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# Effectiveness and Efficiency of Knowledge Transfer in Supplier Development: Key Antecedents and Buyer-Supplier Outcomes

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**EFFECTIVENESS AND EFFICIENCY OF KNOWLEDGE TRANSFER IN SUPPLIER  
DEVELOPMENT: KEY ANTECEDENTS AND BUYER-SUPPLIER OUTCOMES**

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**ABSTRACT**

There is strong evidence that U.S. organizations are increasingly implementing supplier development programs to help their suppliers improve quality, enhance delivery performance, reduce costs, and in turn improve their own supply chain performance. However, many of these supplier development programs are not successful. This study argues that an understanding of the knowledge transfer process should play a central role in understanding improvements in buyer-supplier performance resulting from supplier development activities.

Building on the extant supplier development literature and relevant knowledge transfer literature, this study investigates key antecedents and performance outcomes of knowledge transfer in a supplier development context. Specifically, the study tests the impact of the extent of supplier development involvement, trust (competence and benevolent), shared vision and supplier's learning intent on the effectiveness (comprehension and usefulness) and efficiency (speed and economy) of knowledge transfer and the influence of knowledge transfer on buyer-supplier performance.

For this research, 167 U.S. manufacturing firms were used to test the hypotheses. The results show that suppliers' learning intent and benevolence trust positively impact both the effectiveness and efficiency of knowledge transfer. Supplier development involvement was found to have a positive effect on knowledge transfer effectiveness while shared vision and competence trust had positive effect on knowledge transfer

efficiency. The findings also show that both effectiveness and efficiency of knowledge transfer have impact on supplier delivery performance but have no direct effect on supplier cost performance. This research makes an important contribution to the literature on the antecedents of successful knowledge transfer in supplier development. First, the research highlights that supplier's learning intent leads to better comprehension, better application and quicker absorption of the new knowledge that is transferred to the supplier. Second, suppliers who have trusting relationship with their buyers are more likely to be successful at understanding, applying and rapidly gaining the new knowledge. Moreover, Suppliers who are involved in supplier development with their buyers are more likely to use the knowledge gained on multiple projects and to improve their capabilities. Finally, commonalty in goals, values, culture and strategies between the buyer and the supplier promotes an environment that is conducive for easier flow of knowledge.

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## CHAPTER I

### Introduction

In the modern industrial landscape it has become a truism that the advantages and disadvantages of an individual firm are often linked to those of the network of relationships in which the firm is embedded. In supply chains, firms must seek, build up and maintain relationships with capable suppliers and extract the maximum value through such relationships to compete and survive (Wagner, 2006; Carr and Pearson, 1999; Dyer, 1996) for several reasons. First, in many cases buying firms (buyers) rely on suppliers to provide highly customized inputs that make up a large fraction of the value of the final product. Purchases from suppliers can account for as much as 60 – 80% of the cost of finished goods in many industries (Leenders & Blenkhorn, 1988; Heberling et al., 1992; Tully, 1995; Chapman et al., 1997), implying that suppliers have a significant influence over the buying firm's costs. Second, this influence is bound to increase further as buying firms seek higher productivity by increasing outsourcing of production, downsizing, and focus on their core competences in response to intensified global competition. Third, the performance demonstrated by the supplier on a day-to-day basis (e.g. delivery time, delivery reliability, product quality, product cost etc.) is influential to the competitiveness of the buying firm (Tan et al., 1998). In response to the above challenges, buying firms have begun to place more emphasis on the suppliers' contributions in order to accomplish strategic ends and competitive advantage.

Unfortunately, suppliers are often weak or lack capabilities to deliver products that satisfy the buying firm. When a supplier's performance is found to be unsatisfactory, a buying firm can take one of three options: *vertical integration*; *supplier switching*; or *supplier development*. Vertical integration involves manufacturing the product in-house by acquiring the supplier or setting up capacities to manufacture the product internally (Leiblein et al., 2002). This option may prove costly due to substantial initial capital investments and might be contradictory to the firms' intention to focus on their core competencies and outsource noncore activities. The buying firm could also drop the deficient supplier and switch to a more capable supplier (Wagner & Friedl, 2007). This option, however, might not be feasible if alternative suppliers are not available or if switching costs are excessively high. Last, using supplier development, the buying firm could assist the deficient supplier so that the supplier's performance or the supplier's capabilities are upgraded to an acceptable level (Modi & Mabert, 2007; Hahn et al., 1990). The premise of this dissertation is that the buying firm has chosen to upgrade the skills and capabilities of the supplier using supplier development.

The concept of supplier development has been defined using several different definitions. This study shall use Watts & Hahn's (1993) definition of supplier development as "a long-term cooperative effort between a buying firm and its suppliers to upgrade the suppliers' technical, quality, delivery, and cost capabilities and to foster ongoing improvements" (p. 12). Japanese companies in the automotive industry are credited with pioneering supplier development although supplier development practices can be traced back to the US automotive industry in early 1900's when Henry Ford sought to improve suppliers' capacity and performance (Selter, 1928 cited in Krause et

al., 2007). Interesting, the term ‘supplier development’ was first used by Leenders (1966) in his dissertation discussing developing a new source of supply. Companies such as Toyota and Honda have become masters at supplier development initiatives (Liker and Wu, 2000). However, there is strong evidence that US organizations are increasingly implementing supplier development programs to improve supplier performance and in turn improve their performance (Stundza, 2001, Mesquita, Anand & Brush, 2008). This may partly be a result of a strategy to outsource non-core and partly from recognition of the important role that supplier development played in Japanese automotive success (Dyer & Ouchi, 1993). Purchasing managers in companies such as general Electric, John Deere, Chrysler, Honda of America, NUMMI, Otis Elevators, Eaton Corporation to name a few are helping their suppliers increase quality, enhance delivery performance, and reduce costs (Newman & Rhee, 1990; Hartely & Jones, 1997; Modi & Mabert, 2007). However, many supplier development programs in the US are not successful (Watts & Hahn, 1993; Monczka et al., 1993; Krause et. al., 2000). This may not be surprising as supplier development programs are dynamic and complex initiatives involving two separate business firms trying to work together to be competitive.

The extant supplier development literature has attempted to uncover the antecedents, nature and outcomes of supplier development efforts. The literature indicates that buying firms typically improve suppliers’ performance and capabilities by: providing the supplier with training, providing the supplier with equipment, technological support and even investments, exchanging personnel between the two organizations, visiting the supplier’s site and inviting supplier's personnel to visit them; evaluating supplier performance, conducting supplier certification programs, recognizing supplier progress in

the form of awards, communicating supplier evaluation results and performance goals, promising future business, increasing a supplier's performance goals, and instilling competition by the use of multiple sources (Newman & Rhee, 1990; Galt & Dale, 1991; Watts & Hahn, 1993; Monczka et al., 1993). The supplier development literature has also identified a number of important supplier development prerequisite: strategic purchasing, perception of supplier commitment, expectation of relationship continuity, buyer-supplier relationship, evaluation and certification efforts, collaborative inter-organizational communication, future business incentives, buying firm's, importance of purchased inputs to the buying firm, rate of technological change in supplier's industry, perspective toward suppliers, buying firm's market competition and top management support (Krause & Ellram, 1997; Krause, 1999; Carr & Pearson, 1999; Modi and Mabert, 2007). There is evidence that supplier development programs have a positive impact on the buyer-supplier relationship, supplier performance and buyer performance (cost, quality, delivery, flexibility), buyer firm's competitive strategy (differentiation and cost), and trust between buying firms and their suppliers (Monczka et al., 1993; Krause, 1997; Carr & Pearson, 1999; Krause et al., 2000; Reed & Walsh, 2002; Wagner 2006). However, the supplier development literature reveals several gaps including the lack of research addressing knowledge transfer.

Most supplier development activities require the creation of new knowledge for the supplier. For a supplier the buyer firm can be a crucial outside source of valuable knowledge which can help the supplier in implementing measures to upgrade its engineering, logistics, manufacturing and other capabilities in the long run, or to immediately improve the production and delivery of a particular product. Several authors



have hinted to the fact that suppliers can greatly benefit that way if they are able to integrate such external knowledge (Dyer and Nobeoka, 2000; Kogut, 2000). Direct supplier development activities such as on-site visits, training and education programs, and temporary exchange of personnel transfer knowledge and qualifications into the supplier's organization (Krause, 1997; Krause et al., 2000; Monczka et al., 1993). This suggests that the understanding of knowledge transfer should play a central role in explaining improvement in supplier performance resulting from supplier development activities. Yet the link between supplier development and knowledge transfer has not been fully developed in the supplier development literature.

### *1.1 Purpose of Study*

This dissertation addresses this gap by investigating the relationship between supplier development, knowledge transfer and performance in the context of the U.S. manufacturing firms. Using a large-scale survey, this research addresses the influence of the extent of involvement in supplier development, trust (benevolence and competence), shared vision and supplier's learning intent on the effectiveness (comprehension and usefulness of knowledge) and efficiency (speed and cost) of knowledge transfer. This study further examines the relationship between the effectiveness and efficiency of knowledge transfer and their influence on buyer-supplier performance. The study builds on two important theoretical traditions. The knowledge-based view (Grant, 1996; Nonaka, 1994) draws attention to how knowledge is created in organizations through knowledge management process of socialization (tacit to tacit), externalization (tacit to explicit), combination (explicit to explicit), and internalization (explicit to tacit). Social capital theory (and the related relational view) argues that relational capital (e.g., trust),

structural capital (e.g., supplier development) and cognitive capital (e.g., shared vision) facilitate knowledge transfer, joint learning, and the sharing of risks and costs associated with exploring and exploiting opportunities. (Nahapiet & Goshal, 1998; Inkpen, 2001).

### *1.2 Main Research Questions*

It is expected that firms will implement supplier development programs more and more in a strategic way. This means that to improve the skills and capabilities of suppliers the knowledge transfer should be effective and efficient. What constitutes “effectiveness” and efficiency” in knowledge transfer? Hence, our first major research question is:

#### *1. What are the key relevant variables of knowledge transfer in supplier development?*

It was highlighted earlier that many supplier development programs in the U.S. are not successful (Watts & Hahn, 1993; Monczka et al., 1993; Krause et. al., 2000). This may not be surprising as supplier development programs are dynamic and complex initiatives involving two separate business firms trying to work together to be competitive. There is no guarantee that knowledge will be transferred effectively and efficiently in supplier development. It is well known that many factors foster or inhibit knowledge transfer between two firms. Is knowledge transfer subject to knowledge related factors, supplier related factors, buyer related factors, or interorganizational related factors? Therefore, our second major research question is:

#### *2. What are the key antecedents of knowledge transfer in supplier development?*

After analyzing the key antecedents that drive the knowledge transfer in supplier development, it would also be interesting to examine whether or not knowledge transfer in supplier development improves the performance of the buyer-supplier dyad. Does

knowledge transfer in supplier development really contribute to improved supplier performance and buyer performance? Hence, the third major research question is:

3. *What are the key buyer-supplier performance consequences of Knowledge transfer in supplier developments?*

### *1.3 Research Relevance*

From a researcher's perspective, this study is deemed relevant because it is responsive to explicit calls from other researchers. Modi & Mabert (2007) call for future research to delve deeper into the content of knowledge transfer with suppliers and investigate the relative importance and inter-relationships of different types of knowledge transferred with performance improvement. This research addresses this call by conceptualizing supplier development to include both the topics and the type of knowledge transferred in supplier development. The topics captured by the construct include *kaizen* (i.e., constant improvement techniques), lot-size optimization, machinery and plant set-up techniques, as well as total quality management (Mesquita et al., 2008). The perceived degree to which the supplier had invested in or participated in (i.e., been involved with) programs to acquire any of the above topics captures the type of knowledge transferred. When suppliers become deeply involved in supplier development to implement measures to upgrade its manufacturing capabilities in the long run they acquire implicit or tacit knowledge. On the other hand when suppliers are not deeply involved in the supplier development they will acquire explicit knowledge from their buyers to immediately improve the production and delivery of a particular product.

Terpend et al., (2008) in their study "Buyer-Supplier Relationships: Derived Value Over Two Decades" reveal a paucity of research that has considered mediating or

moderating effects and call for future research in buyer-supplier relationships to include moderating and mediating factors. A review of the supplier development literature also supports this revelation. Most of the research in the supplier development literature addresses either the direct effects of antecedent factors on supplier development or the direct effect of supplier development and/or its antecedent factors on buyer-supplier performance. In response to this call this research is proposing to use knowledge transfer as a mediator of the relationship between supplier development practices and performance outcomes.

Last, this research also responds to calls for adopting multiple theories to explain how buyer practices and buyer–supplier mutual efforts influence the derivation of value from these relationships (Terpend et al., 2008). Most studies in supplier development use single theoretical perspectives drawing from theories such as transaction economic theory, knowledge-based view, resource-based view, relational view and social capital theory. The study by Mesquita et al., (2008) is the only one to use two theoretical perspectives: the resource-based view and the relational view. Buyer–supplier relationships and their efforts to derive value have become much more complex over time and represent multifaceted phenomena that can only be explained by a multitheoretical perspective. This research invokes two theories – the knowledge-based view (and resource-based view) and the social capital theory (and the relational view) – to help provide a richer explanation of the relationship between supplier development, knowledge transfer antecedent factors and knowledge transfer; and the relationship between knowledge transfer and buyer-supplier performance.

#### *1.4 Managerial Relevance*

By scrutinizing the key antecedents of knowledge transfer, this study aims at giving buyers insight into the circumstances in which they are likely to effectively and efficiently share their knowledge with suppliers. Based on these findings, managers can make a *situational analysis* and be able to assess whether or not to start a knowledge transfer arrangement with their supplier. However, if this analysis tells them, that circumstances are somewhat unfavorable, insights from this study may help them to influence the situations in such a way that they can have a productive knowledge transfer arrangement with their supplier. With the investigation of the performance consequences of knowledge transfer, this study aims at providing buyers with a rich insight into “what works” in knowledge transfer arrangement. The findings on the performance consequences should help buyers to prioritize the different dimensions knowledge transfer.

