
EVA	Early	50	10.230	1.948	0.452	97.843	0.652
	Late	50	10.050	2.028			
INC	Early	50	10.070	2.668	-0.424	95.428	0.672
	Late	50	10.280	2.261			
BSR	Early	50	7.550	1.016	0.503	97.801	0.616
	Late	50	7.450	0.971			
TSI	Early	50	7.310	0.949	0.925	97.540	0.357
	Late	50	7.140	0.886			
SPI	Early	50	6.980	1.142	-0.201	95.760	0.841
	Late	50	7.030	1.333			

Table 5.2 Respondents' products or components in the electrical appliance business in Thailand

Product / Component	Frequency	%
Radio and Components	2	.7
Air-Conditioning and Components	90	32.8
Refrigerator	14	5.1
TV/Video/Stereo and components	24	9.9
Other Electrical parts	144	52.6

As illustrated in Table 5.3, most of the respondents were foreign companies (43.4%). Japan's investment was the highest among investors, followed by Taiwan, Germany, and Denmark. The number of employees indicates the diversification of the organization ranging from small in size to large. Small and medium enterprises were mostly electrical and components firms in Thailand. The electrical appliance industry consisted of 138 firms (50.4%) with less than 200 employees, 95 firms (38.3%) employed 200 – 1,500 employees and large firms of more than 2,000 employees constituted 31 firms (11.3%).

The buying firm respondents comprised executives at the level of chief executives, department managers and operation staff as shown in Table 5.4. Most of the survey respondents were department managers (139 firms, 50.7%), chief executives (53 firms, 19.3%) and operational staff (82 firms, 29.9%).

Table 5.3 Demographic data of buying firms

<b>Ownership type</b>		
Thai	65	23.7
Joint venture	90	32.8
Foreign investment	119	43.4
<b>Authorized capital investment</b>		
Below 50 million baht	136	49.6
51 – 200 million baht	98	35.8
More than 200 million baht	40	14.6
<b>No. of employees (persons)</b>		
Less than 200	138	50.4
200 – 500	58	21.2
501 – 1,000	29	10.6
1,001 – 1,500	8	2.9
1,501 – 2,000	10	3.6
More than 2,000	31	11.3

Table 5.4 Respondents' position level

<b>Position Level</b>		<b>%</b>
Chief executives / Managing directors	53	19.3
Department managers	139	50.7
Operational staff	82	29.9

Table 5.5 presents the department respondents worked in. Most respondents came from the purchasing and supply department (73.3%) due to their being the most familiar to their suppliers, followed by 25 logistics and supply chain departments

(13.6%), 38 administration / secretarial offices (13.6%) and 11 others (4.0%) including production, research and development and transportation.

Table 5.5 Department of respondents

Department		%
Purchasing / Supply / Materials	200	73.3
Logistics and Supply Chain	25	9.1
Administration / Secretarial Office	38	13.6
Others	11	4.0

The status of the responding companies in the supply chain and sources of materials are reported in Table 5.6. Brand producers were mostly in the electrical and electronics industry (99 firms, 36.1%). There were 78 firms who were first tier suppliers (28.5%) and 72 firms who were OEMs (26.3%). Second tier (21 firms, 7.7%) and third tier suppliers (4 firms, 1.5%) comprised a minority of the target sample. 160 firms were in domestic sourcing (58.4%) and 114 firms were in outbound sourcing (41.6%).

Table 5.6 Status of the buying firm in the supply chain

Status		%
Brand producer	99	36.1
Original Equipment Manufacturers (OEMs)	72	26.3
First tier supplier	78	28.5
Second tier supplier	21	7.7
Third tier supplier	4	1.5
<b>Source of raw materials</b>		
Domestic	160	58.4
Outbound	114	41.6



Table 5.7 provides the supplier data including the number of suppliers engaged in the supplier development program and working lengths. Approximately 60% of the responding firms had less than 10 potential suppliers in their supplier base. The average length of the relationship between the buying firm and supplier was approximately 8 years.

Table 5.7 Supplier data of supplier developments

Potential supplier who engaged in supplier development (no. of suppliers)		%
1 -10	169	61.7
11 – 20	45	16.4
21 – 30	13	4.7
31 – 40	25	9.1
41 – 50	8	2.9
More than 50	14	5.1
Working length (years)		%
1 – 5	68	24.8
6 - 10	104	38.0
11 – 15	53	19.3
16 – 20	36	13.1
More than 20	13	4.7

Table 5.8 presents the objective for the supplier development. Cost improvements / reduction and product quality improvements were ranked as the most important objectives for supplier development (108 firms (39.4%) and 80 firms (29.2%), respectively).

Table 5.8 Objectives for supplier development

Main Objective for Development		%
Cost improvements / reduction	108	39.4
Delivery improvements	29	10.6
Working process improvements and developments	8	2.9
Product quality improvements	80	29.2
Managerial improvements	20	7.3
Service quality improvements	29	10.6

### 5.2.2 Mean and correlation statistics of constructs

The mean statistics of variables are reported in Table 5.9. The structural model consisted of the eight first-order constructs of supplier's capabilities, supplier's performance, supplier competition, supplier evaluation, supplier incentives, buyer-supplier relationship, transaction-specific investment and supplier performance improvement.

Table 5.9 Mean statistics of first order constructs. All constructs are measured as frequency of use on a 10 point scale (0 – not important, 9 - most important)

Constructs	Variables and Survey Questions	Mean	SD	Min	Max
<b>CAP</b>	<b>Supplier's capabilities:</b>				
CAP1	Technical capabilities	7.79	1.019	3	9
CAP2	Good quality system	8.00	0.993	5	9
CAP3	Flexibilities of product volume changes	6.89	1.666	1	9
CAP4	Financial strength	6.77	1.802	1	9
CAP5*	Good reputation	6.67	1.699	1	9
<b>PER</b>	<b>Supplier's performance:</b>				
PER1*	Raw materials prices	8.30	0.924	4	9
PER2	Total cost of acquisition	7.51	1.394	3	9
PER3	On-time deliveries	7.95	1.085	5	9
PER4	Specification of product quality	8.29	0.922	5	9
PER5*	Quality of design	7.29	1.581	0	9
PER6*	Delivery lead time	7.34	1.432	0	9
PER7	After sales services	8.07	1.027	4	9
<b>COM</b>	<b>Supplier competition:</b>				
COM1	Few suppliers	7.33	1.593	0	9
COM2*	Many suppliers	5.86	2.159	0	9
COM3	Better pricing	6.88	1.721	0	9
<b>EVA</b>	<b>Supplier evaluation:</b>				
EVA1	Assessed this supplier performance through formal evaluation, using established guidelines and procedures	7.09	1.538	1	9

Table 5.9 Mean statistics of first order constructs. All constructs are measured as frequency of use on a 10 point scale (0 – not important, 9 - most important) (Continued)

Constructs	Variables and Survey Questions	Mean	SD	Min	Max
<b>EVA</b>	<b>Supplier evaluation:</b>				
EVA2*	Assessed this supplier performance through informal evaluation	7.08	1.363	1	9
EVA3	Provided this supplier with feedback about results of its evaluation	6.27	1.629	1	9
<b>INC</b>	<b>Supplier incentives:</b>				
INC1*	Used supplier certification programs to reduce the complexity of quality checks before check-in at the plant	6.78	1.752	0	9
INC2	Promise of higher volume purchased for improving current performance	6.94	1.449	0	9
INC3	Promise of future business such as consideration for future business	6.96	1.432	0	9
<b>BSR</b>	<b>Buyer-supplier relationship:</b>				
BSR1	You expect that the relationship with this supplier will last a very long time	7.95	0.982	5	9
BSR2*	You had communication on two-way communications with this supplier	7.74	1.121	4	9
BSR3	You exchanged important or confidential information with this supplier	7.74	1.127	5	9
BSR4	You spent time devoting and seeking joint solutions with this supplier when problems occurred	7.43	1.102	4	9

Table 5.9 Mean statistics of first order constructs. All constructs are measured as frequency of use on a 10 point scale (0 – not important, 9 - most important) (Continued)

Constructs	Variables and Survey Questions	Mean	SD	Min	Max
<b>BSR</b>	<b>Buyer-supplier relationship:</b>				
BSR5	You and this supplier have clarified the sharing of benefits for mutual business development	7.54	1.272	3	9
<b>TSI</b>	<b>Transaction-specific investment:</b>				
TSI1	You have engaged directly in your own assets and capital to develop this supplier	6.88	1.229	4	9
TSI2	You have shared or integrated key processes and activities including adaptations of production lines with supplier	7.35	.954	5	9
TSI3	You have sent engineering and personnel to assist this supplier in improving their performance	7.31	1.035	4	9
TSI4	You have provided the education and training program of this supplier	7.54	.995	5	9
<b>SPI</b>	<b>Supplier performance improvement:</b>				
SPI1*	Raw materials prices	6.81	1.475	3	9
SPI2	Operation cost used for this supplier	7.10	1.286	3	9
SPI3	Development period from design until production	6.78	1.268	2	9
SPI4	Percentage of on-time deliveries	7.52	1.321	2	9
SPI5	Number of incoming defects	7.69	1.035	4	9
SPI6*	Number of complaints from customer	7.00	1.870	1	9

(\*) Items were dropped due to low loadings during scale purification for Confirmatory Factor Analysis

As illustrated in Table 5.9, in terms of the supplier's capabilities attributes, the buying firms viewed a good quality system, with the highest mean, as being the most important among all criteria. The mean values among all criteria ranged from 6.67 – 8.00, SD; 0.993– 1.802.

Raw material price was ranked first with the highest mean regarding performance criteria (mean = 8.30, SD = 0.924). The mean values among variables ranged from 7.29 – 8.30: SD; 0.922 - 1.581.

The means of variables for supplier competition were slightly different: few suppliers (mean = 7.33, SD = 1.593), many suppliers (mean = 5.86, SD = 2.159) and better pricing (mean = 6.88, SD = 1.721).

Formal evaluation and informal evaluation ranked first with the highest mean concerning supplier evaluation (mean = 7.09 and 7.08: SD = 1.538 and 1.363, respectively).

The means of the variables for supplier incentives were very close (mean = 6.78, 6.94, 6.96: SD = 6.78, 6.94, 6.96, respectively).

Long-term relationship ranked first with the highest mean among buyer-supplier relationship variables (mean = 7.95, SD = 0.982). The mean of the remaining variables were very close: communication (mean = 7.74, SD = 1.121), information exchange (mean = 7.74, SD = 1.127), time devoted (mean = 7.43, SD = 1.102) and benefit sharing (mean = 7.54, SD = 1.272).

The means of variables for transaction-specific investment were slightly different: own direct investment (mean = 6.88, SD = 1.229), shared or integrated key process (mean = 7.35, SD = 0.954), personnel assistant (mean = 7.31, SD = 1.035) and training program (mean = 7.54, SD = 0.995).

Number of incoming defects ranked first with the highest mean among variables (mean = 7.69, SD = 1.035), followed by on-time deliveries (mean = 7.52, SD = 1.321), operation costs used (mean = 7.10, SD = 1.286), number of complaints by customers (mean = 7.00, SD = 1.870), raw material prices (mean = 6.81, SD = 1.475) and development period (mean = 6.78, SD = 1.268).