#### *1.5. Structure of the Dissertation*

With the prime purpose of answering the three main research questions, the dissertation is set up around five chapters. This section briefly introduces the content of the chapters to provide an overview of the dissertation’s structure. Chapter 2 reviews the literature on supplier development and the literature on knowledge transfer. This systematic and extensive review does not only result into a list of relevant variables for studying knowledge transfer in supplier development, but also helps to get insight into the theories employed in explaining this phenomenon. Chapter 3 lays out the conceptual model about the nature, the antecedents and the consequences of knowledge transfer in supplier development and the hypotheses. The chapter also explains the data collection

methodology of the survey that was used in collecting data. Specially, the study discusses the sample frame, key informant selection, and questionnaire development. Chapter 3 also discusses the operationalization of the various constructs in the conceptual model. Chapter 4 presents the results of the data collection process, the purification and validation of the measurement instrument, and the evaluation of the measurement models and the structural models. Chapter 5 presents the discussion and managerial implications of the results along with the reasons for acceptance and rejection of hypotheses. Chapter 6 presents the concluding remarks, limitations of the present study, and ideas for future academic research

## CHAPTER II

### Literature Review

This chapter begins with an overview of the supplier development literature in which the supplier development involvement construct and buyer-supplier performance are discussed. The literature review reveals several gaps in the supplier development literature including the lack of treatment of knowledge transfer constructs in supplier development models. Last, the relevant literature on trust, supplier's learning intention, shared vision and knowledge transfer are discussed

#### *2.1. Supplier Development Literature*

##### *2.1.1. Prevalence and Extent of Supplier Development*

Watts & Kahn (1993), surveyed members of the NAPM representing a wide range of industry types, sizes, and purchasing departments to determine the extent of involvement in supplier development programs. They found that supplier development programs were more prevalent than was expected and were called by different names depending on the emphasis of the program. Also, the majority of the firms had active programs of 6 months to over 4 years and had created permanent organizational units to handle supplier development programs.

Watts and Kahn also found that most of the supplier development programs were initiated at the divisional or corporate levels with most functional areas of the business participating in the program with varying degrees of involvement. In particular, purchasing, quality control, and engineering were more involved in the program as compared to materials management and the production department who were less involved and marketing, research and development, and finance who were only occasionally involved. Despite the fact that many functional areas were involved in supplier development programs, the number of people involved was ten or less.

Watts and Kahn also examined differences between firms that had implemented supplier development programs and those that had not implemented supplier development programs. They found that firms with supplier development programs tended to be larger firms in terms of annual gross sales, total employment and size of the purchasing department than firms without such programs.

### *2.1.2. Supplier Development Involvement*

Newman & Rhee (1990) conducted a case study with the New United Motors Manufacturing (NUMMI), a joint venture between General Motors and Toyota to report on the supplier development program undertaken to improve the supplier relationship. The authors found that NUMMI, in its supplier development efforts, transferred many Japanese techniques such as Jikoda (problem prevention), Heijunka (consistency in operations), and kaizen (continuous improvement) to American suppliers. NUMMI utilized these techniques in an effort to close the cultural and technical gaps between it and the American suppliers.



Galt & Dale (1991) conducted case studies of 10 UK firms from various industries to understand the supplier development process. They found several supplier development activities were being used by buyers including supplier evaluation and certification programs to communicate their expectations and motivate suppliers to improve performance, recognizing supplier improvements through performance awards and use of preferred supplier status schemes, and direct involvement in supplier development by investing human and organizational resources to develop supplier performance. Examples of such direct involvement by the buyers included setting up regional training centers to teach suppliers statistical process control, inviting selected suppliers to attend the buyer's in-house training courses, creating supplier development functions to house a supplier development team to directly work with the suppliers.

Krause (1997) surveyed purchasing executive members of NAPM representing different industries to investigate which supplier development activities companies are actually engaged in and which activities are more prevalent than others. The results showed that supplier development activities can be characterized by level of buying firm commitment. A buying firm may force suppliers to make performance improvements by using 2 or 3 suppliers or 4 or more suppliers for a purchased item to create competition among suppliers. This approach involves no commitment by the buyer. Also, a buying firm can give incentives such as increased volume allocations or consideration for future business contracts for supplier performance and/or capabilities increases. This approach involves commitment only if the supplier improves its performance. Last, a buying firm can help suppliers improve performance and/or capabilities by directly involving itself in the supplier development effort through such activities as training/education of suppliers'

personnel, site visits to suppliers' premises, inviting supplier's personnel to buyer's premises, assessment of supplier's performance through informal evaluations, assessment of supplier's performance through formal evaluations, providing supplier with feedback about the results of its evaluation, use of supplier certification program to certify supplier's quality, requests supplier to improve performance, recognition of supplier's achievements/performance, and investments in the supplier's operation. This last approach involves significantly higher levels of commitment.

The results also showed that buying firms participated more often in activities requiring less resource investments such as supplier evaluation and feedback, site visits, requests for improved performance, and promises of increased present or future business, than activities requiring more resource investments such as training/education of suppliers' personnel or investment in suppliers' operations. Further, firms that offered training/education to suppliers' personnel focused more on quality improvement topics such as statistical process control, total quality management, design of experiments, sampling methods, inspection techniques and ISO 9000. Other topics included safety procedures, and materials requirements planning.

Krause & Ellram (1997b) surveyed 527 high-level purchasing executives who were members of the NAPM to determine whether buying firms' success in their supplier development efforts varied, and if so, to identify factors contributing to perceived success or failure. They found that success in supplier development did indeed vary and they split the respondents into two groups representing those firms that had successfully implemented supplier development programs and those that had received less success. The successful group had experienced a superior increase in supplier performance as a

result of the supplier development compared to the less successful group. The authors identified a list of supplier development activities which included a) use of 2 or 3 suppliers for this purchased item to create competition among suppliers; b) use of 4 or more suppliers for this purchased item to create competition among suppliers, c) assessment of supplier's performance through informal evaluation, which takes place on an *ad-hoc* basis with no set procedures, d) assessment of supplier's performance through formal evaluation, using established guidelines and procedures, e) providing supplier with feedback about the results of its evaluation, f) use of a supplier certification program to certify supplier's quality, thus making incoming inspection unnecessary, g) verbal or written request that the supplier improve its performance, h) promise of current benefits such as a higher volume order of the present item, i) promise of future benefits such as consideration for future business, j) site visits by your firm to supplier's premises to help supplier improve its performance, k) inviting supplier's personnel to your site to increase their awareness of how their product is used, l) recognition of supplier's achievements/ performance in the form of awards, m) training/education of the supplier's personnel, and n) investment in the supplier's operation. The results also indicated that the firms that were successful in supplier development had significantly higher involvement in supplier development activities than those firms that were less successful. Specifically, the firms that were successful in supplier development were significantly more involved in activities such as formal evaluation, feedback of evaluation results to the supplier, use of a supplier certification program, site visits to the supplier, visits to the buying firm by the supplier's representatives, supplier recognition, training and education of the supplier's personnel, and investment in the supplier's operation. Also, the communication efforts of

firms that were successful in supplier development was characterized as more timely, frequent, informal, and having a greater number of contacts between the buyer and the supplier and a higher propensity to share proprietary information.

In addition to being more involved in supplier development activities the results also indicated that successful firms were more cooperative and had a proactive philosophy to their suppliers and supplier performance. (Comparisons of demographic) Further, successful firms were larger but did not buy significantly larger percentages of their suppliers' outputs, or have an established relationship with their suppliers for a significantly longer time period.

Hartley & Jones (1997) discuss two approaches to supplier development that buying firms use to improve supplier's performance. The first approach is result-oriented supplier development in which buyers help their suppliers in making technical changes such as simplifying work flows, standardizing work processes, and reducing set-up times in the supplier's operations. The second approach is process-oriented supplier development in which buyers help in increasing the supplier's ability to make production improvements without hands-on assistance from the buyer. Additionally, this type of supplier development program takes a more holistic approach, because it also examines the social and managerial systems that can affect supplier performance. Both results-oriented supplier development and process-oriented supplier development improve suppliers' performance, however, results-oriented supplier development is a more short-term approach, is less resource intense and does not build sustained supplier capability. Although process-oriented supplier development is more effective the authors propose that this approach to supplier development should be used as a complement to, rather

than replacement for, results-oriented supplier development. That is, after a supplier's performance is improved through results-oriented supplier development, buyers should consider collaborating with suppliers to do process-oriented supplier development.

Krause et al. (2000) surveyed purchasing managers in 279 manufacturing firms in the U.S. using the resource-based theory of the firm to examine the relationship between the various supplier development strategies and performance. The study identified four supplier development strategies: competitive pressure, supplier assessment, supplier incentives, and direct involvement. Competitive pressure strategy included those activities that made the supplier aware that there were alternative suppliers that could be utilized if the existing supplier did not perform up to expectations. Competitive pressure strategy included activities such as when a buyer uses more than one supplier for a purchased item or service, or is willing and able to switch to an alternate supplier if it so chooses. The second strategy, supplier assessment, allowed buyers to evaluate suppliers and provide them with feedback on their performance. The supplier assessment activities included evaluation of suppliers' quality, delivery, cost, technical and managerial capabilities. The supplier incentive strategy included activities such as increased volumes of existing business and priority consideration for future business that the buying organization promised the supplier for reaching performance targets. The last strategy, direct involvement, represented direct investment of the buying firm's resources in the supplier through activities such as providing training and education for supplier's personnel and dedicating buying firm personnel temporarily to the supplier.

Krause and Scannell (2002) conducted a survey to compare the supply base management practices of manufacturing (which they referred to as product-based) and

service firms in the area of supplier development. The study compared the manufacturing firms and service firms on four strategies used to improve suppliers: supplier assessment which included formal evaluation, certification and feedback; competitive pressure which included the use of multiple suppliers and the threat of switching suppliers; supplier incentives which included the promise of increased current business, favorable status for future business, and recognition/rewards improved performance; and “direct involvement activities” which included site visits to the supplier’s facility, supplier visits to the buyer’s facility, supplier training, and investment in suppliers’ operations. Manufacturing firms tended to use higher levels of supplier assessment and higher levels of “direct involvement activities” than service firms. In contrast, service firms tended to use competitive pressure to a greater extent than did manufacturing firms.

### *2.1.3. Factors Influencing Utilization of Supplier Development.*

Krause (1999) conducted an empirical study to determine factors that lead to the utilization of supplier development. A random survey of high ranking purchasing executives (NAPM members) from a variety of manufacturing and service industries reporting on the buyers' perspective found several antecedent factors, including top management recognition of the importance of the purchasing function, the level of competition in the buying firm's market, the importance of purchased inputs to the buying firm, perceived supplier commitment to the relationship, and effective buyer-supplier communication. However, factors such as rate of technological change in buying firm’s industry, and buying firm’s expectation of relationship continuity were not found to significantly influence utilization of supplier development programs.

Krause & Ellram (1997a) conducted a survey of 96 buying firm representatives of U.S. firms in a variety of manufacturing and service industries to determine whether buyers involved in supplier development characterized supplier development differently from those buyers not involved in supplier development. They identified 8 potential critical elements of supplier development from the literature including two-way multi-functional communication, top management involvement, cross-functional buying firm teams, emphasis on factors other than price, long-term perspective, purchase a relatively large percentage of supplier's annual sales, supplier evaluation and supplier recognition. The results of the survey indicated that buying firms involved in supplier development placed a greater emphasis on the factors of two-way communication, top management involvement in the buyer-supplier relationship, cross-functional buying firm teams, and purchased a larger percentage of the supplier's annual sales (larger purchasing power) than the buying firms not involved in supplier development

Modi & Mabet (2007) conducted an empirical study to determine whether conducting operational knowledge transfer activities (OKTA) with a supplier lead to value creation in the form of supplier performance improvements. Using a knowledge based view of a firm, they surveyed purchasing executives (ISM members) of manufacturing companies in the U.S. belonging to the following two digits SIC codes: 34, 35, 36, & 37. The results showed that supplier evaluation and certification efforts and providing future business incentives to suppliers are prerequisites for initiating OKTA. However, use of competitive pressure strategy in the form of using multiple suppliers for the purchased item was not found to influence the initiating of OKTA.

Lee & Humphreys (2007) surveyed buyers from companies in the electronic sector of Hong Kong to investigate the influence of guanxi on three elements of supply chain management: strategic purchasing, outsourcing, and supplier development. Guanxi is a Chinese term defining the behavior of parties in a relationship such as mutual obligations, assurance and understanding, a long-term perspective and cooperative behavior (Arias, 1998). The findings of the study indicate that guanxi culture is a critical driving force of supplier development. Specifically, the results reveal that guanxi influences supplier development not only directly, but also indirectly through strategic purchasing and outsourcing.

Carr & Kaynak (2007) conducted a survey of manufacturing and service firms in the U.S. from the ISM membership. They found that information sharing within a buying firm is positively related to the extent to which supplier development support is provided by the buying firm but information sharing between a buying firm and its key suppliers had no significant effect on supplier development support.

#### *2.1.4. Buyer – Supplier Performance*

Watts & Kahn (1993), surveyed members of the NAPM representing a wide range of industry types, sizes, and purchasing departments to assess the success of these programs. The authors found that supplier development programs pursued a number of objectives with improving product quality has the most important objective. The other objectives pursued, in order of importance, are improving delivery, improving service, reducing costs, improving supplier technical capabilities and reducing the supply base. The importance of supplier's capabilities mirrored the supplier development objectives in



that buyers were more concerned with supplier's capabilities that focused on product related capabilities more than on operating systems related capabilities.

Krause (1997) surveyed purchasing executive members of NAPM representing different industries to investigate outcomes of supplier development activities and whether companies were satisfied with the outcomes. The results showed that supplier performance had improved as a result of the supplier development effort. Buyers reported that supplier development efforts with a single supplier had led to significant improvement in incoming defects, percent on time delivery, order cycle times and percent orders received complete. Further, buyers were generally satisfied with the outcomes from their supplier development efforts. Specifically, supplier development efforts had yielded reduced costs for the buyer's final product or service. Also, the results showed that buyers perceived an improvement in the continuity of the relationship with their suppliers after the supplier development effort than before.

Krause & Ellram (1997b) surveyed 527 high-level purchasing executives who were members of the NAPM to determine whether buying firms' success in their supplier development efforts varied, and if so, to identify factors contributing to perceived success or failure. They found that success in supplier development did indeed vary and they split the respondents into two groups representing those firms that had successfully implemented supplier development programs and those that had received less success. The successful group had experienced a superior increase in supplier performance as a result of the supplier development compared to the less successful group. Specifically, the successful group experienced significantly higher improvements in incoming defects and percentage orders received complete; however, the two groups appeared to have

experienced roughly the same increases in on-time delivery and order cycle time reduction.