Table 5.10 Correlations of first-order and second-order constructs

	First-order							Second-order			
	PER	CAP	COM	EVA	INC	BSR	TSI	SS	SD	BSC	SPI
PER	1										
CAP	.459**	1									
COM	.002	.155*	1								
EVA	.175**	.223**	.405**	1							
INC	.014	.194**	.326**	.421**	1						
BSR	.134*	.170**	.333**	.263**	.325**	1					
TSI	.064	.221**	.252**	.290**	.161**	.468**	1				
SS	.813**	.891**	.102	.236**	.134*	.180**	.178**	1			
SD	.092	.252**	.683**	.819**	.790**	.393**	.301**	.212**	1		
BSC	.117	.228**	.343**	.323**	.287**	.866**	.847**	.209**	.407**	1	
SPI	.136*	.204**	.331**	.371**	.387**	.483**	.407**	.204**	.474**	.521**	1

\*\* P < 0.01, \* P < 0.05

The correlations among variables are reported in Table 5.10. The correlation coefficients of the relationships between supplier selection (SS) and the two first-order constructs of supplier performance (PER) and supplier capabilities (CAP) were 0.813 and 0.891, p-value < 0.01, respectively. The two first-order constructs between buyer-supplier relationship (BSR) and transaction-specific investment (TSI) were highly related to buyer-supplier commitment (BSC);  $r = 0.866$  and  $0.847$ , p-value < 0.01. The correlation coefficients of the relationships between supplier development (SD) and the two first-order constructs of supplier competition (COM), supplier evaluation (EVA) and supplier incentives (INC) were 0.683, 0.819 and 0.790, p-value < 0.01. The correlations among the second-order constructs were significantly positive, between 0.204 – 0.521, p-value < 0.01. Most of the correlations among first-order and second-order constructs were reasonably low, with the largest value of 0.468 and 0.521, p-value < 0.01, respectively.

### **5.3 Measurement Model Assessment**

Firstly, confirmatory factor analysis (CFA) was used to assess all constructs. Few studies have explored buyer-supplier commitment based on the combination of the buyer-supplier relationship and transaction-specific investment. EFA was conducted in this study. Two components were extracted by Principal Axis Factoring method. The KMO result for this data set was 0.872. Therefore, the result indicated that the factor analysis was appropriate. Five factors were extracted to represent the buyer-supplier relationship and the remaining four factors represented transaction-specific investment as illustrated in Table 5.11



Table 5.11 Factor Analysis of Buyer-Supplier Commitment

	Factor Loadings	
	Component1	Component2
Cost/Risk/Benefit sharing	<b>.804</b>	.270
Working lengths	.695	.111
Information exchange	.639	.216
Time devoted when problems occur	.609	.254
Communication	<b>.580</b>	.286
Send technician to site	.224	<b>.747</b>
Training	.237	<b>.681</b>
Shared/Integrated process	.221	<b>.674</b>
Company's own investment	.200	<b>.656</b>

For this study, supplier selection served as an independent variable in the measurement model for exogenous constructs which is shown below in Figure 5.1

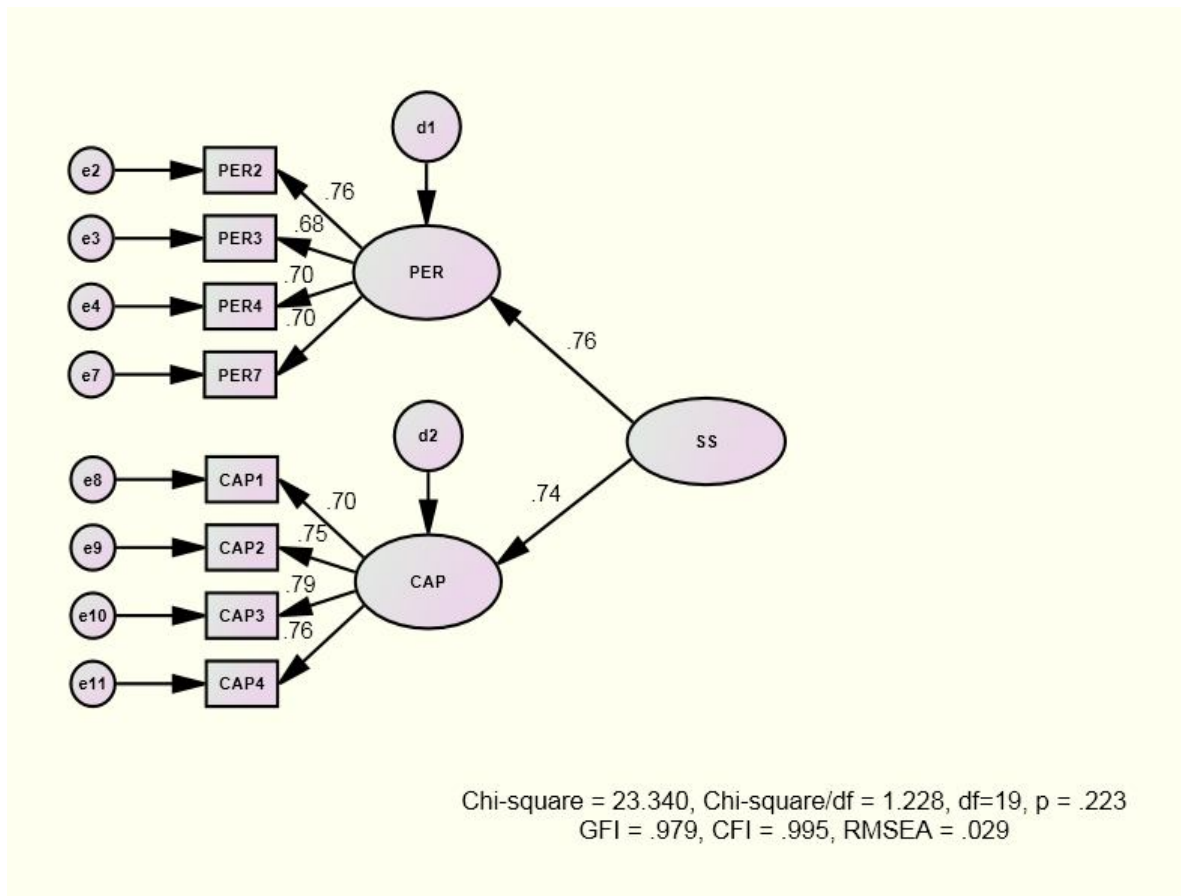


Figure 5.1 The measurement model for exogenous constructs

The goodness of fit indices suggested a good fit model; p-value = 0.223, Chi-square = 23.340, Chi-square/df = 1.228, df. = 19, GFI = 0.979, CFI = 0.995, RMSEA = 0.029.

Similarly, supplier development, buyer-supplier commitment and performance improvement represented the endogenous latent constructs, which are the dependent variables of the measurement model.

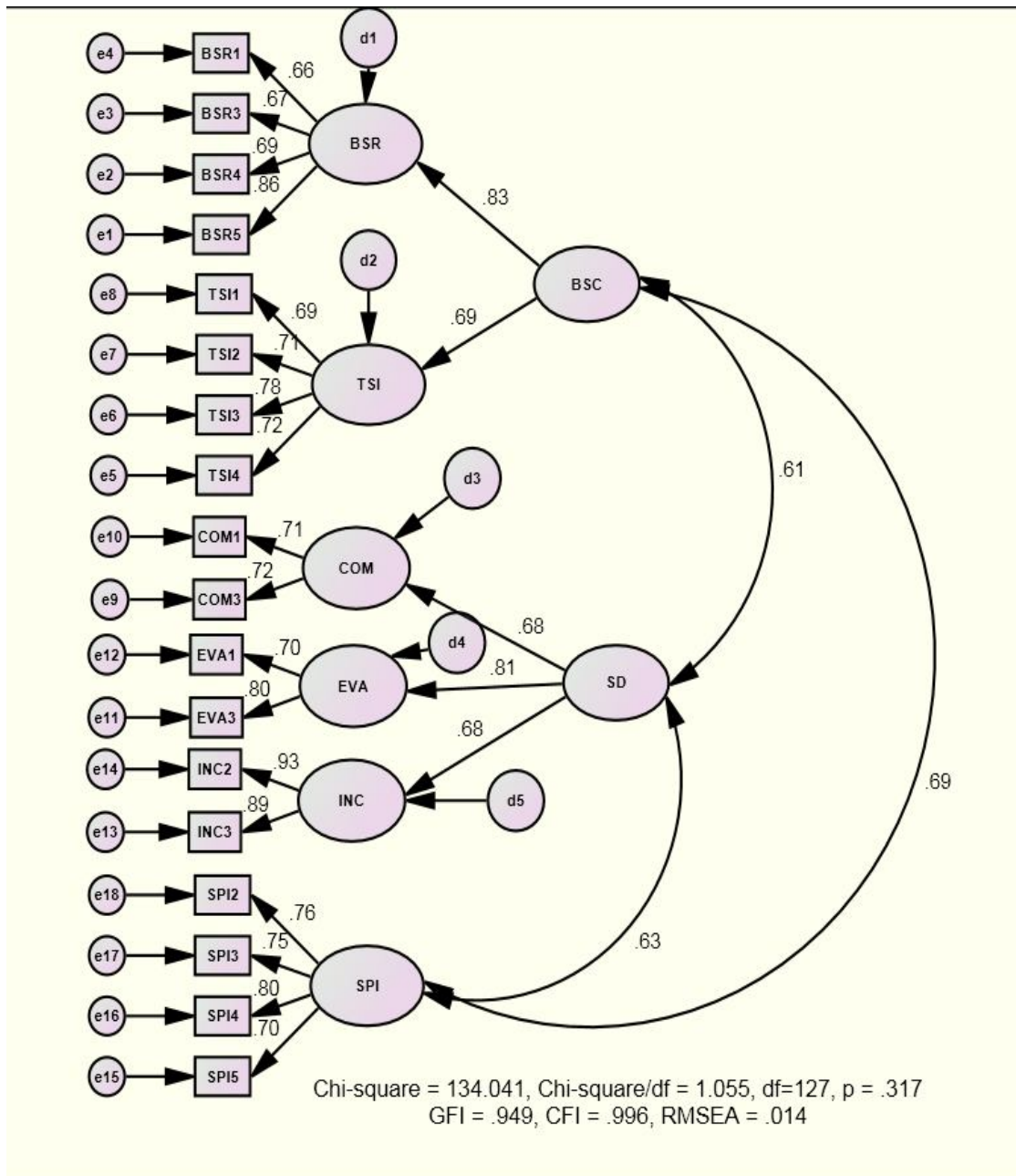


Figure 5.2 the measurement model for endogenous constructs

As shown in Figure 5.2, the goodness of fit indices indicated a good fit model; p-value = 0.317, Chi-square = 134.041, Chi-square/df = 1.055, df. = 127, GFI = 0.949, CFI = 0.996, RMSEA = 0.014.

The initial CFA results indicated the fit indices as shown in Figures 5.1 and 5.2. All constructs of supplier selection – supplier development, buyer-supplier commitment and performance improvements – indicated the good fit of all indices.

Table 5.12 Summary of factor loadings of measurement model

Factors	PER		CAP		COM		EVA		INC		BSR		TSI		SPI	
	Loading	t-value	Loading	t-value	Loading	t-value	Loading	t-value	Loading	t-value	Loading	t-value	Loading	t-value	Loading	t-value
PER2	0.762	10.327														
PER3	0.780	9.550														
PER4	0.675	9.738														
PER7	0.714	N/A														
CAP1			0.700	10.816												
CAP2			0.747	11.507												
CAP3			0.795	12.022												
CAP4			0.766	N/A												
COM1					0.706	6.723										
COM3					0.723	N/A										
EVA1							0.695	8.407								
EVA3							0.802	N/A								
INC2									0.934	14.548						
INC3									0.895	N/A						
BSR1											0.664	11.147				
BSR3											0.665	11.175				
BSR4											0.692	11.696				
BSR5											0.862	N/A				
TSI1													0.691	10.056		
TSI2													0.708	10.269		
TSI3													0.778	11.032		
TSI4													0.718	N/A		
SPI2															0.760	11.082
SPI3															0.754	11.011
SPI4															0.798	11.521
SPI5															0.702	N/A

### 5.3.1 Construct validity

5.3.1.1 **Convergent validity** can be accessed from the measurement model which indicated a good fit both of the endogenous and exogenous constructs as illustrated in Figures 5.1 and 5.2. Furthermore, convergent validity can be accessed by reviewing the factor loading of each indicator with a higher value of 0.5 with a significant t-value ( $t > 2.0$ ). Regarding the results of the measurement model presented in Table 5.12, all indicators were above the 0.5 value with a t-value above 2.0. These can represent a satisfactory convergent validity.

5.3.1.2 **Discriminant validity** can be accessed by examining the average variance extracted (AVE) which should be greater than shared variance (square correlation) between constructs as shown in Tables 5.13 and 5.14

Table 5.13 The squared correlations and average variance extracted of first-order constructs

	PER	CAP	COM	EVA	INC	BSR	TSI
PER	<b>0.507</b>						
CAP	0.211	<b>0.561</b>					
COM	0.000	0.024	<b>0.511</b>				
EVA	0.031	0.050	0.164	<b>0.563</b>			
INC	0.000	0.038	0.106	0.177	<b>0.837</b>		
BSR	0.018	0.029	0.111	0.069	0.106	<b>0.526</b>	
TSI	0.004	0.049	0.064	0.084	0.026	0.219	<b>0.525</b>
CR	<b>0.804</b>	<b>0.836</b>	<b>0.676</b>	<b>0.719</b>	<b>0.911</b>	<b>0.814</b>	<b>0.815</b>
Cronbach	<b>0.795</b>	<b>0.809</b>	<b>0.674</b>	<b>0.715</b>	<b>0.911</b>	<b>0.810</b>	<b>0.810</b>

**Note:** Average variance extracted is presented on the diagonal, squared correlations are below the diagonal

Table 5.14 The squared correlations, average variance extracted, Cronbach's alpha and composite reliabilities of second-order constructs

	SS	SD	BSC	SPI
SS	<b>0.558</b>			
SD	0.045	<b>0.524</b>		
BSC	0.044	0.166	<b>0.584</b>	
SPI	0.042	0.225	0.271	<b>0.569</b>
CR	<b>0.716</b>	<b>0.766</b>	<b>0.736</b>	<b>0.840</b>
Cronbach	<b>0.829</b>	<b>0.784</b>	<b>0.837</b>	<b>0.838</b>

**Note:** Average variance extracted is presented on the diagonal, squared correlations are below the diagonal

**5.3.2 Reliabilities** Cronbach's coefficient alpha was used to assess the scale reliability. The Cronbach's alpha values were all above the acceptable level of 0.7 as shown in Table 5.14 (Nunnally, 1978). In addition, the composite reliability coefficient (CR) for supplier selection, buyer-supplier commitment, supplier selection and supplier performance improvements were 0.716, 0.776, 0.736 and 0.840, respectively, exceeding the threshold of 0.6 suggested by Bagozzi and Yi, (1988).

#### 5.4 Structural model and hypothesis testing

After testing the measurement model as recommended by Anderson and Gerbing (1988), some factors were dropped due to CFA purification. The final factor loadings of the structural model are shown in Table 5.15. For this study, all of the loadings were higher than 0.6 (Bagozzi and Yi, 1988) which implied that the relationship

between the indicators and the constructs was significant. The structural results are shown in Figure 5.3. The fit indices indicated a good fit for the overall model of  $\chi^2 = 49.99$ ,  $\chi^2/\text{d.f.} = 1.316$ ,  $p\text{-value} = 0.092$ ,  $\text{RMSEA} = 0.036$ ,  $\text{CFI} = 0.984$ ,  $\text{GFI} = 0.967$

Table 5.15 Final factor loading

Constructs	Variables and Survey Questions	Loading
<b>CAP</b>	<b>Supplier's capabilities:</b>	
CAP1	Technical capabilities	0.692
CAP2	Good quality system	0.745
CAP3	Flexibilities of product volume changes	0.777
CAP4	Financial strength	0.734
<b>PER</b>	<b>Supplier's performance:</b>	
PER2	Total cost of acquisition	0.761
PER3	On-time deliveries	0.677
PER4	Specification of product quality	0.696
PER7	After sales services	0.697
<b>COM</b>	<b>Supplier competition:</b>	
COM1	Few suppliers	0.704
COM3	Better pricing	0.724
<b>EVA</b>	<b>Supplier evaluation:</b>	
EVA1	Assessed this supplier performance through formal evaluation, using established guidelines and procedures	0.701
EVA3	Provided this supplier with feedback about results of its evaluation	0.794
<b>INC</b>	<b>Supplier incentives:</b>	
INC2	Promise of higher volume purchased for improving current performance	0.936

Table 5.15 Final factor loading (Continued)

Constructs	Variables and Survey Questions	Loading
<b>BSR</b>	<b>Buyer-supplier relationship:</b>	
INC3	Promise of future business such as consideration for future business	0.892
BSR1	You expect that the relationship with this supplier will last a very long time	0.664
BSR3	You exchanged important or confidential information with this supplier	0.664
BSR4	You spent time devoting and seeking a joint solution with this supplier when problems occurred	0.691
BSR5	You and this supplier have clarified the sharing of benefit for mutual business development	0.862
<b>TSI</b>	<b>Transaction-specific investment:</b>	
TSI1	You have engaged directly in your own assets and capital to develop this supplier	0.691
TSI2	You have shared or integrated key processes and activities including adaptations of production lines with this supplier	0.708
TSI3	You have sent engineering and personnel to assist this supplier in improving their performance	0.777
TSI4	You have provided education and training programs for this supplier	0.718
<b>SPI</b>	<b>Supplier performance improvement:</b>	
SPI2	Operation cost used for this supplier	0.758



Table 5.15 Final factor loading (Continued)

Constructs	Variables and Survey Questions	Loading
SPI	Supplier performance improvement:	
SPI3	Development period from design until production	0.754
SPI4	Percentage of on-time deliveries	0.798
SPI5	Number of incoming defects	0.702

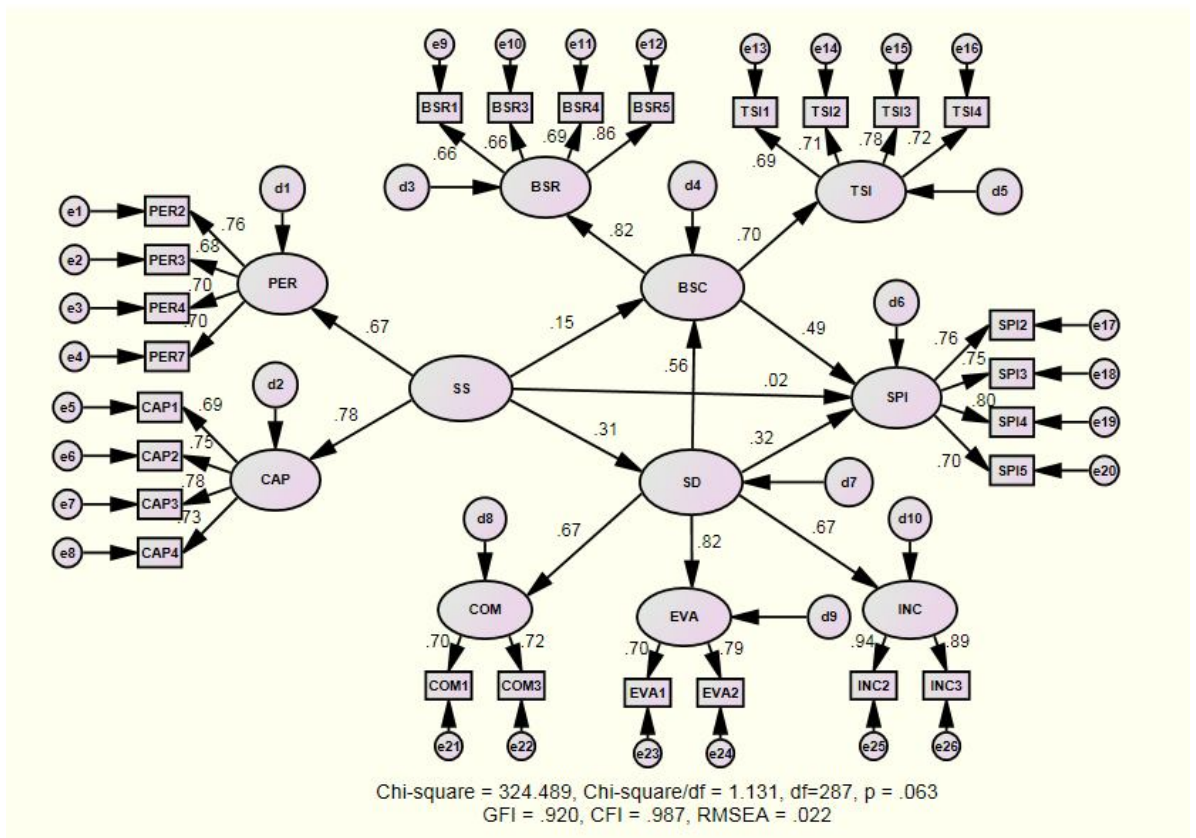


Figure 5.3 The structural model with fit indices

### 5.4.1 Direct effect

As can be seen in Table 5.16, of all the hypotheses, H1 and H2 were not supported in this study. There was no direct relationship between supplier selection and supplier performance (H1). Similar to H1, there was no direct relationship between supplier selection and buyer-supplier commitment (H2). However, the relationships between supplier development and performance improvements (Loading = 0.318,  $p < 0.01$ ) and buyer-supplier commitment (Loading = 0.564,  $p < 0.001$ ) were significant and positive. Furthermore, there was a positive relationship between buyer-supplier commitment and performance improvement (Loading = 0.494,  $p < 0.001$ ). Therefore, H3, H4 and H5 were supported.

Table 5.16 Hypothesis Testing and Results of Direct Relationship

Structural Path	Effect	H	Std. Estimate	Result
Supplier selection → Supplier performance improvement	Direct	H1	0.016	Not Supported
Supplier selection → Buyer-supplier commitment	Direct	H2	0.153	Not Supported
Supplier selection → Supplier development	Direct	H3	0.311**	Supported
Supplier development → Buyer-supplier commitment	Direct	H4	0.564***	Supported
Supplier development → Supplier performance improvement	Direct	H3	0.318**	Supported
Buyer-supplier commitment → Supplier performance improvement	Direct	H5	0.494***	Supported

\*\*\*  $P < 0.001$ , \*\*  $P < 0.01$ , \*  $P < 0.05$

### 5.4.2 Mediation Effects

This study proposed two mediators. According to Hair et al (2010)'s mediation diagrams, the following relationships must exist to verify the mediation effects. First, there must be a significant relationship in the direct path between input and outcome constructs. Model 1 was tested to determine the direct relationship between supplier selection and supplier performance improvement as shown in Figure 5.4. The result of the model indicated a significant relationship between two constructs (Loading = 0.28,  $p < 0.05$ ). Second, the input construct must be significantly associated with the mediator. Model 2 (a, b) was tested and resulted in a significant relationship between supplier selection and buyer-supplier relationship (Loading = 0.33,  $p < 0.01$ ) and supplier development (Loading = 0.32,  $p < 0.01$ )