Krause et al. (2000) surveyed purchasing managers in 279 manufacturing firms in the U.S. using the resource-based theory of the firm to examine the relationship between the various supplier development strategies and performance. The study identified four supplier development strategies: competitive pressure, supplier assessment, supplier incentives, and direct involvement. The supplier's performance improvement factor was measured from the buying firm's perspective. The study tested two structural models of improved supplier performance, the direct impact model and the mediated impact model. The results of the direct impact model showed that competitive pressure, supplier assessment, and supplier incentives strategies did not have a direct impact on supplier's performance improvement. However, direct investment was the only factor that had a direct impact on supplier's performance improvement. The mediated model used direct involvement strategy as the mediator between the other three strategies and supplier's performance improvement. The results of this model indicated that supplier assessment and supplier incentives and not competitive pressure had indirect impact on supplier performance improvement through the direct involvement strategy.

Krause and Scannell (2002) conducted a survey to compare the supply base management practices of manufacturing (which they referred to as product-based) and service firms in the area of supplier development. The authors compared the two groups on the satisfaction derived from supplier development efforts using performance goals comprising increased financial strength, supply base reduction, increased management capability, and improved technical capability; and performance goals which included

quality, cost, delivery performance, and service/responsiveness. Both groups placed moderate levels of importance for the strategic goals but rated performance goals much higher than strategic goals. The manufacturing firms placed more emphasis on quality than did the service firms, while service firms placed more emphasis on cost, delivery performance, and service/responsiveness than manufacturing firms. The only strategic goal that differentiated the two groups was financial strength where service firms placed a higher degree of importance on improving the financial strength of suppliers than did the manufacturing firms.

Humphreys et al. (2004) examined the role of supplier development in the context of buyer–supplier performance from a buying firm’s perspective using a survey of 142 electronic manufacturing companies in Hong Kong. Overall, their findings were that transaction-specific supplier development and its infrastructure factors (supplier development strategic goals, top management support of purchasing management, effective buyer-supplier communication, buyer’s long-term commitment to the supplier, supplier evaluation, supplier strategic objectives, and trust in supplier) significantly correlated with the perceived buyer-supplier performance outcomes. Specifically, they found that transaction-specific supplier development, supplier strategic objectives and trust significantly contributed to the prediction of supplier performance improvement. Also, the study found that transaction-specific supplier development, supplier strategic objectives and trust contributed to the prediction of buyer’s competitive advantage improvement. Similarly, regarding the prediction of buyer-supplier relationship improvement, transaction-specific supplier development and infrastructure factors of

supplier strategic objectives and trust contributed to the prediction of buyer-supplier relationship improvement.

Wagner (2006) examined the relationship between supplier development, improvements and the support of the customer firm's competitive strategy using the resource-based view and the relational view as theoretical explanatory perspectives. They surveyed purchasing or supply chain management executives of industrial and service firms in Switzerland, Germany, and Austria. The results showed that the two types of supplier development (direct vs. indirect) had distinct effects on product and delivery performance improvement and supplier relationship improvement. Specifically, the results showed support for the positive effect of indirect supplier development on product and delivery performance improvements and the positive effect of indirect supplier development on supplier relationship improvement. However, direct supplier development activities neither resulted in an upgrade of the supplier's product and delivery performance nor the buyer-supplier relationship. The findings of the study also indicated that supplier development is a critical driving force of the customer firm's competitive strategy. Specifically, the results revealed that supplier development influences both the cost leadership and the differentiation strategy indirectly through improved buyer-supplier relationships. However, supplier development had no indirect influence on both competitive strategies through improved product and delivery performance.

Krause (1997) conducted a study on current practices and outcomes of supplier development. The study showed that the introduction of supplier development efforts

resulted in significant improvements in quality, on-time delivery, cycle-time reduction and percent of orders received complete.

Krause, Handfield & Tyler (2007) conducted an empirical study with senior purchasing executive from the U.S. electronics and automobile industries and their suppliers to investigate the relationships between buying firms' supplier development efforts, commitment, social capital accumulation with key suppliers, and buying firm performance. Overall, their findings showed that commitment between buyers and suppliers is an important complementary condition to establishing performance goals, and provides value to buying firms that seek social capital accumulation with suppliers. Further, their finds suggest that the different dimensions of social capital have unique effects depending on the performance goals. Specifically, cognitive capital in the form of shared values, and relational capital in the form of buyer and supplier dependence, were important in explaining buyer performance achievements in reducing product cost and total product cost. In contrast, in explaining buyer performance in terms of quality, delivery and flexibility, cognitive capital in the form of shared values, and structural capital in the form of supplier development activities were important. Common explanatory factors for both dimensions of performance included commitment to the relationship and cognitive capital.

Li et al. (2007) surveyed Hong Kong electronic manufacturing companies to examine the relationships between supplier development efforts and buyer competitive advantage from the buyer's perspective, and to understand how specific supplier development efforts may impact on a buyer's operational performance. They tested a model with six constructs: asset specificity, joint action, performance expectation, and

trust as the independent variables, and operational effectiveness, and market responsiveness as the dependent variables. Asset specificity was defined as transaction-specific investments in the supplier by the buying firm and included a buyer's direct investments in human assets such as training suppliers or providing technical support personnel to suppliers. Asset specificity also included buyer's direct investments in physical assets that were dedicated to a particular supplier such as customized equipment and tools. Joint action was defined as in-depth cooperation between buyers and suppliers on certain activities that were important for improving the performance of both parties e.g., buyers may participate in the management of suppliers' operations, and suppliers may assist buyers in product development. Performance expectation was defined as buyers' expectation of suppliers' performance improvement. Trust in the supplier was defined as the extent to which the buyer believed that the supplier was honest and/or benevolent. Operational effectiveness was measured as the extent to which the supplier development effort had helped to reduce the buyer's product cost and the extent to which the supplier development effort had helped the buyer improve their product cost. Market responsiveness was measured as the extent to which the buyers products could be produced faster than before, due to improved supplier quality and the extent to which the buyer's capability of responding to changes in the market had been improved.

Results showed that asset specific investments such as providing training, equipment and supporting personnel significantly influenced market responsiveness, although the relationship was weak. The authors also found that joint actions and trust in supplier were the two most critical factors in supplier development to enhance operational performance of the buyer. However, increasing supplier performance goals

and recognizing their efforts had a weak and unexpected negative relationship with operational performance of the buyer.

Rogers et al. (2007) examined the implementation and use of a supplier development program by a major North American manufacturer and its suppliers using institutional theory to determine operational efficiency outcomes and image construction outcomes. Using quantitative data from the manufacturer and interview data from the suppliers the study tested models with manufacturing effectiveness index (MEI) and the number of workshops (representing supplier development) as the independent variables and supplier performance (cost, quality, service level) and process performance (inventory, floor space utilization, lead-time, and productivity) as the dependent variables.

Using the rational approach, MEI scores were found to be unrelated to whether a workshop was initiated for reasons of cost or quality or service problems, and unrelated to the number of workshops suppliers received. The workshops were perceived as having contributed to lower product cost, with somewhat weaker evidence for quality and service improvements. Using the institutional image construction approach, workshops were given more credit for identifying problems and solutions. The results further indicated that, for all process performance target variables, improvements measured 6 months after the workshops were significantly higher than predictions at the time of the workshops.

Hines (1996), conducted a study to collect information from Japanese companies (through semi-structured interviews and a questionnaire) and Japanese academics

(through semi-structured interviews) to unravel the complex web of interconnected causality factors that are responsible for creating world class buyer-supplier relationships. Supplier development was found to be a primary cause of high asset specificity, supplier innovation and close high trust relationships.

#### *2.1.5. Implementing and Sustaining Supplier Development*

Hartley & Choi (1996) conducted a case study of major North American automotive manufacturers and 8 automotive supplier companies to describe how supplier development is implemented and sustained and to explore why supplier development improves suppliers' performance. They found that most of the aspects of implementing supplier development were similar across the firms' studied and involved five common steps: 1) gaining commitment from supplier's top management, 2) identifying a leader in the supplier's organization, (3) forming a capable buyer-supplier development team, (4) implementing data driven changes, and (5) demonstrating success using a successful "model line".

The study reported four factors found to be instrumental in sustaining and spreading improvement activities throughout a supplier organization after the supplier development project had been completed and the buyer had moved on: 1) hands-on training of supplier team members, 2) follow-up and measurement by the customer on a regular basis, 3) fit of the approach with the supplier firm's corporate culture such as linking the improvement efforts to the supplier's overall strategy , and 4) building a support structure in the supplier's organization to facilitate continuous improvements by the suppliers



The authors also found that buyer-driven supplier development was successful in improving supplier's processes and systems because buyers provided a catalyst to change by offering expertise and a fresh perspective - two aspects that are important to process improvement but usually lacking in the suppliers. Further, while many suppliers knew that they needed to make improvements, they frequently found themselves caught up in daily activities and hence "postponed" making improvements. However, when a buyer requested that supplier development be undertaken, process improvement became a priority.

Krause, Handfield, and Scannell (1998) conducted an exploratory study with purchasing managers to gain better understanding of the supplier development process. They studied the process from the initial stage of identifying commodities for development to ensuring continuous improvement effort had taken place and developed a 10 step process model for supplier development. Additionally, the authors classified respondent firms as either 'strategic' or 'reactive' in their supplier development approach depending on how the process model was applicable to the firm. Firms with a strategic supplier development approach focused on improving the entire *supply base* through a supplier development *program*. In contrast, firms with a reactive supplier development approach focused on improving a deficient *single supplier* through a supplier development *project*. Although the authors found similarities between the strategic and reactive approaches, the primary differences between the two processes were captured in the first few process steps. Firms with a strategic supplier development approach were more likely to: have a formal process to identify suppliers for development; utilize cross-functional teams to steer supplier development initiatives; have formal timelines for

improvements from the suppliers; and have identified critical performance areas of improvement to gain competitive advantage.

## *2.2. Shared Vision*

Shared vision represents the extent to which the work values, norms, philosophy, problem-solving approaches, and prior work experience of a dyad are similar (Gerwin and Moffat 1997; Nelson and Coopriider 1996). Research suggests that similar heuristics and shared experiences between a source and a recipient are important antecedents of knowledge transfer (Hansen 1999), that they remove barriers to understanding and acceptance between a source and a recipient (Krauss and Fussell 1990), and that both participants thereby enhance their ability to work toward a common goal (Nelson and Coopriider 1996). Without shared vision, there is a tendency for the parties to disagree about what they should be doing and why, which leads to poor outcomes (Bennett 1996; Gerwin and Moffat 1997).

Hult et al. (2004) surveyed Fortune 500 transportation firms operating in 200 countries to examine how knowledge development may enhance supply chain outcomes. They found that a supply chain's level of shared meaning was negatively related to cycle time. They describe shared meaning as the extent to which participants in knowledge development develop common understandings about data and events. They also found that supply chain's level of information distribution activities was positively related to its level of shared meaning.

Inkpen and Tsang (2005) discuss how the social capital dimensions of networks affect an organization's ability to acquire new knowledge from the network and facilitate

the transfer of knowledge among network members. They define knowledge transfer as the process through which one network member is affected by the experience of another through acquiring knowledge from a partner by gaining access to the skills and competencies the partner brings to the partnership such as technical knowledge or market knowledge.

Inkpen (2008) explores organizational knowledge transfer using two cases of successful knowledge transfer (The China-Singapore Suzhou Industrial Park and the NUMMI joint venture between General Motors and Toyota). In the NUMMI case the author attributes the knowledge transfer success to the shared understanding based on practice and experience within knowledge communities that allowed knowledge to move easily. These knowledge communities emerged as the number of managers exposed to NUMMI increased and as these managers gained seniority in the company, the distribution of the knowledge became easier.

Li (2005) examined the relationship between shared vision and inward knowledge transfer to subsidiaries from both the subsidiary's corporate and external relations among 75 western MNCs; subsidiaries located in China. Li found that the effect of shared vision on inward knowledge transfer was more pronounced in intra-organizational relationships than in inter-organizational relationships.

Lane & Lubatkin (1998) surveyed U.S. executives of alliances between biotech and pharmaceutical companies to test the impact of two firms' relative absorptive capacity, defined as a shared research community, on inter-organizational knowledge transfer. Knowledge transfer was conceptualized as the pharmaceutical firm's success at

acquiring new skills or capabilities and technology or research developments in the alliance. The study found a positive relationship between shared research community and inter-organizational knowledge transfer.

Darr and Kurtzberg (2000) examined the conditions under which similarity between units' strategies and tasks, termed strategic similarity, enhances knowledge transfer. They surveyed pizza franchise organizations owning pizza stores in England and found that strategic similarity between the English franchise organizations had a significant negative relationship with unit costs of production. Knowledge transfer between stores with the same strategy significantly leads to adoption of good practices that decreases the unit cost of production.

### 2.3. *Trust*

Trust in the supplier is, on the one hand, the buyer's belief that the supplier is reliable, stands by its word, fulfils promised role obligations, and is sincere (cf. Anderson and Narus, 1990; Dwyer and Oh, 1987; Schurr and Ozanne, 1985), and on the other hand, the belief that the supplier is genuinely interested in its interests or welfare and is motivated to seek joint gains (cf. Geyskens, et al., 1998).

The trust literature provides considerable evidence that trusting relationships lead to greater knowledge transfer. When trust exists, people are more willing to give useful knowledge (Andrews and Delahay, 2000; and Tsai and Ghoshal 1998) and are also more willing to listen to and absorb others' knowledge (Srinivas, 2000; Levin 1999, Mayer et al. 1995,). These effects have been found at the individual and organizational levels of analysis in a variety of settings. For example, Levin (1999) found that strong, trusting ties

usually helped improve knowledge transfer between scientists and engineers. Tsai and Ghoshal (1998) found that at the department level trust and perceived trustworthiness, leads to the exchange of more resources (including knowledge) between departments.

Jansen et al., (2006) examined how formal and informal coordination mechanisms influence a unit's exploratory and exploitative innovation and how environmental aspects moderate the effectiveness of exploratory and exploitative innovation of a large European financial services firm. They found that social relations underpinned by trust in organizations are not only important for pursuing both exploratory innovation and exploitative innovation but are also more important than formal coordinating mechanisms for developing either exploratory innovation or exploitative innovation.