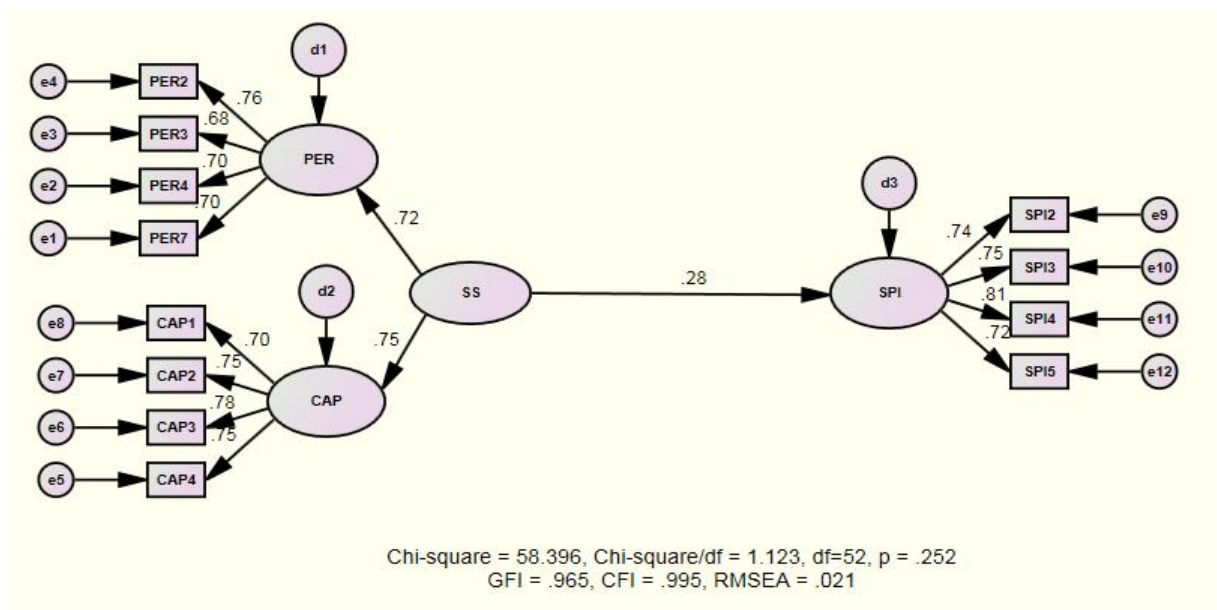


Figure 5.4 Model1\_Direct effects model between SS and SPI

Third, the mediator must have a relationship with the outcome constructs. Model 3 (a,b) indicated that both BSC (Loading = 0.68,  $p < 0.001$ ) and SD (Loading = 0.63,  $p$

< 0.001) had a significant relationship with SPI. From the above models, all pairs of constructs had a significant relationship. Then, the following conditions were tested to assess the level of mediation. First, if the relationship between SS and SPI remained significant and unchanged after adding the mediator, then mediation is not supported. Model 4 (a) indicated a non-significant relationship between SS and SPI once BSC was added to the model (Loading = 0.05  $p > 0.05$ ) which indicated that full mediation was supported. Similar to Model 4(a), Model 4(b) indicated that the coefficient of the direct relationship between SS and SPI was not statistically significantly after adding SD in the model (Loading = 0.05,  $p > 0.05$ ), indicating full mediation effects.

This study proposed a full model which included BSC and SD as mediators. Therefore, we tested the combined effects of BSC and SD in a multi-mediation model (Model 5).

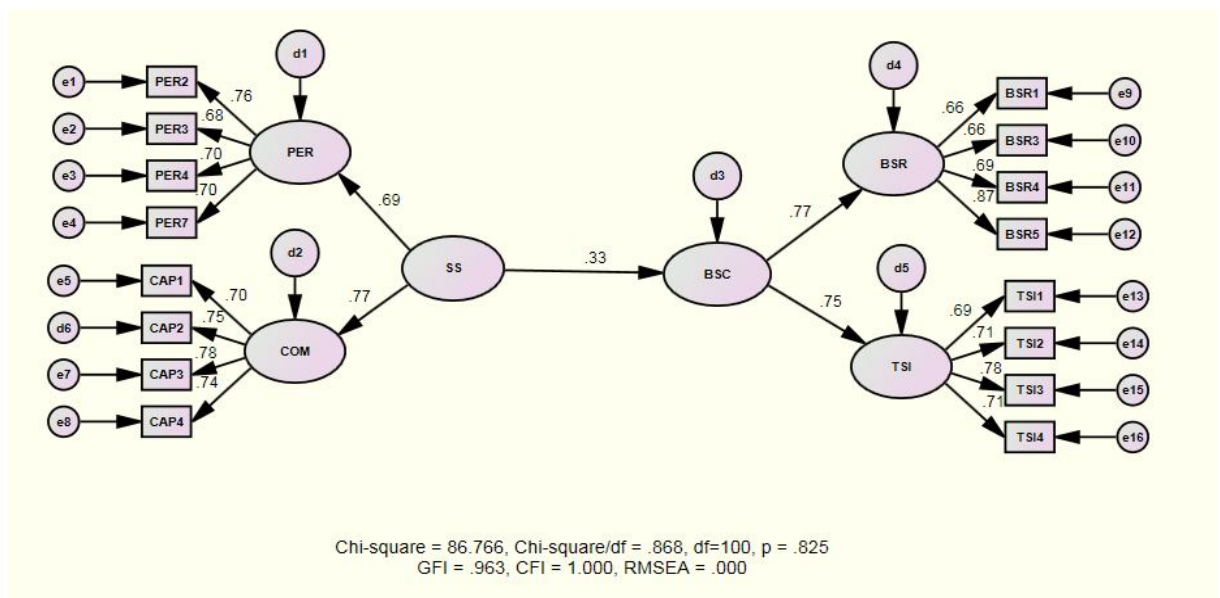


Figure 5.5 Model 2(a)\_Direct effects model between SS and BSC

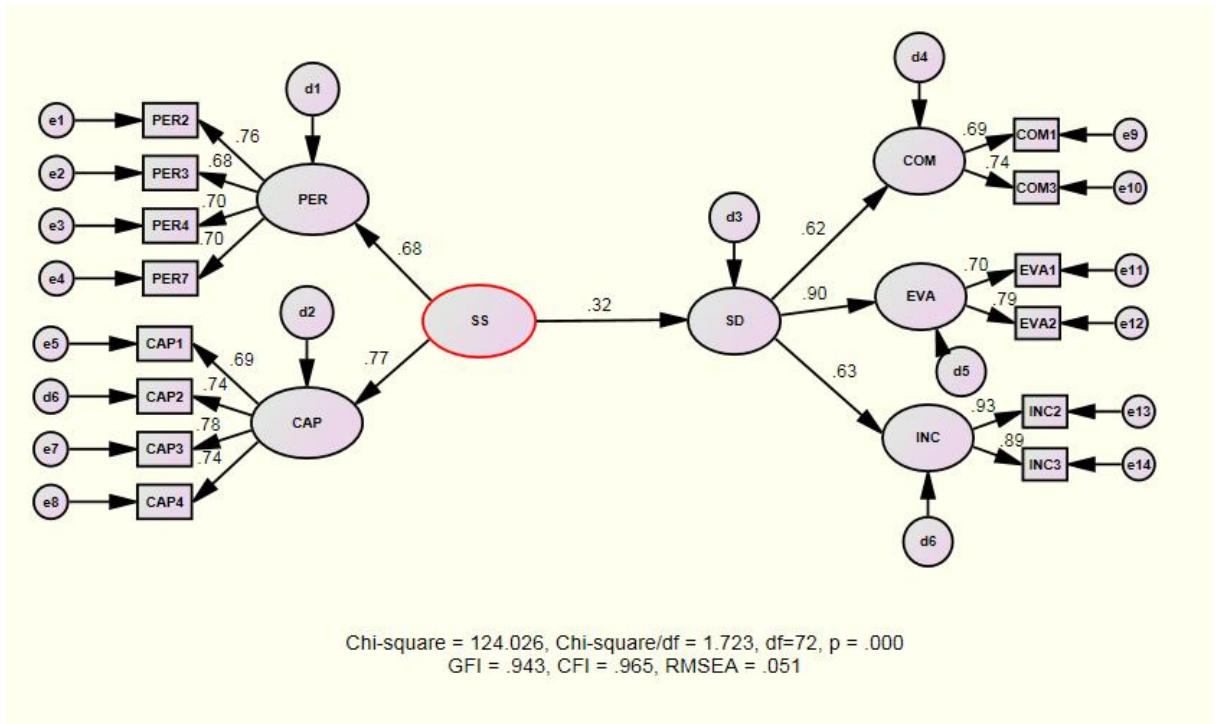


Figure 5.6 Model 2(b)\_Direct effects model between SS and SD

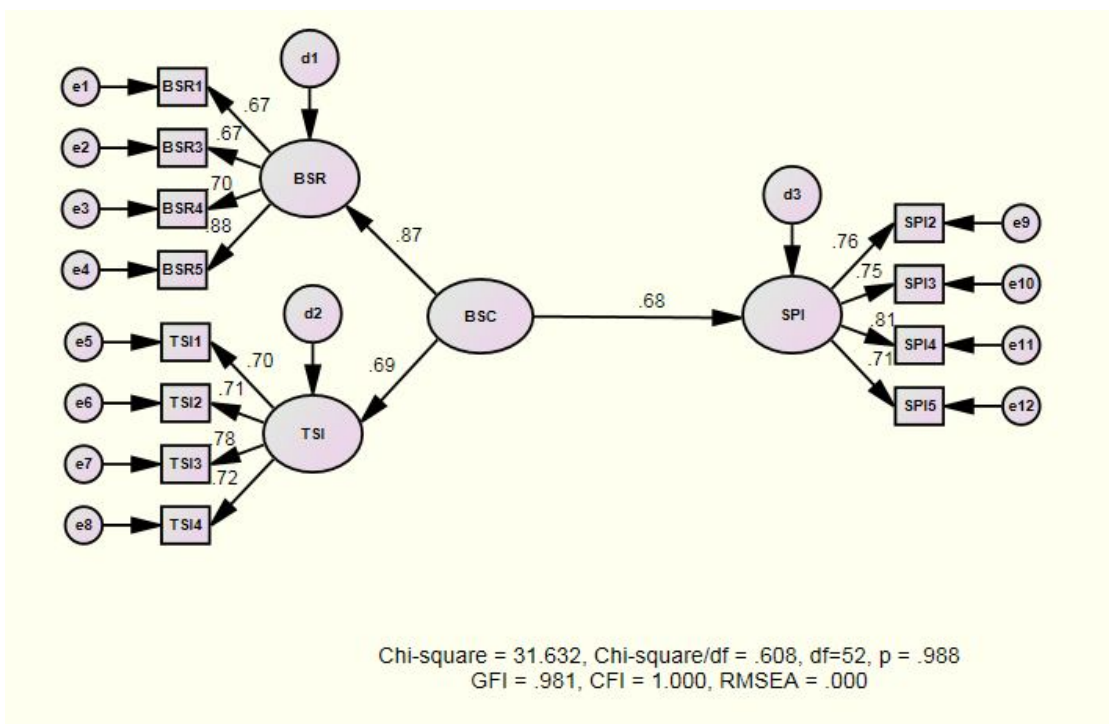


Figure 5.7 Model 3 (a)\_Direct effects model between BSC and SPI

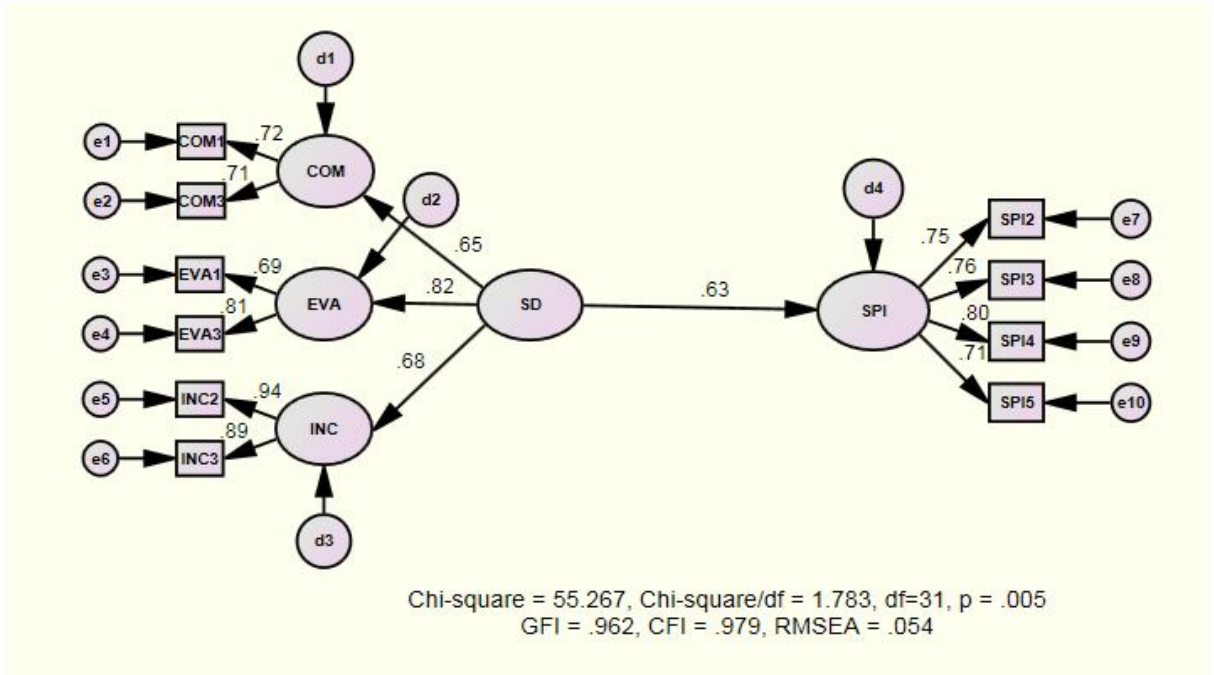


Figure 5.8 Model 3 (b)\_Direct effects model between SD and SPI

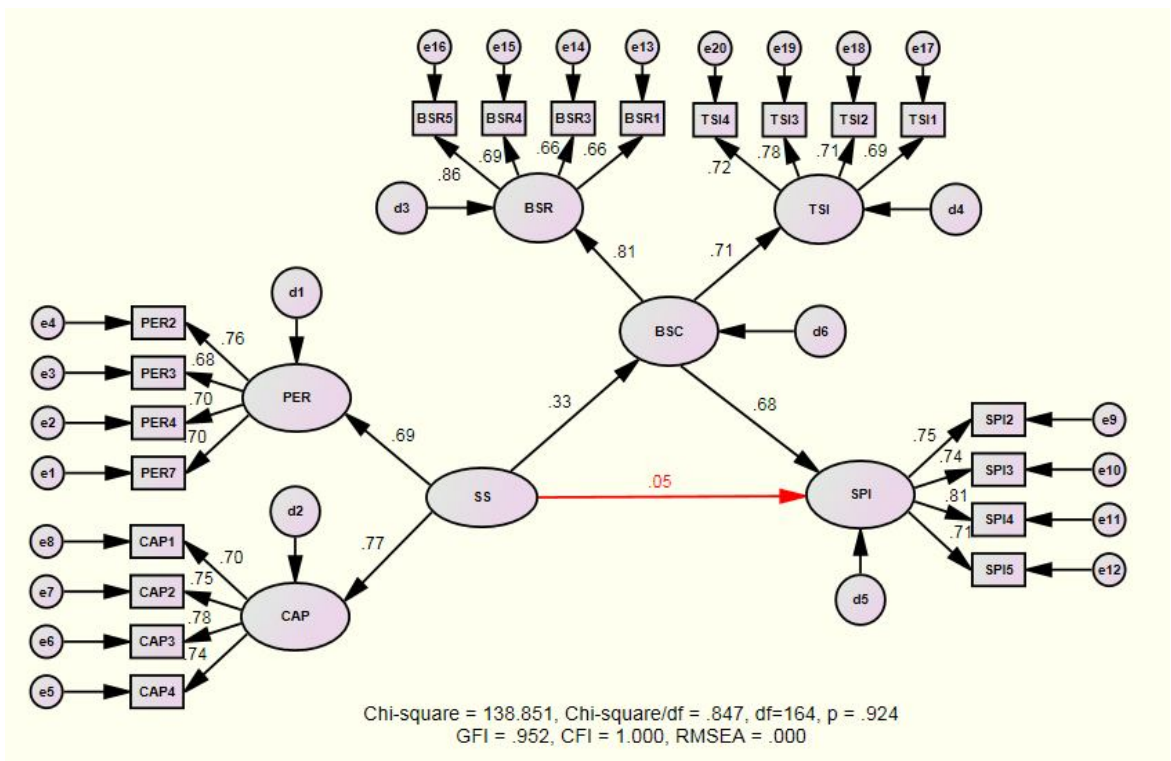


Figure 5.9 Model 4(a)\_Mediation effects model between SS, BSC and SPI



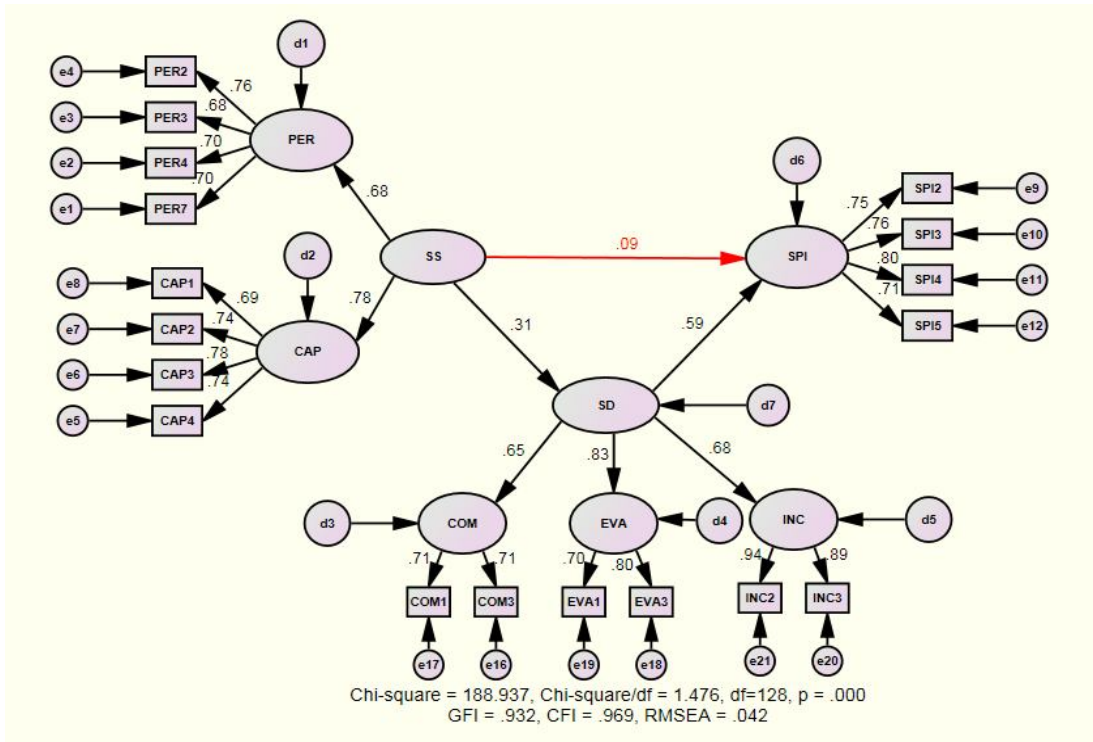


Figure 5.10 Model 4(b)\_Mediation effects model between SS, SD and SPI

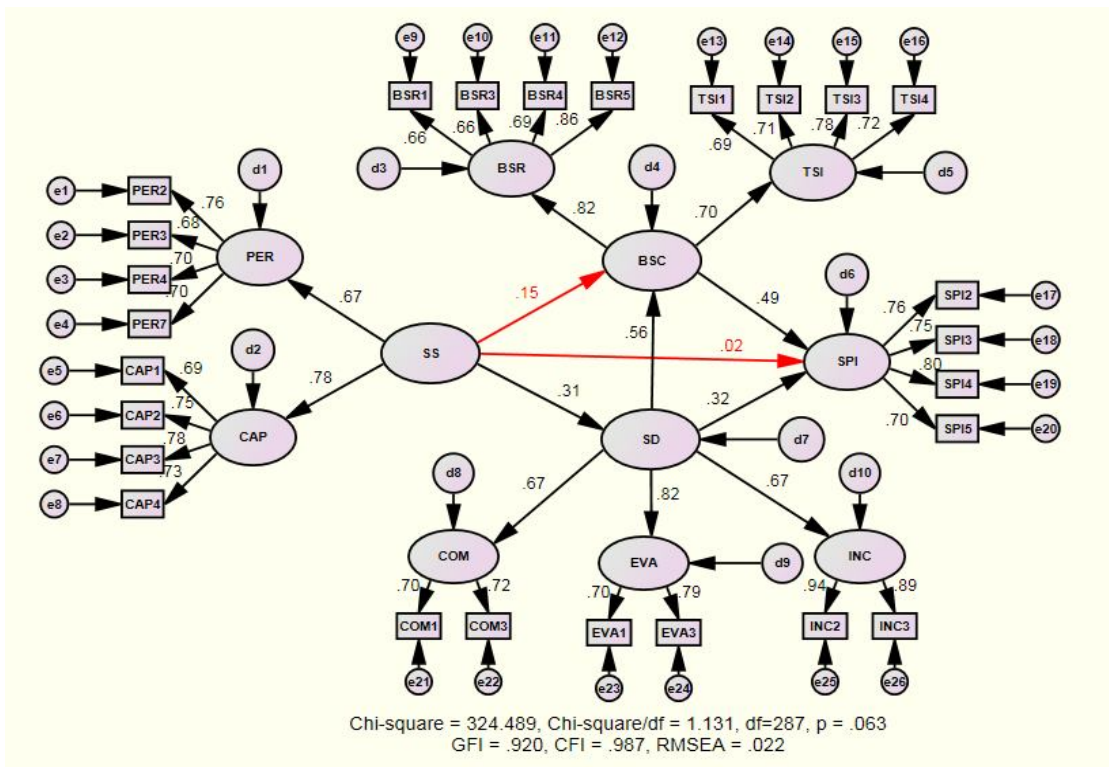


Figure 5.11 Model 5\_Multi mediation effects model

The results of the relationships for multi-mediation effects testing are shown in Figure 5.11. All path coefficients were significant except for the direct path between SS and BSC (Loading = 0.15,  $p > 0.05$ ), SS and SPI (Loading = 0.02,  $p > 0.05$ ). There were three indirect effects paths from SS to SPI through the mediators (SD and BSC): (1) SS  $\rightarrow$  BSC  $\rightarrow$  SPI; (2) SS  $\rightarrow$  SD  $\rightarrow$  SPI; (3) SS  $\rightarrow$  SD  $\rightarrow$  BSC  $\rightarrow$  SPI. To examine the mediation effects, the path from SS  $\rightarrow$  BSC becomes non-significant. This means that BSC does not act as a mediator. However, the other two indirect mediating effects still have significant relationships. As a result of Model 5, SD acts as a completed mediator from SS to SPI. Moreover, SD is still a facilitator from SS to BSC because SS is not associated directly with BSC.

#### 5.4.3 Total effect

From the direct and indirect effects, we summarized the total effects among all constructs as demonstrated in Table 5.17



Table 5.17 Summary of total effects between antecedents and dependent constructs

Dependent constructs	R <sup>2</sup>	Effects	Antecedents		
			SS	SD	BSC
SD	0.10	Direct	0.311	N/A	N/A
		Indirect	N/A	N/A	N/A
		Total	0.311	N/A	N/A
BSC	0.40	Direct	0.153	0.564	N/A
		Indirect	0.175	N/A	N/A
		Total	0.329	0.564	N/A
SPI	0.56	Direct	0.016	0.318	0.494
		Indirect	0.261	0.279	N/A
		Total	0.277	0.597	0.494

As can be seen in Table 5.17, there were three antecedent factors: *supplier selection (SS)*, *supplier development (SD)* and *buyer-supplier commitment (BSC)* that had effect on the three endogenous variables or dependent variables of supplier development (SD), buyer-supplier commitment (BSC) and supplier performance improvement (SPI). SD got the highest total effect from SS of 0.311. BSC got the highest effect from SD directly of 0.564. SPI got the highest effect from SD of 0.597, followed by BSC, with only a direct effect on SPI of 0.494. SPI got the least effect from SS of 0.277.

## Chapter VI

### Discussion and Conclusions

This final chapter discusses and analyzes the results from this study. This chapter outlines the limitations of the study and the recommendations for future research including the theoretical and managerial implications of the study.