McAllister (1995) has demonstrated empirically the importance of two types of trust: affect based and cognition based. Similarly, Mayer et al. (1995) identify benevolence, which has a large affective component, and competence, which has a large cognitive component, as two key trust dimensions. *Benevolence* trust is defined as the extent to which a trustee is believed to want to do good for the trustor, apart from any profit motives, with synonyms including *loyalty, openness, caring, or supportiveness* (Mayer et al., 1995). While *Competence trust* is the buyer's perception of the ability of the supplier to meet commitments. Competence is based on the various resources and capabilities of a supplier which may include capital, human resources, physical properties and others. A supplier's competence suggests a high probability of getting things accomplished successfully. Therefore, competence trust gives a buyer a sense of confidence that the supplier is capable of accomplishing given tasks in the supplier development program.

Levin and Cross (2004) proposed and tested a model to establish whether stronger or weaker ties provides more useful knowledge at the dyadic level. They Surveyed midlevel professionals engaged in knowledge-intensive work in three divisions: one in an American pharmaceutical company, one in a British bank, and one in a Canadian oil and gas company. They found that the link between strong ties and receipt of useful knowledge (as reported by the knowledge seeker) was mediated by competence- and benevolence-based trust. Competence-based trust was especially important for the receipt of tacit knowledge.

Lui and Ngo (2004) examined how two different types of trust—goodwill trust and competence trust—interact with contractual safeguards to determine the cooperative outcomes of the architect–contractor partnership. They surveyed architects in an architect–contractor partnership in Hong Kong. Lui and Ngo found that goodwill trust and contractual safeguards serve as substitutes for each other and have similar effects on completion of projects on time. Competence trust, in contrast, functions as a complement for contractual safeguards. Further, the study revealed a more positive relationship between contractual safeguards and completion of projects on time in situations of low goodwill trust, and a more positive relationship between contractual safeguards and completion of projects on time in situations of high competence trust.

Dyer and Nobeoka (2000), in a case study of 30 Toyota executives and 10 first-tier suppliers in Japan and 11 suppliers in the U.S. demonstrated that suppliers do learn more quickly after participating in Toyota’s network in part due to strong ties which produce the trust (social capital) necessary to facilitate the transfer of tacit knowledge.

Inkpen and Tsang (2005) discuss how the social capital dimensions of networks affect an organization's ability to acquire new knowledge from the network and facilitate the transfer of knowledge among network members. They argue that when trust is high, firms may be more likely to invest resources in learning because of the willingness of their partners to refrain from instituting specific controls over knowledge spillovers.

Li (2005) examined the relationship between trust and inward knowledge transfer to subsidiaries from both the subsidiary's corporate and external relations among 75 western MNCs; subsidiaries located in China. Li found that the effect of trust on inward knowledge transfer was more pronounced in inter-organizational relationships than in intra-organizational relationships.

Dyer and Singh (1998) discuss the role of knowledge sharing routines as a potential source of inter-organizational competitive advantage. They argue that self-enforcing agreements, such as trust, call forth greater value-creation initiatives, such as sharing fine-grained tacit knowledge.

Perez-Nordtvedt et al. (2008) surveyed senior executives of U.S. firms' recipients of new knowledge from their international business affiliates. They identified relationship quality as one of the antecedents of successful inter-organizational transfer of knowledge across borders. Relationship quality was defined as the degree to which the relationship between source and recipient is close and based on trust and signifies the quality of transmission between the source and the recipient. Relationship quality was found to be positively related to knowledge transfer comprehension, speed and economy. Thus, organizations which have a close and trusting relationship with their foreign business

affiliates are more likely to be successful at understanding and rapidly and economically gaining the new knowledge from cross-border knowledge transfer.

Dhanaraj et al. (2004) surveyed 140 Hungarian joint venture presidents and general manager representing industries such as chemicals, electronics, construction, machineries and components, auto components, food processing, and textiles to study the role of social embeddedness and the impact on performance of tacit learning and explicit learning. They found that social embeddedness had a stronger influence on tacit learning than it did on explicit learning, and this differential effect was stronger in mature IJVs compared to young IJVs. Social embeddedness in this context refers to the social relationship between the foreign parent and the local management as evidenced by the level of parent support to the IJV, the degree of trust, and the extent to which the IJV has been socialized in the ways and procedures of the foreign parent. They concluded that trust facilitates knowledge transfer by creating a sense of security that the knowledge in question will not be exploited beyond what is initially intended.

#### *2.4. Suppliers' Learning Intent*

*Supplier's learning intent* captures the desire of the supplier to learn from the buyer. The specific elements of supplier's learning intent are a firm's motivation to learn (Mowery et al., 1996), articulating learning objectives (Hammel, 1991; Inkpen, 1998), learning benefits (Szulanski, 1996) and allocating resources to learning (Khanna, Gulati, & Nohria, 1998). The following studies although not drawn from the buyer-supplier relationship literature are pertinent to this study as they represent other forms of inter-organizational relationships.



Dyer and Singh (1998) discuss the role of knowledge-sharing routines as a potential source of inter-organizational competitive advantage. They argue that the ability of a receiver of knowledge to “unpackage” and assimilate the knowledge from a source is a function of partner-specific absorptive capacity. They refer partner-specific absorptive capacity as the idea that a firm has developed the ability to recognize and assimilate valuable knowledge from a particular alliance partner. They also argue that partner-specific absorptive capacity is a function of: the extent to which partners have developed overlapping knowledge bases and; the extent to which partners have developed interaction routines that maximize the frequency and intensity of sociotechnical interactions.

Perez-Nordtvedt et al. (2008) surveyed senior executives of U.S. firms’ recipients of new knowledge from their international business affiliates. They identified recipients’ learning intent as one of the antecedents of successful inter-organizational transfer of knowledge across borders. Recipients’ learning intent was defined as the motivation or intention that a potential recipient has to learn. Recipients’ learning intent was found to be positively related to knowledge transfer comprehension and speed. Thus, organizations which have a strong learning intent are more likely to be successful at understanding and rapidly gaining the new knowledge from cross-border knowledge transfer.

Hamel (1991) conducted multiple case studies of Euro-Japanese alliances within the electronics industry to examine the dimensions of inter-partner learning and to understand in detail the processes and mechanisms through which factors such as intent to learn impacted on learning outcomes. The results established that the recipient’s intent

to learn is a key determinant of the extent of knowledge transfer. None of the firms in the partnerships that had adopted defensive learning intents could demonstrate that systematic learning had taken place.

### *2.5. Knowledge Transfer*

There are several definitions of knowledge transfer in the organization learning literature. Szulanski (1996) defined knowledge transfer as "dyadic exchanges of organizational knowledge between a source and a recipient unit in which the identity of the recipient matters" (p. 28). Other researchers have looked at the resulting changes to the recipient and defined knowledge transfer as "the process through which one unit (e.g., group, department, or division) is affected by the experience of another" (Inkpen and Tsang, 2005; Argote and Ingram, 2000, p. 151). While other researchers focus on when knowledge transfer can be said to have taken place and define knowledge transfer as "when a contributor shares knowledge that is used by an adopter" (Darr and Kurtzberg 2000, p. 29). There are many conceptualization of knowledge transfer in the organizational learning literature. However, this study adopts Perez-Nordtvedt et al., (2008) conceptualization of knowledge transfer as a multidimensional construct comprising four components: comprehension, usefulness, speed and economy. Much of the work on knowledge transfer has been done in the alliance and joint venture field. This study is yet to establish the generalizability of this research to the buyer-supplier relationship. However, alliances, joint ventures and buyer-supplier relationships are all inter-organizational relationships suggesting that the following studies are pertinent to this research.

### 2.5.1. *Comprehension*

*Comprehension* is characterized as the extent to which the knowledge transferred is fully understood by the recipient (Perez-Nordtvedt et al., 2008). This dimension of knowledge transfer is supported by studies by Zahra et al. (2000). Zahra et al. (2000) in their study of new international ventures conceptualized knowledge transfer as “depth” of a venture's technological learning. “Depth” referred to a venture's mastery of new knowledge, evidenced by an ability to draw new conclusions and find new links among diverse knowledge bases. They found a significant positive relationship between technological learning “depth” and ROE. However, they did not find a significant relationship between “depth” and sales growth.

Using the resource-based view Perez-Nordtvedt et al., (2008), in their research on effectiveness and efficiency of cross-border knowledge transfer between U.S. firms (recipient) and their international business affiliates (source) in high tech industries, found that relationship quality positively influenced the comprehension of cross-border knowledge transfer. A relationship based on trust and involving significant interactions between involved parties results in the creation of a ‘common language’ which facilitates knowledge transfer. Recipients’ learning intent was also found to be positively related to knowledge transfer comprehension. Thus, organizations which have a strong learning intent are more likely to be successful at understanding the new knowledge from cross-border knowledge transfer.

Lane et al., (2001) proposed and tested a model of absorptive capacity in the context of international joint ventures (IJV) learning from foreign parents. The model

included three components of absorptive capacity: understanding external knowledge, assimilating that knowledge, and commercially applying the assimilated knowledge. The study found a weak but positive relationship between trust and knowledge understanding. They also found a significant positive association between knowledge acquired from foreign parents and IJV performance.

### 2.5.2. *Usefulness*

*Usefulness* of transferred knowledge is characterized as the extent to which such knowledge was relevant and salient to organizational success (Perez-Nordtvedt et al., 2008). Simonin (1999) in a study of the role played by the 'casually ambiguous' nature of knowledge in the process of technological knowledge transfer between strategic alliance partners conceptualized knowledge transfer as technological knowledge transfer. They captured technological knowledge transfer using a unidimensional construct and measured it using three items. One of the items captured the usefulness of knowledge transferred as “the technology/process know-how held by your partner has been assimilated by your company and has contributed to other projects developed by your company”.

Yli-Renko et al., (2001), explored how young technology-based firms could leverage inter-organizational relationships to acquire external knowledge and exploit it for competitive advantage. They conceptualized knowledge transfer as knowledge acquisition by a young firm from a larger customer. A survey of managing directors of young technology-based firms in the UK indicated that the social interaction and network ties dimensions of social capital were associated with greater knowledge acquisition, but

that the relationship quality dimension was negatively associated with knowledge acquisition. Knowledge acquisition was, in turn, positively associated with knowledge exploitation for competitive advantage through new product development, technological distinctiveness, and sales cost efficiency. Further, the results provided evidence that knowledge acquisition plays a mediating role between social capital and knowledge exploitation.

Lane et al., (2001) proposed and tested a model of absorptive capacity in the context of international joint ventures (IJV) learning from foreign parents. The model included three components of absorptive capacity: understanding external knowledge, assimilating that knowledge, and commercially applying the assimilated knowledge. The study found a weak but positive relationship between trust and knowledge application predictions.

Based on empirical evidence from a survey of 253 suppliers to the equipment industry, Mesquita et al.,. found that partnership exclusive performance (i.e., ‘relational performance’), the true source of learning dyads’ competitive advantage, was a function of suppliers acquiring know-how within the dyad and developing dyad-specific assets and capabilities.

### 2.5.3. *Speed*

*Speed* of knowledge transfer refers to how fast and efficient knowledge is transferred (Perez-Nordtvedt et al., 2008). A major factor that has been shown to affect the speed of knowledge transfer is the tacitness of knowledge - the degree to which knowledge is difficult to codify (e.g., in writing) or articulate.

Using the resource-based view Perez-Nordtvedt et al., (2008), in their research on effectiveness and efficiency of cross-border knowledge transfer between U.S. firms (recipient) and their international business affiliates (source) in high tech industries, found that relationship quality positively influenced the speed of cross-border knowledge transfer. A relationship based on trust and involving significant interactions between involved parties results in the creation of a ‘common language’ which facilitates knowledge transfer. Recipients’ learning intent was also found to be positively related to knowledge transfer speed. Thus, organizations which have a strong learning intent are more likely to be successful at rapidly gaining the new knowledge from cross-border knowledge transfer.

Zander & Kogut (1995) examined the relationship between knowledge transfer and the degree of codification of a manufacturing capability. Knowledge transfer was conceptualized as the speed of transfer of an innovation. Zander and Kogut surveyed project engineers of major Swedish innovation transfers to recipient firms located in major industrialized countries. They found that the more codified a capability was, the higher the “risk” of rapid transfer and concluded that the degree of codification of a manufacturing capability has a significant influence on the speed of transfer.

Szulanski (1996) in his model of Intra-Firm Transfer Of Best Practice found causal ambiguity of knowledge to be a significant origin of “stickiness” through all phases of the transfer process (i.e., initiation, implementation, ramp-up and integration) and particularly important during the first three stages. “Stickiness” reflected the difficulty, laborious and time consuming nature of the knowledge transfer process.

Hansen et al., (1999) conducted a survey in a large high-technology company in the U.S. to explain the role of weak ties in sharing knowledge across organization subunits in a multiunit organization. They found that the net effect on project completion time of having either weak ties or strong interunit ties is contingent on the complexity of the knowledge to be transferred across subunits. Strong ties provided the highest relative net effect (at least negative effect on completion time) when the knowledge was highly complex, whereas weak interunit ties had the strongest positive effect on completion time when the knowledge was not complex.

Uzzi (1997) using ethnographic fieldwork conducted studies on 23 firms in the New York City apparel industry conceptualized knowledge transfer as fine-grained Information transfer that included tacit information acquired through learning by doing. Uzzi found that relational embeddedness speeded up the exchange of this tacit knowledge and assisted in greater understanding, assimilation, and socialization of the knowledge between buyers and suppliers.

Zahra et al. (2000) in their study of new international ventures conceptualized knowledge transfer as “speed” of a venture's technological learning. “Speed” of technological learning described how rapidly the venture acquired new insights and skills. They found significant positive relationships between technological learning “speed” and ROE and sales growth. More recently, Perez-Nordtvedt et al., (2008) in their research on effectiveness and efficiency of cross-border knowledge transfer between U.S. firms and their international business affiliates in high tech industries, found that relationship quality and recipient learning intent positively influenced the speed of cross-border knowledge transfer.

### 2.5.3. *Economy*

*Economy* of knowledge transfer relates to the costs and resources associated with the knowledge transfer (Perez-Nordtvedt et al., 2008). Using the resource-based view Perez-Nordtvedt et al., (2008), in their research on effectiveness and efficiency of cross-border knowledge transfer between U.S. firms (recipient) and their international business affiliates (source) in high tech industries, found that relationship quality positively influenced the economy of cross-border knowledge transfer. A relationship based on trust and involving significant interactions between involved parties results in the creation of a ‘common language’ which facilitates knowledge transfer.