#### 6.1 Discussion

This research examined the structural model of the buying firm's efforts to improve supplier performance. Three factors were proposed to enhance supplier performance: supplier selection, supplier development and buyer-supplier commitment. Buyer-supplier commitment and supplier development are the key proposed mediators. The total of 274 complete surveys was collected to test the hypotheses. The structural model was analyzed in AMOS 20.0 using confirmatory factor analysis.

Based on the results, several key interesting and managerial insights and implications are discussed.

##### 6.1.1 Supplier selection and supplier performance

The impact of supplier selection on supplier performance improvement was addressed in past literature. When the buying firm selects the supplier from the good selection criteria, they should enhance their supplier's abilities to meet the company's needs. However, the results of the study indicate that supplier selection does not directly encourage supplier performance improvement. Therefore, H1 is not supported in this study. Supplier selection and evaluation in and of itself is not supplier development (Krause and Ellram, 1997; Abdullah and Maharjan, 2003). For example, suppliers

selected under appropriate criteria did not necessarily perform to the buying firm's expectations because no supplier development activities occurred. This is consistent with the work of Lin et al (2005) – that supplier selection does not correlate directly with organizational performance.

This study divided the supplier selection criteria into two aspects: supplier's performance and supplier's capabilities. The result of study also indicates that buying firms tend to concentrate more on supplier's capabilities than supplier's performance. The coefficient of capabilities (Loading=0.78) is higher than performance attributes (Loading=0.67). This implies that firms are increasingly focusing on long-term capabilities between buyer and supplier. Below are the results of the relatively important factors for each aspect.

**6.1.1.1 Supplier performance** includes cost, delivery, product specification and after sales services.

- ***Total cost of acquisition***: It is not surprising that cost is a critical element when selecting suppliers. This study indicates that the coefficient of cost is ranked as the highest indicator (Loading=0.76) among the selection criteria. Compared to price, total cost is more critical for selecting potential suppliers in the Thai electrical manufacturing industry. This may imply that buying firms decide to select the supplier by considering the total cost of ownership with a specific supplier as critical to the company's requirements (Kahraman et al, 2003; Weber et al, 1991).
- ***Product specification and after sales services*** are considered to be of equal importance as ranked by respondents (Loading=0.70). The

buying firm expects that suppliers will supply the parts and components in accordance with the requirements. After-sales services have received much attention in recent literature. Buying firms prefer a supplier who provides good customer service such as easy accessibility, accuracy and fast response. Based on the results of the interviews, managers in the electrical products and component industry always regard the customer's problem as the top priority. Therefore, a supplier who provides quick responses to customer questions and problems can be a potential partner in the future.

- *Delivery* is one of the most important in the multiple-sourcing buying situation (Swift, 1995). Based on the results, the coefficient of on-time delivery was ranked as the fourth indicator (Loading=0.68). Firms in the electrical appliance manufacturing industry require rapid changes in product and process (Lee et al, 2009). Therefore, the buyer should consider that time competition is necessary in order to create competitive advantage over rivals.

**6.1.1.2 Supplier's capabilities** include good quality system, technical capability, flexibilities of product variety and financial background.

- *Flexibilities to change production volumes* received the highest coefficient from all variables (Loading=0.78). This may imply that Thai electrical appliance manufacturers focus on flexibility to gain competitive advantage. The ability of potential suppliers should include the ability to meet changes in quantity requirements. This enables manufacturers to meet the changing needs of their

customers (Krause et al, 2007). This may imply that manufacturers in electrical and electronic industry prefer to work with suppliers who can avoid holding obsolete subcomponent inventory when sales drop at the end of their life cycle (Krause et al, 2007).

- **Good quality system** is rated as the second most important factor by respondents (Loading=0.75). The buyer needs to consider a supplier who manages quality well in order to maintain and improve the quality system including quality assurance, quality control, quality manuals and ISO9000.
- **Strong financial background** is an important indicator when selecting a specific supplier ranking third in importance (Loading=0.73). The buyer should consider a potential supplier who can maintain the products and services available. Therefore, a supplier with a strong financial background can be a capable partner in the future.
- **Technical capability** was the least important of factors from the set of capability criteria (Loading=0.69). The buying firm needs a capable supplier competent in technical support. The buyer should consider a supplier who possesses the technical capability essential for the buyer's competitive advantage (Katsikeas et al, 2004). Technical criteria may motivate a firm to move into the global market (Kahraman et al, 2003). Therefore, technical capability is an important factor that the buyer needs to focus on in their supplier selection criteria.

### 6.1.2 Supplier selection and buyer-supplier commitment

According to Lin et al (2005) suggested that supplier participation plays an indirect role in improving the firm's performance. In addition, this study also suggested that facilitators are needed to transform the supplier selection's efforts into performance improvements. This corresponds with Cousins and Lawson (2007), who also suggested that sourcing strategies with critical products did not have an impact on supplier performance by themselves. The buying firm needs to focus on the relationship and commitment between two parties. Therefore, buyer-supplier commitment is one of the key proposed mediators in this research. However, the results of the structural model demonstrate that buyer-supplier commitment does not act as a mediator from supplier selection in improving supplier performance. Therefore, H7a is not supported in this study. The results of the research also indicate that supplier selection is not associated with buyer-supplier commitment. Therefore, H2 is not supported in this study. This may imply that selection strategy is based on the basis of standard requirements regardless of how the buyer's commitments with the specific supplier. Firms need the time and mechanisms to build their commitment with their supplier. The results of the survey indicate that the average working length between firms and suppliers is approximately eight years. This represents a long-term relationship between two parties that creates commitment between firms. The survey results also indicate that 39.4% of respondents indicate that cost improvement/reduction ranks as the most important objective in supplier performance improvement. However, if the buyer focuses on cost savings and efficiency when selecting suppliers, cost savings often lead to an arms-length relationship (Cousins and Lawson, 2007). This result supports the research of Koufteros et al (2012), in which suppliers who are selected based on strategic cost are not motivated to build on the buyer-supplier relationship but more likely to be associated

with arms-length supplier relations. This is an important reason why selection strategy does not lead to enhanced buyer-supplier commitment and has only a marginal impact on buyer-supplier commitment.

### **6.1.3 Supplier selection and supplier development**

Based on the results, it was found that supplier selection has a positive impact to supplier development. Therefore, H3 is supported in this study. In addition, the result shown that supplier development acts as a mediator to transforming the buying firm's efforts in selecting strategy into performance improvements. Therefore, H7b is supported in this study. This evidence is consistent with the findings of previous studies which suggested that the importance of supplier selection leads to the influence of supplier development (Koufteros et al, 2012). Therefore, it is significant that supplier developments need to be taken after selecting suppliers.

**In summary,** supplier selection does not directly encourage supplier performance improvement and buyer-supplier commitment. However, it was found that supplier selection does indirectly encourage supplier performance improvement via supplier development strategies. In addition, buying firms tend to focus more on supplier's capabilities than supplier's performance when they select their supplier. Cost and flexibilities of product variety are the most important factors for each aspect of selecting their potential suppliers.

### **6.1.4 Supplier development and supplier performance**

Based on the results of the study, supplier development has a significant impact on supplier performance. Therefore, H5 is supported in this study. This evidence supports prior work that stressed the importance of supplier development toward

supplier performance (Krause and Ellram, 1997b; Li et al, 2007; Monzcka et al, 1993; Humphreys et al, 2004; Wagner, 2006b). Supplier development is a source of competitive advantage (Wagner, 2006a). Providing assistance that addresses their supplier's weaknesses leads to the creation of a competitive situation resulting in maintaining lower price and product quality (Choi and Hartley, 2006). Therefore, supplier development initiated by buying firms leads to significant performance improvements over competitors.

**6.1.4.1 Supplier evaluation** was rated the most important factor (Loading= 0.82) compared to the other two strategies. Supplier evaluation encourages buying firms to identify the areas of weakness which need improvement (Hahn et al, 1990; Modi and Mabert, 2007). Therefore, supplier evaluation provides direction for poorly performing suppliers to improve their operations (Narasimhan et al, 2001). Feedback communication (Loading=0.79) has greater influence than formal evaluation (Loading=0.70). This may imply that effective communication aids suppliers to better understand the buying firm's requirements when they do not perform as firms expect. Then, this feedback mechanism creates a co-operative working environment which impacts performance improvement.

**6.1.4.2** Contrary to previous works (Krause et al, 2000; Modi and Mabert, 2007), **competitive pressures** (Loading=0.67) was found to be an important factor in improving supplier performance. The electrical and electronic industry is a very cost-competitive business (Choi and Krause, 2006). Therefore, buyers create a competitive environment by using a few suppliers to create competition among the supplier base. The result of the survey indicates that approximately 60% of the responding firms have less than or equal to 10 potential suppliers in their supplier bases. Buying firms desire to have a



closer relationship with the key supplier. With few suppliers, the buying firm can efficiently develop and improve buyer-supplier operations (Choi and Krause, 2006). In addition, when fierce competition exists, the buyer can consider switching suppliers to save costs.

**6.1.4.3 Supplier incentive** is reported to be of equal importance (Loading=0.67) to competitive pressure. The buying firm provides incentives to encourage supplier performance. The buyer induces the current improvements of suppliers by promising higher volume purchases and future business considerations. Based on the field interviews, rewarding suppliers for improving or maintaining high levels of performance allows suppliers to create and share rewards, in turn, with their sub-suppliers. Therefore, the supplier can realize the benefits from supply chain relationships and this result in higher overall supply chain performance (Wisner et al, 2009).

#### **6.1.5 Supplier development and buyer-supplier commitment**

The results of this study demonstrate that supplier development has a significant relationship with buyer-supplier commitment. Therefore, H4 is supported in this study. This result supports previous work that stresses the importance of supplier development strategies to motivate a greater level of buyer-supplier relationship and transaction-specific investment (Li et al, 2007; Modi and Mabert, 2007; Krause and Ellram, 1997a; Carr and Pearson, 1999; Prahinski and Benton, 2004; Wagner, 2006a). Furthermore, this study also reveals that supplier development is a key mediator to transforming the buying firm's efforts to improve the level of commitment between firms. Suppliers are unable to improve by themselves (Krause et al, 2000). Therefore, buying firms tend to increase the level of inter-firm relationships and resource investments. For example,

when suppliers get feedback and direction improvements from buyers, they may need the assistance of technical support from buying firms. This action encourages a greater collaboration in the relationship between buying firm and supplier in the joint problem solving of a product's quality, cost and delivery. Also, incentives and competitive pressure are important factors behind motivating the buyer and supplier to engage in resources investment. Suppliers who desire increased business volume and priority consideration for future business are likely to extend their resource investments with buyers. Like supplier incentives, competitive pressure among suppliers motivates suppliers to develop the long-term business relationship including involvement in resources investment in order to reduce the alternative choices of competitors.

**In summary**, supplier development plays an important role in encouraging supplier performance improvement and buyer-supplier commitment. Also, supplier evaluation is the most important factor in improving supplier performance.

#### **6.1.6 Buyer-supplier commitment and supplier performance**

It is not surprising that buyer-supplier commitment directly significantly improves supplier performance. H6 is supported in this study. This result supports prior research that shows significant performance improvement by building the commitment between buyer and suppliers (Li et al, 2007; Krause et al, 2000; Humphreys et al, 2004; Kannan and Tan, 2006). Also, buyer-supplier commitment plays an important role in facilitating the buyer's efforts in supplier development to improve supplier performance. Suppliers may lack the resources and knowledge when involved in a supplier development program. Therefore, buyers need to work closely with key suppliers and this includes spending human and capital resources to increase the level of performance

improvements. Hence, buyer-supplier relationship and transaction specific-investment comprise the foundations of buyer-supplier commitment.

**6.1.6.1 Buyer-supplier relationship** is rated as the most important factor compared to transaction-specific investment (Loading= 0.82 and 0.70, respectively). According to the transaction cost theory by Williamson (1985), transaction-specific investments create risk through a lock-in situation for investors who desire to invest more with their partners. Therefore, firms tend to improve and build the buyer-supplier relationship rather than creating their own investment for key suppliers. This is consistent with the suggestion by Williamson (1985) that firms must safeguard specific-investment by establishing long-term buyer-supplier relationships. This implies that building buyer-supplier relationships reduces the risk of investment by the buyer.