Szulanski (2000) analyzed how characteristics of the source of knowledge, the recipient, the context, and the knowledge itself affected transfer. Szulanski found that the importance of these factors varied over stages of the transfer process. Factors that affected the perception of an opportunity to transfer knowledge, such as the reliability of the source, predicted difficulty of transfer during the early initiation stage, whereas factors that affected the execution of transfer, such as the recipient’s ability to absorb knowledge, affected difficulty during the implementation phases. Szulanski (1996) in his model of Intra-Firm Transfer Of Best Practice found causal ambiguity of knowledge to be a significant origin of “stickiness” through all phases of the transfer process (i.e., initiation, implementation, ramp-up and integration) and particularly important during the first three stages. “Stickiness” reflected the difficulty, laborious and time consuming nature of the knowledge transfer process.



## 2.6. Conclusion

This chapter has reviewed the literature that is related to knowledge transfer in the context of supplier development. More specifically, in addition to the supplier development literature, supplier's learning intent, shared vision, trust, and knowledge transfer literatures were reviewed. In the supplier development literature five themes were reviewed: the prevalence and extent of supplier development; supplier development involvement; factors influencing supplier development; buyer-supplier performance outcomes of supplier development and; implementing and sustaining supplier development. The review indicates that supplier development programs were more prevalent than was expected and were called by different names depending on the emphasis of the program. Also, the majority of the firms had active programs of 6 months to over 4 years and had created permanent organizational units to handle supplier development programs. The supplier development activities suppliers are involved in range from indirect involvement such as supplier evaluations to more direct involvement such as education/teaching events. The review also identified top management recognition of the importance of the purchasing function, the level of competition in the buying firm's market, the importance of purchased inputs to the buying firm, perceived supplier commitment to the relationship, and effective buyer-supplier communication as some of the factors influencing the utilization of supplier development. The most prevalent buyer- supplier performance outcomes included operational effectiveness attributes such as quality, delivery and cost. The literature on shared vision indicates that shared vision influences both the knowledge transfer as well as the buyer-supplier performance outcomes. Recipient's learning intent has been stressed in the knowledge

transfer literature as being essential in the knowledge transfer process. The review established that the recipient's intent to learn is a key determinant of the effectiveness and efficiency of knowledge transfer. The trust literature reviewed two important components of trust that have differential impact on knowledge transfer: competence trust and benevolence trust. In general the trust literature provides considerable evidence that trusting relationships lead to greater knowledge transfer. The knowledge transfer literature reviewed that knowledge transfer can be conceptualized as a multidimensional construct comprising four components: comprehension, usefulness, speed and economy. These constructs have differential effect on the performance outcome of knowledge transfer.

## CHAPTER III

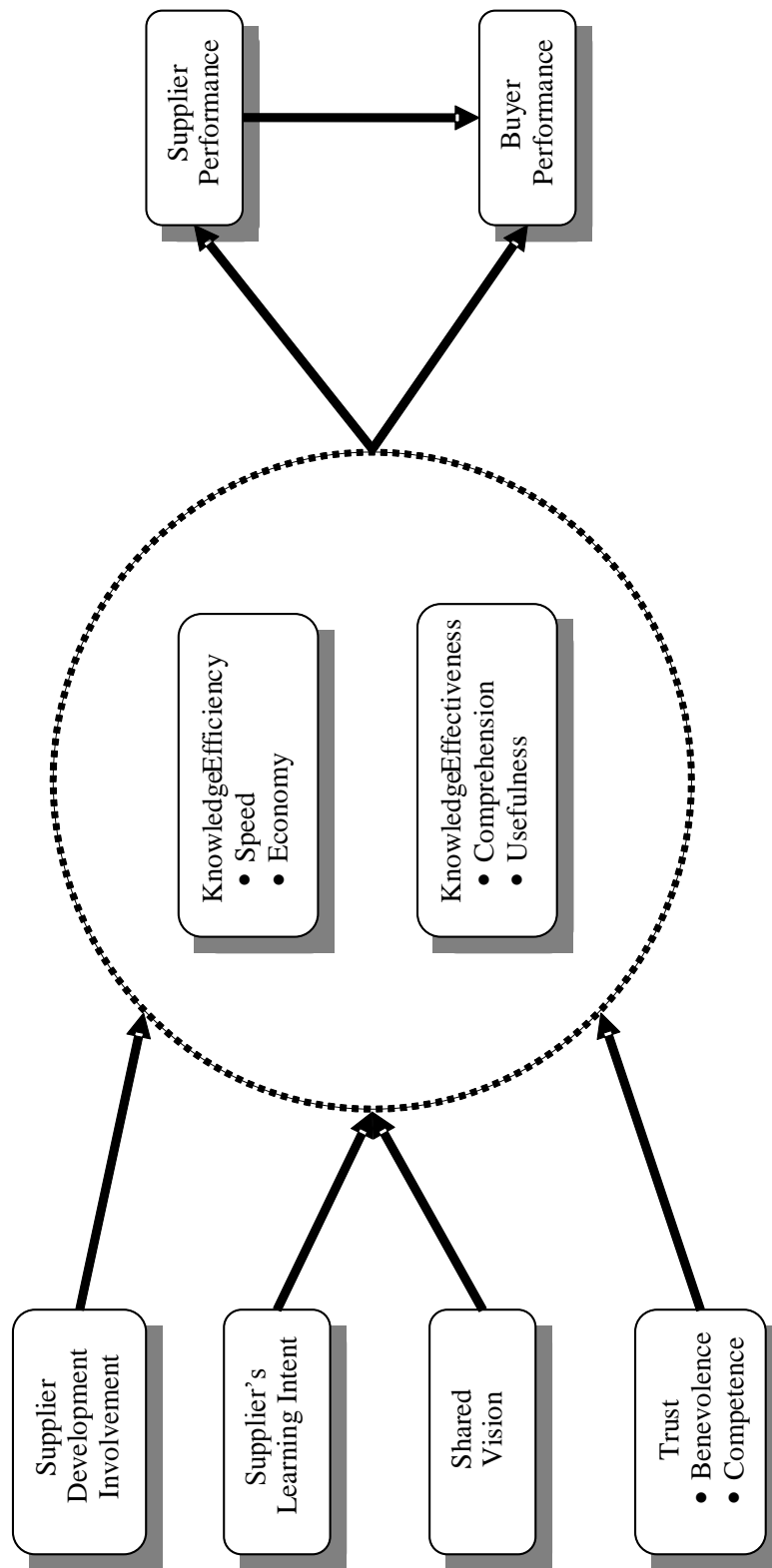
### Methodology

A conceptual model of the factors that affect knowledge transfer and the consequences of knowledge transfer in supplier development is presented in this section. This model was developed based on integration of the key factors from the supplier development literature and the knowledge transfer literature discussed in the literature review section of this proposal. Based upon the conceptual model, several simplified research models will be identified and hypotheses showing the linkages will be developed and tested.

#### *3.1 Conceptual Model of Knowledge Transfer in Supplier Development*

Figure 3.1 shows the conceptual model of knowledge transfer in supplier development constituted by three main blocks, which ordering is based on the logic of the buyer practice – value derived - performance outcomes (Terpend et al., 2008) in which knowledge transfer is viewed as the “derived value,” whereas the supplier development is viewed as the “buyer practice” and the buyer-supplier performance as the performance outcomes. Factors such as shared vision, supplier’s learning intent, and trust in the supplier are infrastructure factors of supplier development. The infrastructure factors of

Figure 3.1: Knowledge Transfer Conceptual Model



supplier development comprise the environment that supports effective use of supplier development activities (Humphreys & Chan, 2004).

Both supplier development and its infrastructure factors (antecedents of knowledge transfer) are expected to have direct effects on the effectiveness and the efficiency of knowledge transfer. In turn, the effectiveness and efficiency of knowledge transfer is expected to influence the buyer-supplier performance. Also, effective knowledge transfer impact on buyer-supplier performance may stem principally through its indirect effect on efficiency of knowledge transfer. Social capital theory and the knowledge based theory help to explain the conceptual model. Social capital theory helps to explain the link between the knowledge transfer antecedents and knowledge transfer, whilst knowledge based theory explains the effectiveness and efficiency of

### *3.2. Operationalization of the Constructs*

All independent and dependent variables, except for control variables, were measured on multi-item scales (4 to 7 items for each scale). Existing scales from the supplier development and the knowledge transfer literatures were used to measure the constructs presented in the conceptual model.

#### *3.2.1 Supplier Development Involvement*

Sako (2004), MacDuffie & Helper (1997) and Kotabe et al., (2003) discuss supplier development as a firm's attempt to transfer (or replicate) some aspect of its in-house organizational capability across firm boundaries to help improve its suppliers' capabilities. These organizational capabilities include, among others, lean manufacturing, total quality control and shopfloor improvement. The proposed scale is designed to capture the transfer of these capabilities from the buyer to the supplier. Scale items were

adapted from Mesquita et al., (2008). Because the Mesquita scale was designed to capture the supplier perspective of knowledge transfer, the wording of the items had to be adapted accordingly to reflect the buyers' perspective. The scale uses multi-items to measure the perceived degree to which suppliers had 'invested' or 'participated' in any of a series of knowledge acquisition programs to acquire team-based capabilities, such as *kaizen* (i.e., constant improvement techniques), lot-size optimization, machinery and plant set-up techniques, as well as total quality management (Mesquita et al., 2008). Supplier 'participation' is defined as attending workshops, lessons conducted by the buyer or teams from both the buyer and the supplier join efforts in someone else's training program. The Mesquita scale and the scale proposed for this study are presented below to provide greater understanding of how the scale was adapted.

*Mesquita scale: Joint buyer-supplier knowledge acquisition efforts:*

Degree to which supplier has invested in or participated in (i.e., been involved with) programs to acquire any of the following improvement packages with 'co-participation' of 'this' buyer, that is, where this buyer participated in these knowledge acquisition efforts either by 'teaching,' 'consulting,' or 'joint-participating' (e.g., this buyer's and supplier's employees jointly participated in someone else's programs) (1 = Not at all, and 5 = To a large degree)

*Adapted scale for this study: Supplier development*

Please circle the indicator that best describes the degree to which this supplier had invested in or participated in (i.e., been involved with) the following improvement packages during the supplier development program with your firm. Your firm participated in the supplier development either by 'teaching,' 'consulting,' or 'joint-participating' (e.g., your firm's and this supplier's employees jointly participated in someone else's programs). (1 = Not at all, 4 = Neutral and 7 = To a large degree)

<i>Mesquita scale</i>	<i>Adapted scale proposed for study</i>
Total quality management programs.	Total quality management programs.
New machine set up techniques programs.	New machine set up techniques programs.
Kaizen programs.	Kaizen programs.
Lot size optimization techniques programs.	Lot size optimization techniques programs.

### 3.2.2. Shared Vision

*Shared vision* is often used to refer to shared values and mutual goals and understanding in a cooperative relationship (Morgan & Hunt, 1994; Parsons, 2002). When talking about shared vision, Hankanson (1995) proposes that organizational culture should also be taken into consideration, because organizational culture helps to convey a sense of identity in organizational members and may create commitment to the organization and its goals. The construct of shared vision is operationalized by similarity in business practice, organizational culture, shared goals, and shared understanding of doing business. Four scale items comprise the scale for shared vision. These items tap well into the idea that goals and values may be shared by buyers and their key suppliers (Weick, 1995).

Please circle the indicator which best describes this relationship. (1=strongly disagree, 7=strongly agree)

Both firms share the same business values.
The parties often agree what is in the best interest of the relationship.
This supplier shares our goals for this business.
Both firms have similar organizational cultures

### 3.2.3. Supplier's Learning Intent

The perceived *supplier's learning intent* is the extent to which the buyer believes that the supplier is focused on learning during the supplier development program.

*Supplier's learning intent* captures the desire of the supplier to learn from the buyer. The specific elements of supplier's learning intent are a firm's motivation to learn (Mowery et al., 1996), articulating learning objectives (Hammel, 1991; Inkpen, 1998), learning benefits (Szulanski, 1996) and allocating resources to learning (Khanna, Gulati, & Nohria, 1998). The items that are being proposed to measure this construct have been assembled from scales used by Perez-Nordtvedt et al., (2008) and the partner's learning intent and partner access scales used by Norman, (2002). The items on the scale were modified, as can be seen in the table below, to reflect the supplier development context.

(1 = strongly disagree to 7 = strongly agree)

<i>Perez-Nordtvedt et al., (2008) scale</i> <i>Our company saw benefit in...</i>	<i>Adapted scale</i> <i>Please circle the indicator which best describes the extent to which this supplier is focused on learning from your firm.</i>
Understanding the knowledge possessed by the IBA.	Understanding the knowledge possessed by our firm.
Absorbing the IBA's understanding of the knowledge it possessed.	Absorbing our firm's understanding of the knowledge we possessed.
Analyzing the feasibility of adopting the knowledge possessed by the IBA.	Analyzing the feasibility of adopting the knowledge possessed by our firm.
Communicating the needs to the IBA with respect to the knowledge acquired.	Communicating their needs to our firm with respect to the knowledge acquired.
<i>Norman, (2002) partner's intent to learn scale</i>	
One of our partner's objectives in forming the alliance was to learn about our management techniques	One of this supplier's objectives in the supplier development program was to learn about our skills, techniques and capabilities.
Our partner aggressively tries to learn from us	This supplier aggressively tries to learn from us



### 3.2.4. Trust in Supplier – Competence

*Competence trust* is the buyer’s perception of the ability of the supplier to meet commitments. Competence is based on the various resources and capabilities of a supplier which may include capital, human resources, physical properties and others. A supplier’s competence suggests a high probability of getting things accomplished successfully. Therefore, competence trust gives a buyer a sense of confidence that the supplier is capable of accomplishing given tasks in the supplier development program. The study proposes to use the ability-based trust scale that Muthusamy and White (2005) used to examine the effects of social exchange processes between alliance partners on the extent of learning and knowledge transfer in a strategic alliance.

Please indicate your perception of the level of trust in the ability of this supplier at the beginning of the supplier development program. (1 = Strongly disagree, 7 = Strongly agree)

<i>Muthusamy and White (2005) Scale</i>	<i>Adapted scale</i>
The partner firm is very capable of performing its role in the alliance	This supplier was very capable of performing its role in the supplier development program
The partner firm is known to be successful at the things it tries to do	This supplier was known to be successful at the things it tries to do
The partner firm is well qualified for the alliance	This supplier was well qualified for the supplier development program
The partner firm has much knowledge about the work that needs to be done in the alliance	This supplier had much knowledge about the work that needs to be done in the supplier development program

### 3.2.5. Trust in Supplier – Benevolence

*Benevolence* trust is defined as the extent to which a trustee is believed to want to do good for the trustor, apart from any profit motives, with synonyms including *loyalty*, *openness*, *caring*, or *supportiveness* (Mayer et al., 1995). Benevolence trust was measured using five items that captured the extent to which the buyer perceived the supplier would not intentionally harm its interests. The study proposes to use the trust scale that Humphreys et al., (2004) used to examine “The impact of supplier development on buyer–supplier performance”.

Please indicate your perception of the level trust in the ability of this supplier at the beginning of the supplier development program. (1 = Strongly disagree, 7 = Strongly agree)

Adapted scale
This supplier was genuinely concerned that our business succeeds.
We trusted this supplier to keep our best interests.
We found it necessary to be cautious with this supplier.
We believe the information that this supplier provides us.
This supplier is not always honest with us.

### 3.2.6. Knowledge Transfer – Comprehension

*Comprehension* is characterized as the extent to which the knowledge transferred is fully understood by the recipient. The scale was adapted from Perez-Nordtvedt et al., (2008), who conducted research to examine the effectiveness and efficiency of cross-border knowledge transfer between U.S. firms (recipient) and their international business affiliates (source) in high tech industries.

Please circle the indicator which best describes your perceptions about this supplier's receipt and application of the knowledge provided in the supplier development program (1=strongly disagree, 7=strongly agree)

Perez-Nordtvedt et al., (2008) scale The new knowledge that we acquired from our International Business Affiliate (IBA) was...	Adapted scale The knowledge that we shared with this supplier was...
complete enough that we were able to become proficient with it.	complete enough that the supplier were able to become proficient with it.
thorough enough that we were able to fully understand it.	thorough enough that the supplier was able to fully understand it.
well understood in the organization.	well understood by the supplier organization.
	appreciated and the supplier requested for more advanced knowledge.

### 3.2.7. Knowledge Transfer – Usefulness

*Usefulness* of transferred knowledge is characterized as the extent to which such knowledge was relevant and salient to organizational success (Perez-Nordtvedt et al., 2008). The usefulness construct taps more specifically into the buyers perception of the effectiveness of the knowledge gained by the supplier as a result of the supplier development program. All the four items on this scale were taken from Perez-Nordtvedt et al., (2008) research on effectiveness and efficiency of cross-border knowledge transfer between U.S. firms (recipient) and their international business affiliates (source) in high tech industries. The scale was modified, as can be seen in the table below, to reflect the supplier development context.

Please circle the indicator which best describes your perceptions about this supplier's receipt and application of the knowledge provided in the supplier development program. (1=strongly disagree, 7=strongly agree)

Perez-Nordtvedt et al., (2008) scale	Adapted scale
The new knowledge transferred from our IBA contributed a great deal to multiple projects.	The knowledge transferred from our firm contributed a great deal to multiple projects at our supplier's firm.
Our organization was very satisfied with the quality of the knowledge that our IBA provided.	This supplier was very satisfied with the quality of the knowledge that our firm provided.
Our organization dramatically increased the perception about the efficacy of the knowledge after gaining experience with it.	This supplier dramatically increased the perception about the efficacy of the knowledge after gaining experience with it.
The transfer of knowledge from the IBA greatly helped our company in terms of actually improving our organizational capabilities.	The transfer of knowledge from our firm greatly helped this supplier in terms of actually improving its organizational capabilities.

### 3.2.8. Knowledge Transfer – Speed

*Speed* at which knowledge was transferred signifies how rapidly the recipient acquires new insights and skills (Zander & Kogut, 1995; Zahra et al., 2000). Three items on this scale were taken from Perez-Nordtvedt et al., (2008) research on effectiveness and efficiency of cross-border knowledge transfer between U.S. firms (recipient) and their international business affiliates (source) in high tech industries. The scale was modified, as can be seen in the table below, to reflect the supplier development context. Also, one item was included to improve the psychometric properties of the scale.

Please circle the indicator which best describes your perceptions about this supplier's receipt and application of the knowledge provided in the supplier development program (1=strongly disagree, 7=strongly agree)

Perez-Nordtvedt et al., (2008) scale	Adapted scale
The rate at which the new knowledge was transferred from our IBA was very fast.	The rate at which the knowledge was transferred to our supplier was very fast.
The new knowledge was transferred from our IBA in a timely fashion	The knowledge was transferred to our supplier in a timely fashion

It took our company a short time to acquire and implement the knowledge provided by our IBA	It took our supplier a short time to acquire and implement the knowledge provided by our firm
	This supplier complained that the knowledge was being transferred at a faster rate than they could handle.

### 3.2.9. Knowledge Transfer – Economy

*Economy* of knowledge transfer relates to the costs and resources associated with the knowledge transfer (Szulanski, 1995, 1996 and Hansen et al. 2005). The economy construct taps more specifically into the buyers perception of the efficiency of the knowledge transfer by the supplier as a result of the supplier development program. Three items on this scale were taken from Perez-Nordtvedt et al., (2008) research on effectiveness and efficiency of cross-border knowledge transfer between U.S. firms (recipient) and their international business affiliates (source) in high tech industries. The scale was modified, as can be seen in the table below, to reflect the supplier development context. Also, one item was included to improve the psychometric properties of the scale.

Please circle the indicator which best describes your perceptions about this supplier’s receipt and application of the knowledge provided in the supplier development program (1=strongly disagree, 7=strongly agree)

Perez-Nordtvedt et al., (2008) scale	Adapted scale
The new knowledge provided by our IBA was acquired and implemented at a very low cost.	The knowledge transferred from our firm to this supplier was acquired and implemented at very low cost.
The acquisition and implementation of the new knowledge from our IBA did not require the utilization of too many company resources.	This supplier did require the utilization of too many company resources during the acquisition and implementation of the new knowledge.

Our company did not waste money acquiring and implementing the new knowledge from our IBA.	This supplier did not waste money during the acquisition and implementation of the new knowledge.
	This supplier did not waste time during the acquisition and implementation of the new knowledge.

Venkatraman and Ramanujam (1986) classified business performance measures as either financial or operational (non-financial). Operational measures of performance can be classified in two streams: key competitive success factors (e.g., quality, delivery, price, service, and flexibility) and internal indicators, such as defects, schedule realization and cost. In this study, the buyer - supplier performance is an operational measure of key competitive success factors and internal indicators, namely product quality, delivery performance, flexibility, and cost. The supplier's performance directly influences the buying firm and is, therefore, a critical criterion for the buying firm.

### 3.2.10. Supplier Performance – Delivery

The supplier delivery performance scale includes 3 items focusing on meeting design specifications, delivery and quality.

Please circle the indicator which best describes the performance changes as a consequence of the involvement of this supplier in your firm's supplier development program. (1 – Decreased Significantly 4 – Remained Constant 7 – Increased Significantly)

Percentage of orders meeting design specification.
Percentage of orders meeting quality requirements.
Percentage of on-time deliveries.

### 3.2.11. Supplier Performance - Cost

The supplier cost performance scale includes 4 items focusing on cost and time.

Please circle the indicator which best describes the performance changes as a consequence of the involvement of this supplier in your firm's supplier development program. (1 – Decreased Significantly 4 – Remained Constant 7 – Increased Significantly)

Cost of purchased parts.
Average investment in purchased parts inventory.
Lead time for special/rush orders.
Time required for supplier to take a new item from development into production.

### 3.2.12. Buyer Performance – Delivery

The buyer delivery performance scale includes 4 items focusing on quality, delivery and flexibility.

Please circle the indicator which best describes the performance changes as a consequence of the involvement of this supplier in your firm's supplier development program. (1 – Decreased Significantly 4 – Remained Constant 7 – Increased Significantly)

Product quality
Delivery times of our products
Reliability of our product delivery
Manufacturing flexibility

### 3.2.13. Buyer Performance – Cost

The buyer cost performance scale includes 2 items focusing on cost.

Please circle the indicator which best describes the performance changes as a consequence of the involvement of this supplier in your firm's supplier development program. (1 – Decreased Significantly 4 – Remained Constant 7 – Increased Significantly)

Total costs of our products
Product costs

### 3.3. Research Models and Hypotheses

This section links the key constructs of knowledge transfer in supplier development using multiple research models. Each of the research models is formulated based on a main knowledge transfer dimension. The research hypotheses are presented within the domain of each of these research models.

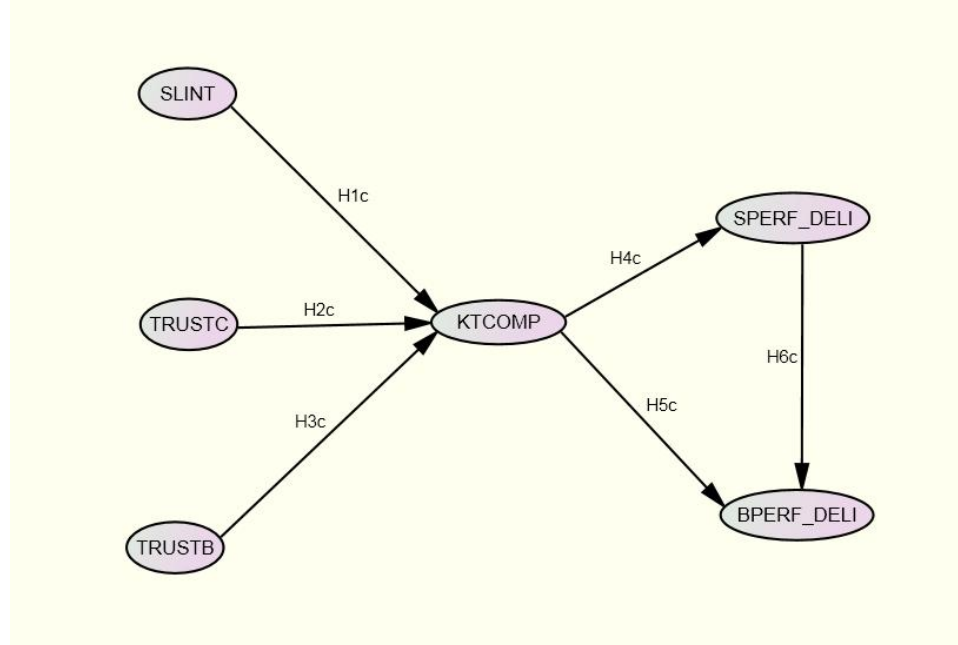
#### 3.3.1. Model 1: Knowledge Transfer Comprehension – Delivery Performance

Figure 3.2 presents the proposed model of knowledge transfer comprehension – delivery performance. In this model the impact of supplier's learning intention, competence trust and benevolence trust on knowledge transfer comprehension are studied. Supplier's delivery performance and buyer's delivery performance are considered as performance outcomes.

Researchers have identified the concept of learning intent of the recipient as an important factor in knowledge transfer success (Baughn et al., 1997; Hamel, 1991). The idea is that a recipient firm will take action that facilitates the transfer of knowledge if they realize that a particular knowledge can provide a sustainable competitive advantage (Pérez-Nordtvedt et al., 2008). This action will be in the form of articulating learning objectives designed to facilitate knowledge transfer (Inkpen, 1998; Hamel, 1991),



Figure 3.2 Knowledge Transfer Comprehension – Delivery Performance (Proposed Model)



providing learning incentives (Szulanski, 1996) and allocating appropriate resources to learning (Khanna, Gulati, & Nohria, 1998; Hartley & Choi, 1996). This will in turn foster the building of a learning capacity (Hamel, 1991), which is critical to the transfer of knowledge across firm boundaries. For instance, Hartley & Choi (1996) found that limited staffing for supplier development resulted in a constant struggle to solve immediate problems, leaving no leeway for learning. Pérez-Nordtvedt et al., (2008) provide empirical evidence supporting the importance of recipient learning intention in cross border knowledge transfer. Recipients' learning intent was found to be positively related to knowledge transfer comprehension. Thus, organizations which have a strong learning intent are more likely to be successful at understanding the new knowledge from knowledge transfer. The above arguments lead to the following hypothesis:

H1c: Supplier's learning intent is positively associated with the comprehension of knowledge transferred in supplier development.

The nature of the relationship between a source and a recipient is important in inter-organizational knowledge transfers. Several studies suggest that trusting relationships facilitate knowledge transfer (e.g. Dhanaraj et al., 2004; Lane et al., 2001; Szulanski, 1995, 1996). The trust literature has demonstrated that two dimensions of trust, competence and benevolence, are relevant to the knowledge transfer context (Levin 1999).

Supplying firms that are benevolent to the buying firm i.e., honest, genuinely concerned about buyers business and can be trusted to keep the buyers best interests help create an environment that leads to a good buyer-supplier relationship. A good buyer-supplier relationship allows for greater openness and cooperation between the buyer and the supplier (Das and Teng, 1998). This leads to sharing of valuable secret information and tacit knowledge (Makino and Delios, 1996; Inkpen and Beamish, 1997) and facilitates the comprehension of the knowledge transferred. Also, a good relationship allows for greater interaction, which, in turn, generates a 'common language' between the supplier and the buyer and facilitates better understanding of the transferred knowledge (Reagans and McEvily, 2003).

*Competence trust* can be defined as the buyer's perception of the ability of the supplier to meet commitments. Competence is based on the various resources and capabilities of a supplier which may include capital, human resources, physical properties and others. A supplier's competence suggests a high probability of getting things accomplished successfully. Therefore, competence trust gives a buyer a sense of confidence that the supplier is capable of accomplishing given tasks in the supplier development program. This confidence will in turn encourage the buyer to actively help

the supplier to understand the knowledge it is offering. This is unlikely to happen unless the teacher is confident that its partner is reliable and will fulfill its obligations (Johnson *et al.*, 1996). The above arguments lead to the following hypotheses:

H2c: The perceived supplier's competence trust will be positively associated with the comprehension of the transferred knowledge in supplier development.

H3c: The perceived supplier's benevolence trust will be positively associated with the comprehension of the transferred knowledge in supplier development.

In their review of the literature on interfirm knowledge sharing, Dyer and Nobeoka (2000, p. 346) argue that, "scholars have recognized that *inter-organizational* learning is critical to competitive success, noting that organizations learn by collaborating with other firms as well as by observing and importing their practices." When buying firms transfer knowledge to suppliers in the course of a supplier development program, the suppliers are able to upgrade capabilities that help them to develop, produce, and sell superior products to their customers in the long run (Modi and Mabert, 2007; Day, 1994). Expected outcomes of such knowledge transfer in supplier development include, improved efficiency and reduced costs (Quayle, 2000; Handfield *et al.*, 2000) as well enhanced supplier performance in terms of technical, quality, delivery (Watts and Hahn, 1993). Thus, it is argued that knowledge transfer facilitates buyer-supplier performance.