- **Benefit sharing** ranks as the most important factor among buyer-supplier relationships (Loading = 0.86). Based on the results of the interviews, managers stress the importance of the framework for defining cost, price, and profit between buyer and supplier. Buyer and supplier agree to work in partnerships to create win-win outcomes or for both to gain benefits including cost reduction, reduced risk and increased efficiency and productivity (Burnes and Whittle, 1995; Ellram et al, 1995). Sharing the benefits this way is one of the foundations of building effective supply chains (Wisner et al, 2009). This may imply that buying firms desire to develop the buyer-supplier relationship as partnership characteristics which lead to mutual loyalty and cooperative environment (Ellram et al, 1995).

- *Spending time on joint problem solving when problems occur* was rated as the second most important factor (Loading = 0.69). Joint problem solving is an effective tool when performance problems with suppliers arise. Based on the results of the interviews, most problems for air-conditioning producer concerns customer complaints regarding product quality such as loud noises from fan-coils and compressors. Manufacturers always consider customer problems as urgent especially if current problems impact the production line. Therefore, they both are greatly motivated to find an effective way to resolve problems as promptly as possible.
- *Information sharing and long-term relationship* are equally important factors for buyer-supplier relationships (Loading = 0.66). The results of the survey show that the average working length between buyer and supplier is approximately eight years. This may imply that buying firms desire to work with key suppliers in a long-term relationship and continuous improvement. This relationship leads to a partnership relationship which requires a high degree of co-operation between partners. Thus, information sharing is needed to co-operate in work such as demand forecasting and technical information.

**6.1.6.2 Transaction-specific investment** is rated second in importance to buyer-supplier relationship. Firms tend to reduce the risk of more specific investment by building long-term relationships instead. As a result of this study, human investment is more critical than direct investment due to most respondents' firms being of a small business size. However, transaction-

specific investment is a critical component when buying firms consider building commitment with their suppliers.

- *Providing personnel for technical assistance* ranks as the most important factor (Loading=0.78). One possible explanation for this finding is that buyers are directly involved in sending engineering staff to assist at supplier sites leading to quick and marked improvements (Krause et al, 2000). The purchasing manager in a large electrical firm noted that providing personnel for helping suppliers is only considered when there exist critical problems that have huge effects on buyers.
- *Training* is the second most important factor in improving supplier performance (Loading=0.72). From the interviews, training is critical for large manufacturing when firms launch new products or change the working process which affects the working procedure of the buyer and suppliers. This ensures that supplier understanding of new products or processes directly relates to the buyer-supplier performance.
- *Shared or integrated key processes or production adaptations* ranks as the third most important factor (Loading= 0.71). In order to improve efficiency and effectiveness, many buyers are required to share logistics and production activities for parts and components such as sharing storage space. The improvement of the collaborative relationship between firms leads to a closer integration of operations (Modi and Mabert, 2007).
- *Direct investment in tools and equipment* by the buying firm was rated the least important factor in transaction-specific investment (Loading=0.69).

Most of the respondents are small enterprises with limited funds. This may imply that the buyer needs to consider the cost of investment as an important factor when engaging in capital investment decisions.

**In summary**, buyer-supplier commitment directly encourages supplier performance improvement. Buying firms focus more on the buyer-supplier relationship compared to transaction specific investment. Benefit sharing is the most important factor in building the buyer-supplier relationship, whereas providing personnel for technical assistance is the most important factor in transaction-specific investment.

#### **6.1.7 The consequences of supplier performance improvements.**

The results of this study indicate that on-time delivery ranks as the highest performance improvement (Loading=0.80). This may imply that firms improve markedly in the area of logistics planning and transportation after collaborative work with suppliers. Cost improvement is less important than delivery improvement. Costs ranks second in performance improvements (Loading=0.76). Although costs ranks as the most important factors in supplier selection criteria, the supplier still needs time to improve and develop in areas of weakness. Therefore, the results of improvement can yield cost reduction over long-term performance. Developing time to market is rated third (Loading=0.75). This may be from respondents that are in dynamic industries that require time-based competition to satisfy customer needs faster than competitors. Percentage of incoming defects ranks the least important in performance improvements (Loading=0.70). Quality improvements may be reflected in buying firms that focus on cost improvement.

## 6.2 Theoretical implications

This research extends the previous literature of buyer-supplier commitment by developing the conceptualization of buyer-supplier commitment based on buyer-supplier relationship and transaction-specific investment. The results show that both buyer-supplier relationship and transaction-specific investment are key elements of buyer-supplier commitment. This framework provides a foundation for future research. In the future, new constructs may be added to provide important aspects of buyer-supplier commitment.

Furthermore, this study filled an important gap in supplier management literature with respect to the area of supplier performance improvement. There is much written about the factors affecting supplier performance improvement; however, this study is the first attempt to model the relationships between supplier selection, supplier development, buyer-supplier commitment with the supplier performance improvements by proposing two key mediators.

This study examines the role of buyer-supplier commitment in achieving supplier performance improvements including direct and indirect effects. Contrary to expectations, buyer-supplier commitment does not act as a mediator from supplier selection to supplier performance improvements. However, findings indicate that supplier development fully mediates the impact of supplier selection on supplier performance. This result is useful to researchers interested in studying the factors that affect supplier performance improvements both in terms of direct and indirect relationships. Since the study is designed to achieve the performance outcomes,

potential mediators should be proposed as important factors in the area of supplier performance improvements.

Finally, this research contributes to the collective understanding of supplier selection criteria, supplier development strategies, buyer-supplier commitment and supplier performance improvements. This research also provides a foundation and insight into the area of supplier performance improvements.

### **6.3 Managerial implications**

The result of this study is useful for managers in the electrical appliances and components industry wishing to better understand how factors affect supplier performance improvements. The findings suggest that the buyer should concentrate on the supplier's capabilities that yield long-term advantages when selecting suppliers. Next, the buyer-supplier relationship is an important factor for buyer-supplier commitment compared to transaction-specific investment. This implies that firms should build and develop closer relationships with key suppliers in order to increase the level of buyer-supplier commitment. Then, supplier evaluation is the most important factor in supplier development strategies behind improving performance. More specifically, supplier development is more crucial than buyer-supplier commitment. Supplier development also acts as an important facilitator in transforming the buying firm's selection strategy efforts into performance improvements. Therefore, management should place strong emphasis on supplier development strategies with suppliers. This enables firms to enhance supplier performance improvements both directly and indirectly.



#### 6.4 Limitations of research

It is noticeable that some factors in some constructs such as Raw material prices (PER1) and Informal evaluation (EVA2) got the high scoring averages from respondents but they do not selected into the model during purification for confirmatory factor analysis. These results are concerned with the outliers of some respondents. Regarding to raw material price (PER1), there is a company which ranks the least score of raw material prices when selecting the supplier but ranking the cost reduction as a highest score for supplier development objectives. As shown in Figure 6.1, this company is considered as an extreme outlier. This may come from the respondent's confusion. It is not logical for company that pay highest attention to the cost reduction objectives but raw material prices is less important when selecting their suppliers.

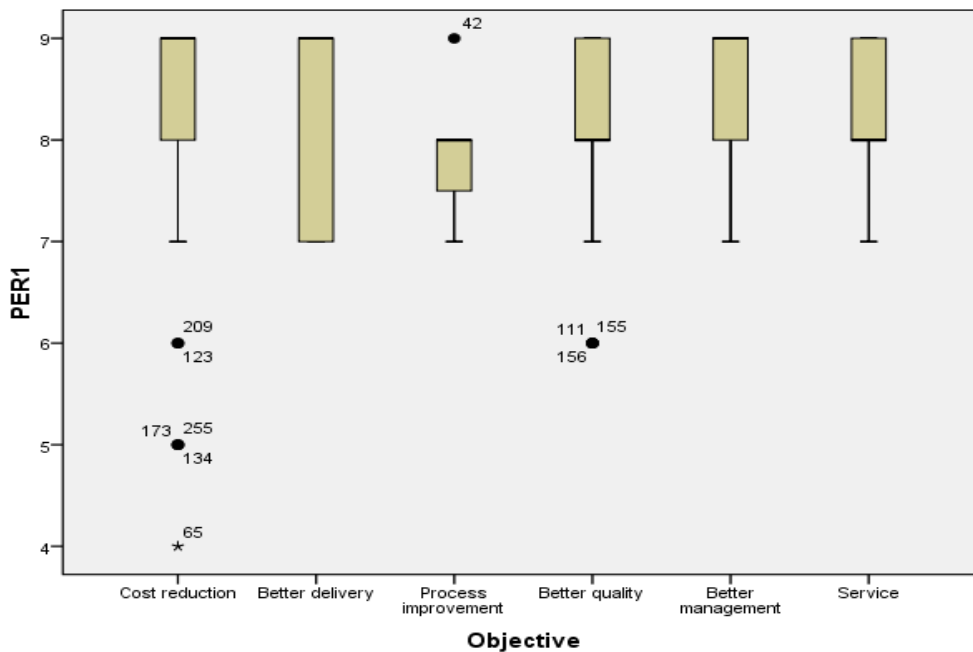


Figure 6.1 Box plot graph for raw material prices (PER1) and objectives for supplier development

Regarding to Informal evaluation (EVA2), it is found that few respondents who give the least score of informal evaluation (EVA2) are chief executives in refrigerator manufacturers. As shown in Figure 6.2, these companies are considered as normal outliers. This may imply that few companies in refrigerator section do not prefer to assess supplier performance through informal evaluation.

As the results of outliers in some factors, it is important to note that the researcher should ensure that respondents clearly understand each item in questionnaires. Then, data should be corrected before beginning data entry in order to avoid those errors of outliers.

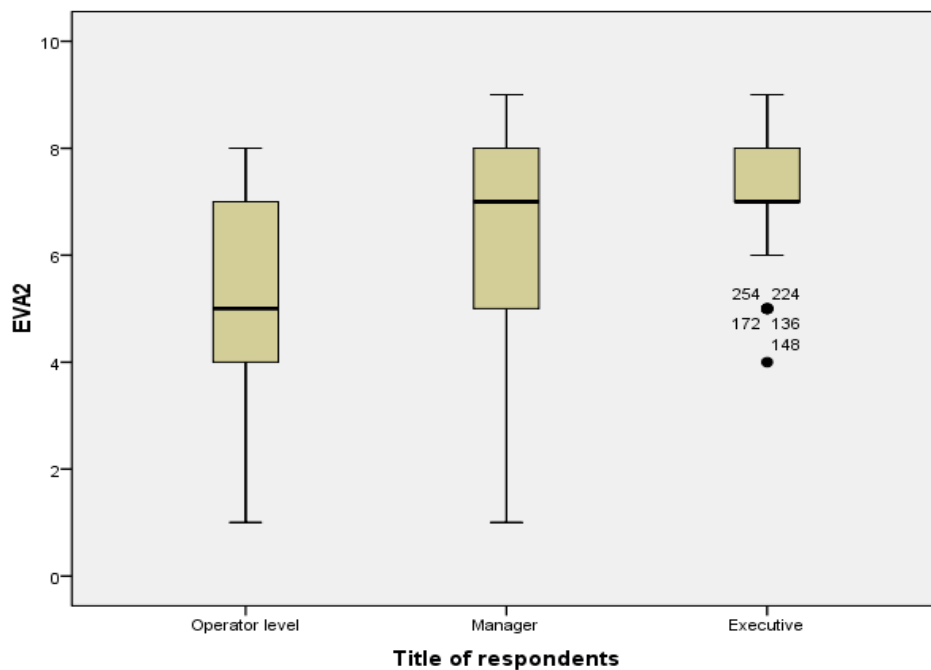


Figure 6.2 Box plot graph for Informal evaluation (EVA2) and Title of respondents

In addition, this study focuses on supplier performance improvements from the buying firm's perspective. The supplier's perspective should be explored to provide

insights into the supplier compared with the buying company in future research. Finally, the data for the study was selected from one single industry, so the findings are demonstrative but not representative of all supply chains.

### **6.5 Recommendations for future research**

Future research should consider other relevant factors for developing the construct of buyer-supplier commitment. This study does not measure long-term performance while the selection criteria included the long-term perspectives. Therefore, additional dimensions of supplier performance should be examined. In addition, future research should extend the sample size in order to sufficiently measure the moderator effects between small and large manufacturers and whether it yields the same results or not.

Future studies also can carry out their research in a variety of contexts of different industries and different countries, thereby providing a better understanding of how the factors affect supplier performance improvement.

### **6.6 Conclusions**

This study has gone beyond previous research which measured the combined effects among supplier selection, supplier development and buyer-supplier commitment to supplier performance improvements. Specifically, this research attempted to examine the role of buyer-supplier commitment. The results of this study provide partial support regarding the relationship between these constructs. Buyer-supplier commitment has a direct significant relationship with supplier performance improvement. However, buyer-supplier commitment does not act as a mediator from supplier selection to supplier performance improvement. Instead, supplier development plays a critical role in

mediating the significant relationship between supplier selection and supplier performance improvements. However, based on the total effect – i.e. direct and indirect effect – both supplier development and buyer-supplier commitment have a greater impact on performance improvement.

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## APPENDICES



APPENDIX A

ที่ ศธ.0512.5/ลจต. 722 /54



หลักสูตรสาขาวิชาการจัดการด้านโลจิสติกส์  
บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย  
ถนนพญาไท ปทุมวัน กทม. 10330

16 ธันวาคม พ.ศ. 2554

เรื่อง ขออนุเคราะห์ข้อมูล

เรียน

ด้วย นางสาววารภรณ์ ตั้งจิตเจริญ รหัสประจำตัว 528 78180 20 นิสิตระดับบัณฑิตศึกษา หลักสูตรวิทยาศาสตร  
ดุขฎิบัณฑิต สาขาวิชาการจัดการด้านโลจิสติกส์ (สหสาขาวิชานานาชาติ) บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย  
กำลังทำงานวิจัยเรื่อง “ ปัจจัยที่ส่งผลกระทบต่อผลการทำงานของผู้ส่งมอบผ่านข้อมูลระหว่างผู้ซื้อ-ผู้ส่งมอบ ” โดยมี  
ศาสตราจารย์ ดร. กมลชนก สุทธิวาหนฤพุมิ เป็นอาจารย์ที่ปรึกษางานวิจัยครั้งนี้ จึงมีความประสงค์จะขอความอนุเคราะห์  
ข้อมูลเพื่อนำไปประกอบการศึกษาวิจัยฯ ดังกล่าว เพื่อให้มีความถูกต้องและลงลึกในภาพจริงให้มากที่สุด

หลักสูตรฯ จึงใคร่ขอความอนุเคราะห์มายังท่าน เพื่อโปรดให้ความอนุเคราะห์ข้อมูลด้วย จักขอบพระคุณยิ่ง

ขอแสดงความนับถือ

(ศาสตราจารย์ ดร. กมลชนก สุทธิวาหนฤพุมิ)

ผู้อำนวยการหลักสูตรฯ

สาขาวิชาการจัดการด้านโลจิสติกส์

นางสาววารภรณ์ ตั้งจิตเจริญ  
โทร. 088-2052387

APPENDIX B

## แบบสอบถามเพื่อการวิจัย

เรียน ท่านผู้ประกอบการ

แบบสอบถามนี้มีวัตถุประสงค์เพื่อศึกษาวิจัยถึงแนวทางในการปรับปรุงผลการดำเนินงานของผู้ส่งมอบในอุตสาหกรรมผลิตเครื่องใช้ไฟฟ้า ชิ้นส่วนอิเล็กทรอนิกส์ และส่วนประกอบที่เกี่ยวข้อง เพื่อนำผลการวิเคราะห์ไปจัดทำข้อเสนอแนะ เพื่อสนับสนุนการพัฒนาผู้ส่งมอบในประเทศ ตลอดจนแนวทางในการเพิ่มขีดความสามารถในการแข่งขันและส่งเสริมโอกาสในการพัฒนาผู้ผลิตในแต่ละลำดับขั้นในห่วงโซ่อุปทาน

แบบสอบถามนี้เป็นส่วนหนึ่งในการจัดทำวิทยานิพนธ์ หลักสูตรวิทยาศาสตร ุขย ุภบัณฑิต สาขาการจัดการด้านโลจิสติกส์ จุฬาลงกรณ์มหาวิทยาลัย ดังนั้นข้อมูลในแบบสอบถามจะไม่มีเผยแพร่ ชื่อบุคคล และสถานประกอบการโดยเด็ดขาด ทั้งนี้ข้อมูลที่ได้รับจากแบบสอบถามนี้จะนำไปใช้อ้างอิง และเผยแพร่เพื่อการศึกษาเท่านั้น

### คำชี้แจง

1. แบบสอบถามเพื่อการวิจัยแบ่งออกเป็น 5 ส่วนดังนี้
  - ส่วนที่ 1 หลักเกณฑ์ที่ใช้ในการคัดเลือกผู้ส่งมอบ
  - ส่วนที่ 2 วิธีการที่ใช้ในการพัฒนาศักยภาพของผู้ส่งมอบ
  - ส่วนที่ 3 ผลการทำงานของผู้ส่งมอบหลังจากได้รับการพัฒนา
  - ส่วนที่ 4 ลักษณะความสัมพันธ์และการลงทุนระหว่างบริษัทและผู้ส่งมอบ
  - ส่วนที่ 5 ข้อมูลบริษัท ข้อมูลผู้ส่งมอบ และผู้ตอบแบบสอบถาม
2. โปรดอ่านคำชี้แจงในการตอบแบบสอบถามแต่ละส่วน กรุณาตอบแบบสอบถามทุกข้อตามความเป็นจริง โดยผู้วิจัยขอรับรองว่าคำตอบของท่านจะถูกเก็บเป็นความลับ และจะไม่มีผลกระทบใดๆ ต่อผู้ตอบและสถานประกอบการทั้งสิ้น

ขอขอบพระคุณเป็นอย่างยิ่งที่ให้ความอนุเคราะห์ในการตอบแบบสอบถามในครั้งนี้

นางสาว วราภรณ์ ตั้งจิตเรจริญ

นิสิตปริญญาเอก สาขาการจัดการด้านโลจิสติกส์ จุฬาลงกรณ์มหาวิทยาลัย











## ส่วนที่ 5: ข้อมูลบริษัท ข้อมูลผู้ส่งมอบ และผู้ตอบแบบสอบถาม

### 5.1 ประเภทบริษัท

- บริษัทคนไทย
- บริษัทร่วมทุนกับต่างชาติ โปรรระบุประเทศที่ร่วมทุน.....
- บริษัทต่างชาติ ประเทศ.....

### 5.2 ทุนจดทะเบียน

- น้อยกว่า 50 ล้านบาท
- ระหว่าง 50 - 200 ล้านบาท
- มากกว่า 200 ล้านบาท

### 5.3 จำนวนพนักงานในบริษัท/โรงงาน

- ต่ำกว่า 200 คน                       ระหว่าง 200 – 500 คน
- ระหว่าง 501 – 1,000 คน             ระหว่าง 1,000 คน – 1,500 คน
- ระหว่าง 1,501 -2,000 คน           มากกว่า 2,000 คนขึ้นไป

### 5.4 ประเภทสินค้า/ส่วนประกอบหลัก ที่บริษัทท่านผลิตในโรงงานของท่าน (โปรดระบุมา 1 ชนิดที่สำคัญที่สุด)

- เครื่องรับวิทยุและส่วนประกอบ                       เครื่องวิดีโอ/เครื่องเสียง
- เครื่องปรับอากาศและส่วนประกอบ                       เครื่องตัดต่อและป้องกัน
- ผู้เขียน/ผู้แช่     อื่นๆ....โปรดระบุ.....

### 5.5 จากข้อ 5.4 วัตถุดิบหลัก (Main Raw Materials) ส่วนใหญ่ซื้อจาก Supplier ใน หรือ ต่างประเทศ

- ในประเทศ .....%
- ต่างประเทศ .....%

### 5.6 โปรดจรรยาบรรณว่าบริษัทท่านมีสถานะเป็นOEM หรือ เป็นผู้ส่งมอบ(Supplier) ในลำดับชั้น(Tier)ที่เท่าไร ใน สัดส่วนร้อยละเท่าไร

- เป็นผู้ผลิต มีแบรนด์เป็นของตนเอง ..... %
- เป็นผู้ประกอบ OEM ..... %
- ลำดับชั้นที่หนึ่ง (First Tier) ..... %
- ลำดับชั้นที่สอง(Second Tier) ..... %
- ลำดับชั้นที่สาม(Third Tier) ..... %

- 5.7 ผู้ตอบแบบสอบถามดำรงตำแหน่งใดในองค์กร
- พนักงานระดับปฏิบัติการ  ผู้บริหารระดับสูง
- ผู้จัดการแผนก  อื่นๆ....โปรดระบุ.....
- 5.8 ผู้ตอบแบบสอบถาม ทำงานอยู่ส่วนงาน/แผนกใด
- แผนกจัดซื้อ หรือวัสดุ หรือวัตถุดิบ  แผนกคลังสินค้า
- แผนกโลจิสติกส์หรือซัพพลายเชน  แผนกขนส่ง
- แผนกผลิต  แผนกบริหาร หรือกรรมการผู้จัดการ
- แผนกวิจัยและพัฒนาผลิตภัณฑ์  แผนกประกันคุณภาพ
- แผนกวิศวกรรม  อื่นๆ....โปรดระบุ.....
- 5.9 จากชิ้นส่วน/ส่วนประกอบหลัก ที่บริษัทท่านผลิตตามข้อ5.4 ท่านมีจำนวนผู้ส่งมอบทั้งหมดกี่ราย
- น้อยกว่า 50 ราย  ระหว่าง 151 – 200 ราย
- ระหว่าง 51 – 100 ราย  มากกว่า 200 ราย
- ระหว่าง 101 – 150 ราย
- 5.10 ท่านมีจำนวนผู้ส่งมอบหลักที่ท่านกำลังพัฒนาศักยภาพอยู่กี่ราย
- ระหว่าง 1 - 10 ราย  ระหว่าง 31- 40 ราย
- ระหว่าง 11 – 20 ราย  ระหว่าง 41- 50 ราย
- ระหว่าง 21- 30 ราย  มากกว่า 50 ราย
- 5.11 ผู้ส่งมอบหลักรายนี้ทำงานร่วมกันกับบริษัทท่านมาเป็นเวลานานกี่ปี
- 1-5 ปี  16-20 ปี
- 6-10 ปี  มากกว่า 20 ปีขึ้นไป
- 11-15 ปี
- 5.12 วัตถุประสงค์สำคัญ หรือเป้าหมายหลักที่บริษัทต้องการพัฒนาผู้ส่งมอบคือ ...(ระบุข้อที่สำคัญที่สุดมา 1 ข้อ)
- ต้องการปรับปรุง และลดต้นทุนการผลิต
- ต้องการปรับปรุงความเร็วในการส่งมอบ
- ต้องการปรับปรุงความยืดหยุ่นในการทำงาน
- ต้องการปรับปรุงและพัฒนาขั้นตอนหรือกระบวนการผลิต
- ต้องการปรับปรุงและพัฒนาคุณภาพสินค้าที่ผลิต
- ต้องการปรับปรุงและพัฒนาความสามารถในการบริหารจัดการ
- ต้องการปรับปรุงและพัฒนาคุณภาพในการให้บริการ

### Biography

Miss Waraporn Tungjitjarun is born in April, 1979. She received Master of Business and Administrative of Chulalongkorn University, Thailand in 2006. She is a Ph.D. student in the Department of Logistics Management, Chulalongkorn University, Thailand. Presently she is a lecturer in the Faculty of Management and Sciences, Kasetsart University, Sriracha Campus, Thailand. Her research interests include supplier development, logistics and supply chain management