The buying firm can invest in a deficient supplier by transferring knowledge to that supplier (Dyer and Hatch, 2006). Suppliers can greatly benefit if they are able to integrate such external knowledge. Receiving crucial outside sources of valuable knowledge can help the supplier to improve the production and delivery of a particular product, or to upgrade its engineering, logistics, manufacturing, and other capabilities in

the long run (Hult et al., 2004; Mobi and Mabert, 2007). Diffusion of manufacturing and production expertise (e.g., SPC and SMED) in the supply base through knowledge transfer enhances supplier performance (Modi and Mabert). Also, implementing activities that enable the transfer of “tacit” production knowledge improves supplier skills, which benefits the customer organization in the form of a more capable and better performing supplier.

Using the number of workshops to represent knowledge transfer in supplier development, Rogers et al. (2007) found that workshops were perceived as having contributed to lower product cost, with somewhat weaker evidence for quality and service improvements. In the international joint ventures (IJV) context Lane et al., (2001) found a significant positive association between knowledge acquired and performance.

This leads to the following set of hypotheses:

H4c: There is a positive association between the supplier firm’s knowledge transfer comprehension and the supplier firm’s delivery performance.

H5c: There is a positive association between the supplier firm’s knowledge transfer comprehension and the buyer firm’s delivery performance.

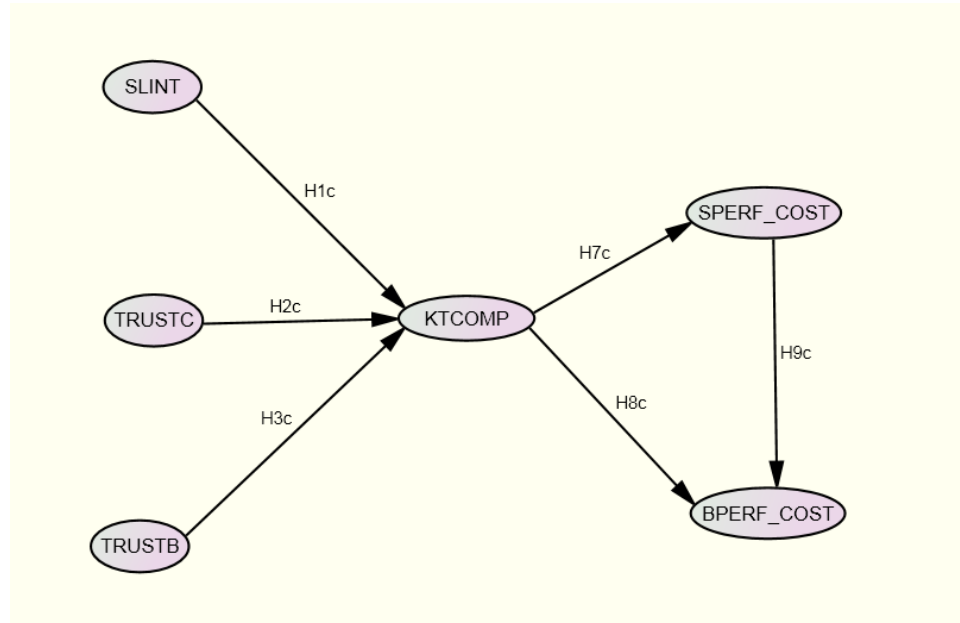
H6c: There is a positive association between the supplier firm’s delivery performance and the buyer firm’s delivery performance.

### *3.3.2. Model 2: Knowledge Transfer Comprehension – Cost Performance*

Figure 3.3 presents the proposed model of knowledge transfer comprehension – cost performance. Similar to Model 1, the impact of supplier’s learning intention, competence trust and benevolence trust on knowledge transfer comprehension are studied. However, unlike Model 1, supplier’s cost performance and buyer’s cost

performance are considered as performance outcomes. Thus, hypotheses H1c, H2c and H3c, are the same for Models 1 and 2.

Figure 3.3 Knowledge Transfer Comprehension – Cost Performance (Proposed Model)



As argued in Model 1, this model also hypothesizes knowledge transfer comprehension to have a positive impact on supplier’s cost performance and buyer’s cost performance (Rogers et al. (2007; Modi and Mabert, 2007; Day, 1994; Lane et al., 2001; Quayle, 2000; Handfield et al., 2000).

H7c: There is a positive association between the supplier firm’s knowledge transfer comprehension and the supplier firm’s cost performance.

H8c: There is a positive association between the supplier firm’s knowledge transfer comprehension and the buyer firm’s cost performance.

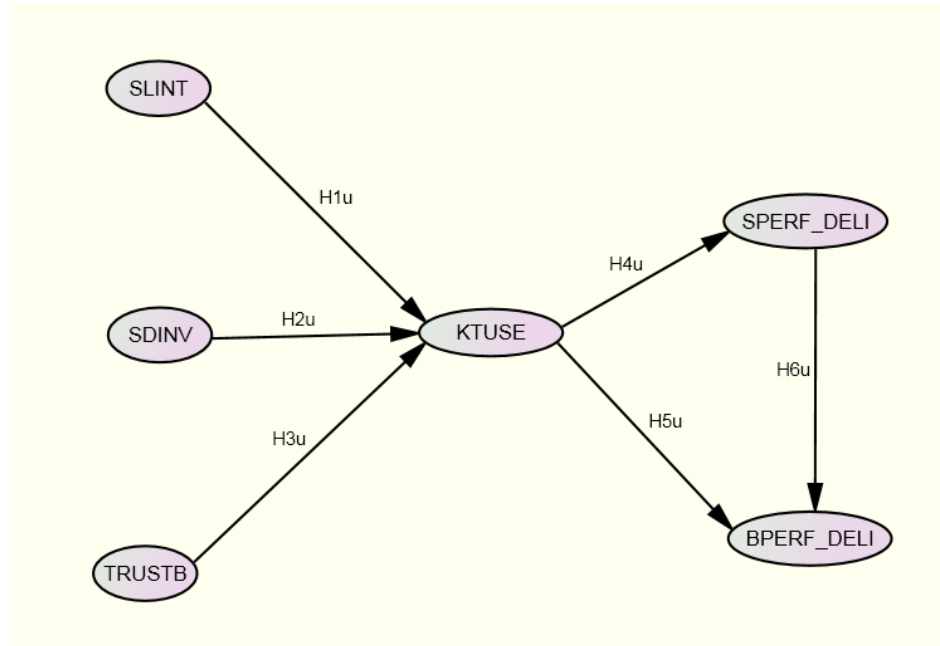
H9c: There is a positive association between the supplier firm’s cost performance and the buyer firm’s cost performance.

### 3.3.3. Model 3: Knowledge Transfer Usefulness – Delivery Performance

Figure 3.4 presents the proposed model of knowledge transfer usefulness – delivery performance. In this model the impact of supplier’s learning intention, supplier

development involvement and benevolence trust on knowledge transfer usefulness are studied. Supplier's delivery performance and buyer's delivery performance are considered as performance outcomes

Figure 3.4 Knowledge Transfer Usefulness – Delivery Performance (Proposed Model)



As discussed earlier, recipient learning intent, which represents the extent of desire on the part of a recipient to learn from another entity (Simonin, 2004; Tsang, 2002), is an important factor in knowledge transfer (e.g. Lord and Ranft, 2000; Mowery et al., 1996; Simonin, 1999, 2004; Tsang, 2002). The important role played by learning intent is well recognized in the literature. The outcome of many Japan–West alliances is perceived to be detrimental to Western firms and beneficial to their Japanese partners partly due to the latter's clear intent to acquire specific competencies from the former and the former's lack of such intent (Hamel *et al.*, 1989; Reich and Mankin, 1986; Teramoto, Richter, and Iwasaki, 1993).

H1u: The perceived supplier's learning intent is positively associated with the usefulness of knowledge transferred in supplier development.

The supplier development literature shows that involvement in direct supplier development activities affects knowledge flows to suppliers (Modi and Mabert, 2007). The study argues that suppliers are more likely to get more involved in supplier development programs organized by a buyer who is a world class manufacturer and is associated with knowledge creation. Knowledge emanating from such a buyer is likely to be perceived as being particularly useful by a supplier for the following reasons. First, a buyer that is perceived to be a consistent superior performer over time is likely to have greater trustworthiness, given its ability to achieve results or 'accomplish something on its own' (Szulanski et al., 2004, p. 604). A supplier is likely to view a buyer that has achieved superior results as being skilled at generating and using knowledge – knowledge that they see as having a greater likelihood of being useful from their perspective. Second, a buyer that has been involved in the creation of knowledge can be expected to know precisely how the knowledge can be best applied to improve operations. Knowledge transferred from such a buyer is also likely to be viewed as being more useful because of the ability of the buyer to illustrate to the supplier how the knowledge can be best applied. Indeed, the case study by Dyer and Nobeoka (2000), demonstrated that suppliers do learn more quickly and apply the new knowledge after participating in Toyota's network in part due to the superior manufacturing knowledge possessed by Toyota and also the reputation of Toyota products. This leads to the following hypothesis:

H2u: Supplier development involvement by a supplier will be positively associated with the perceived usefulness of knowledge that is transferred in the supplier development.

As discussed earlier benevolence trust facilitates the transfer of useful knowledge. The trust literature (Dirks & Ferrin, 2001; Mayer et al., 1995) provides considerable evidence that trusting relationships lead to greater knowledge exchange. When trust levels are higher, people are more willing to give useful knowledge (Andrews & Delahay, 2000; Penley & Hawkins, 1985; Tsai & Ghoshal, 1998; Zand, 1972) and also more willing to listen to and absorb it (Levin, 1999; Mayer et al., 1995; Srinivas, 2000). High levels of trust between partners are positively and significantly related to the access of rich information between the partners. Partners share rich information with confidence because the development of norms of reciprocity and sanctions for the violation of trust dampens opportunistic behavior (Coleman, 1988). For instance, Uzzi (1996, 1997) found that the development of trust between alliance partners changed the nature of information that was exchanged. Such exchange is geared towards value creation as both partners commit to joint problem solving. In contrast, in arm's-length relationships information exchange is restricted to price-based information that is stripped of its context.

H3u: The perceived supplier's competence trust will be positively associated with the usefulness of knowledge that is transferred in the supplier development.

As hypothesized in the earlier models, this model also considers the impact of knowledge transfer usefulness on buyer-supplier delivery performance. Knowledge transfer usefulness is expected to be positively associated with both supplier's delivery performance and buyer's delivery performance. Also, supplier's delivery performance is expected to have an impact on buyer's delivery performance.

H4u: There is a positive association between the supplier firm's knowledge transfer usefulness and the supplier firm's delivery performance.



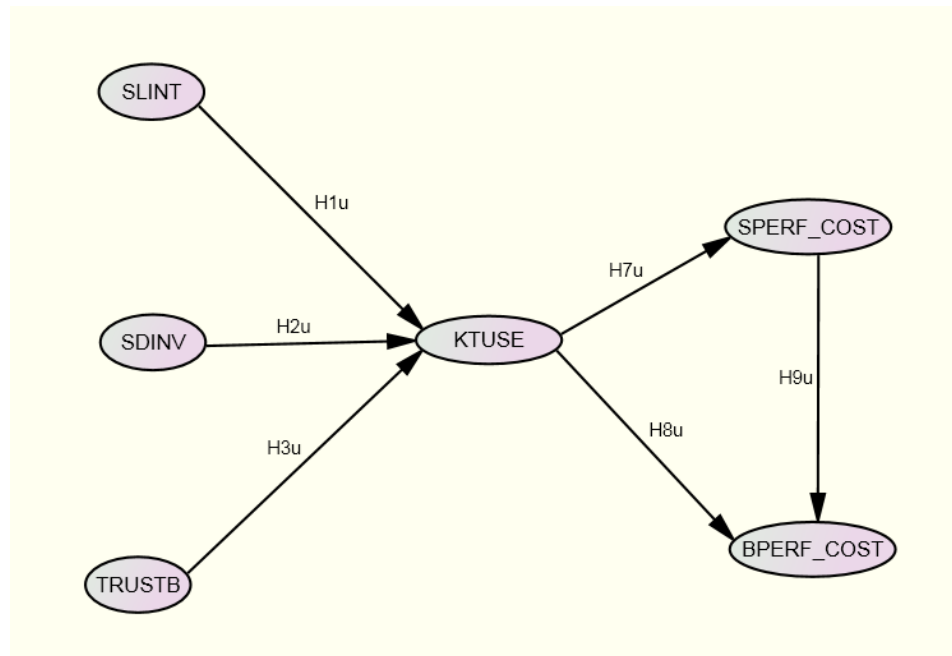
H5u: There is a positive association between the supplier firm’s knowledge transfer usefulness and the buyer firm’s delivery performance.

H6u: There is a positive association between the supplier firm’s delivery performance and the buyer firm’s delivery performance.

### 3.3.4. Model 4: Knowledge Transfer Usefulness – Cost Performance

Figure 3.5 presents the proposed model of knowledge transfer usefulness – cost performance. Similar to Model 3, the impact of supplier’s learning intention, supplier development involvement and benevolence trust on knowledge transfer usefulness are studied. However, unlike Model 3, supplier’s cost performance and buyer’s cost performance are considered as performance outcomes. Thus, hypotheses H1u, H2u and H3u, are the same for Models 3 and 4.

Figure 3.5 Knowledge Transfer Usefulness – Cost Performance (Proposed Model)



As argued in Model 1, this model also hypothesizes knowledge transfer usefulness to have a positive impact on supplier’s cost performance and buyer’s cost

performance (Rogers et al. (2007; Modi and Mabert, 2007; Day, 1994; Lane et al., 2001; Quayle, 2000; Handfield et al., 2000).

H7u: There is a positive association between the supplier firm's knowledge transfer usefulness and the supplier firm's cost performance.

H8u: There is a positive association between the supplier firm's knowledge transfer usefulness and the buyer firm's cost performance.

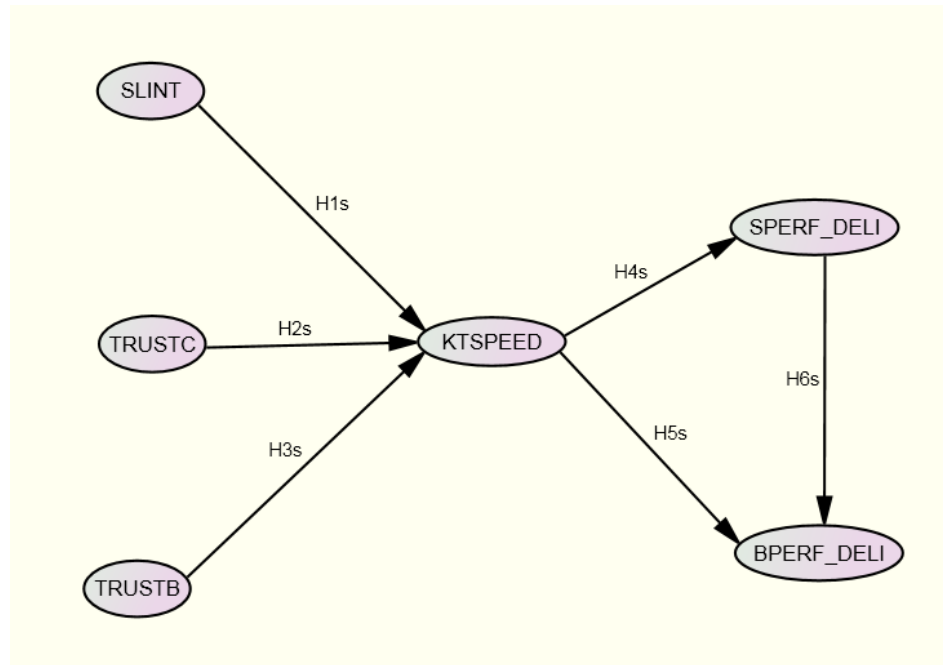
H9u: There is a positive association between the supplier firm's cost performance and the buyer firm's cost performance.

### 3.3.5. Model 5: Knowledge Transfer Speed – Delivery Performance

Figure 3.6 presents the proposed model of knowledge transfer speed – delivery performance. In this model the impact of supplier's learning intention, supplier competence trust and benevolence trust on knowledge transfer speed are studied. Supplier's delivery performance and buyer's delivery performance are considered as performance outcomes.

*Supplier's learning intent* captures the desire of the supplier to learn from the buyer. One of the elements of supplier's learning intent is a firm's motivation to learn (Mowery et al., 1996). If a recipient firm is highly motivated to acquire knowledge, its openness to receive such knowledge allows for quicker transfer. The idea is that a recipient firm will take action that facilitates the transfer of knowledge if they realize that a particular knowledge can provide a sustainable competitive advantage (Pérez-Nordtvedt et al., 2008). Zander and Kogut (1995) provide empirical evidence wherein they found

Figure 3.6 Knowledge Transfer Speed – Delivery Performance (Proposed Model)



that competition encouraged firms to speed up the process of internal transfer of capabilities in Swedish firms. Dyer and Nobeoka (2000), in a case study of Toyota executives and suppliers in Japan and in the U.S. demonstrated that suppliers do learn more quickly after participating in Toyota’s network in part due to Toyota’s superior knowledge in manufacturing (the so called “Toyota Production System”). Toyota transfers this knowledge, related to work organization, processes, measurement, employee motivation, etc. to their suppliers, and suppliers benefit from absorbing this knowledge. The suppliers are motivated to transfer this superior knowledge rapidly so that they could benefit from it. The above arguments lead to the following hypothesis:

H1s: The perceived supplier’s learning intent is positively associated with the speed of knowledge transferred in supplier development.

As discussed earlier *competence trust* can be defined as the buyer’s perception of the ability of the supplier to meet commitments. The ability to meet commitments may be enhanced if the two parties to a transfer know each other well and thus have learned to

work together (Hansen, 1999; Uzzi, 1997). When two parties to a transfer have developed a strong relation prior to the transfer effort, they have likely developed a shared communication frame whereby each party has come to understand how the other party uses subtle phrases and ways of explaining difficult concepts (Uzzi, 1997). Such strength in a dyadic transfer relation should therefore facilitate the rapid transfer of knowledge.

Supplying firms that are benevolent to the buying firm i.e., honest, genuinely concerned about buyers business and can be trusted to keep the buyers best interests help create an environment that leads to a stronger buyer-supplier relationship. Stronger relationships result in superior communication and contribute to more rapid knowledge transfer, especially, in the context of tacit knowledge. Reagans and McEvily (2003) observed that the strength of ties between two individuals impact the ease of knowledge transfer, with close ties resulting in less time and effort is spent on the transfer process. Also, a good relationship allows for greater interaction, which, in turn, generates a ‘common language’ between the supplier and the buyer and facilitates rapid transfer of knowledge (Reagans and McEvily, 2003). Also, Perez-Nordtvedt et al., (2008) provide empirical evidence that relationship quality positively influenced speed of cross-border knowledge transfer. The above arguments lead to the following hypotheses:

H2s: The perceived supplier’s competence trust will be positively associated with the speed of the transferred knowledge in supplier development.

H3s: The perceived supplier’s benevolence trust will be positively associated with the speed of the transferred knowledge in supplier development

As hypothesized in the earlier models, this model also considers the impact of knowledge transfer speed on buyer-supplier delivery performance. Knowledge transfer

speed is expected to be positively associated with both supplier's delivery performance and buyer's delivery performance. Also, supplier's delivery performance is expected to have an impact on buyer's delivery performance.

H4s: There is a positive association between the supplier firm's knowledge transfer speed and the supplier firm's delivery performance.

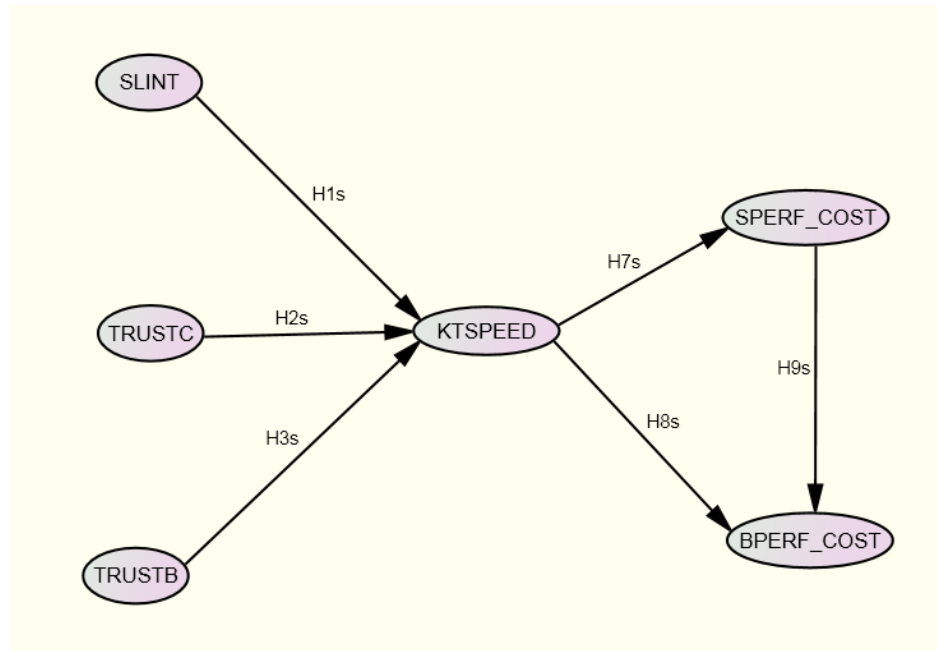
H5s: There is a positive association between the supplier firm's knowledge transfer speed and the buyer firm's delivery performance.

H6s: There is a positive association between the supplier firm's delivery performance and the buyer firm's delivery performance.

### *3.3.6. Model 6: Knowledge Transfer Speed – Cost Performance*

Figure 3.7 presents the proposed model of knowledge transfer speed – cost performance. Similar to Model 5, the impact of supplier's learning intention, competence trust and benevolence trust on knowledge transfer speed are studied. However, unlike Model 5, supplier's cost performance and buyer's cost performance are considered as performance outcomes. Thus, hypotheses H1s, H2s and H3s, are the same for Models 5 and 6.

Figure 3.7 Knowledge Transfer Speed – Cost Performance (Proposed Model)



As argued in Model 1, this model also hypothesizes knowledge transfer speed to have a positive impact on supplier’s cost performance and buyer’s cost performance (Rogers et al. (2007; Modi and Mabert, 2007; Day, 1994; Lane et al., 2001; Quayle, 2000; Handfield et al., 2000).

H7s: There is a positive association between the supplier firm’s knowledge transfer speed and the supplier firm’s cost performance.

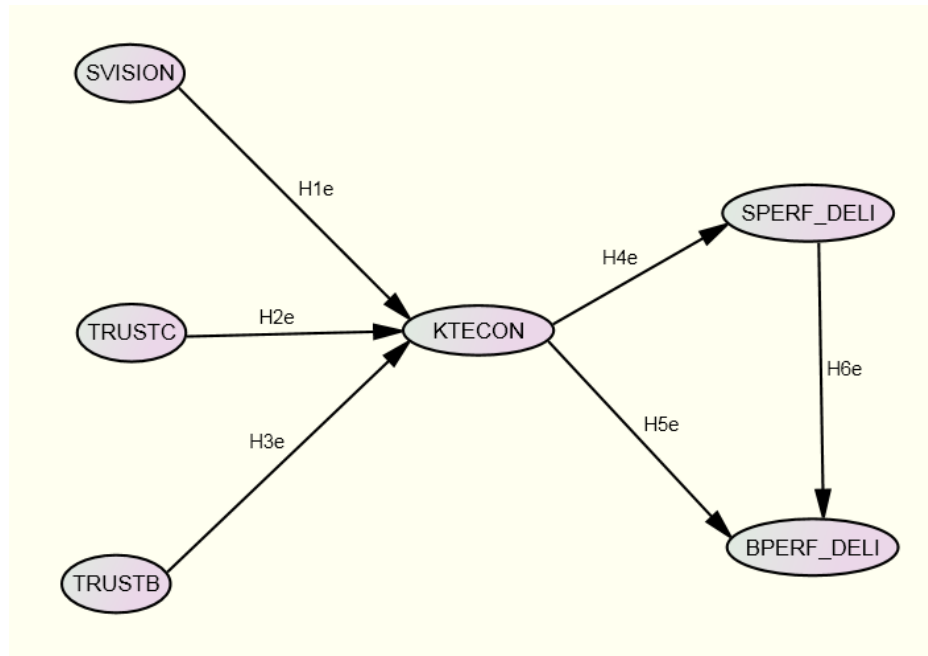
H8s: There is a positive association between the supplier firm’s knowledge transfer speed and the buyer firm’s cost performance.

H9s: There is a positive association between the supplier firm’s cost performance and the buyer firm’s cost performance.

### 3.3.7. Model 7: Knowledge Transfer Economy – Delivery Performance

Figure 3.8 presents the proposed model of knowledge transfer economy – delivery performance. In this model the impact of shared vision, supplier competence trust and benevolence trust on knowledge transfer economy are studied. Supplier’s delivery performance and buyer’s delivery performance are considered as performance outcomes

Figure 3.8 Knowledge Transfer Economy – Delivery Performance (Proposed Model)



Several studies suggest that shared vision between buyer and supplier facilitate knowledge transfer (e.g. Hansen, 1999; Lane and Lubatkin, 1998; Darr and Kurtzberg, 2000). If goals and values are shared, buyers and suppliers can be expected to have a shared understanding of what constitutes improvement and how to accomplish it (Krause et al., 2007). This should lead to better coordination of the knowledge transfer process (Handfield and Nichols (1999) in supplier development and, therefore, should make knowledge transfer less costly. Inkpen (2008) provides empirical evidence of knowledge transfer success using the NUMMI joint venture between General Motors and Toyota). In the NUMMI case Inkpen attributes the knowledge transfer success to the shared understanding based on practice and experience within knowledge communities that allowed knowledge to move easily. If goals and values are incongruent, interactions between the two parties can be expected to lead to misinterpretation of events and conflict (Inkpen and Tsang, 2005; Schnake and Cochran, 1985). As misinterpretation and

conflict intensifies, both parties can be expected to become dissatisfied resulting in negative effects on the economy of knowledge transfer.

A study of pizza franchise organizations owning pizza stores in England by Darr and Kurtzberg (2000) provide evidence that similarity between units' strategies and tasks, termed strategic similarity, enhances knowledge transfer. Knowledge transfer between stores with the same strategy was found to occur more easily than otherwise. These arguments suggest that when buyers and their key suppliers have similar goals, values and strategies for their relationship, shared vision will positively affect the economy of knowledge transfer.

H1e: Buying firms' perceptions of shared vision with key suppliers is positively associated with the economy of knowledge transferred in supplier development.

*Competence trust* can be defined as the buyer's perception of the ability of the supplier to meet commitments. In the context of supplier development, this implies that the supplier is well qualified for the supplier development program, has much knowledge about the work that needs to be done in the supplier development program and is capable of performing its role in the supplier development program (Muthusamy and White, 2005). Therefore, a competent supplier is not likely to require the utilization of too much company resources during the knowledge transfer process. Lui and Ngo (2004) and Perez-Nordtvedt et al. (2008) empirically support the notion that competence trust is positively associated with economy of knowledge transfer. Lui and Ngo (2004) found a more positive relationship between contractual safeguards and completion of projects on time in situations of high competence trust in an architect–contractor partnership in Hong



Kong. Whilst Perez-Nordtvedt et al. (2008) found a positive relationship between trust and knowledge transfer economy.

H2e: The perceived competence trust of the supplier will be positively associated with the economy of knowledge transfer in supplier development

In addition to what was argued in Model 1 the costs associated with knowledge transfer are also likely to be lower when there is a good buyer-supplier relationship. A good buyer-supplier relationship allows for greater openness and cooperation between the buyer and the supplier (Das and Teng, 1998) thereby reducing conflicts and the need to verify information. By reducing conflicts and the need to verify information, benevolence trust also makes knowledge transfer less costly (Currall and Judge, 1995; Zaheer et al., 1998). Also, greater openness and cooperation between the buyer and the supplier contributes to the development of a 'common language' which, in turn, should result in the transfer process being more economical (Levin and Cross, 2004) because knowledge transfer follows the path of least resistance (Reagans and McEvily, 2003). If the knowledge being transferred is not framed in the language of the supplier, the transfer is likely to entail greater resources (Borgatti and Cross, 2003). Thus,

H3e: The perceived benevolence trust by the supplier will be positively associated with the economy of knowledge transfer in supplier development.

As hypothesized in the earlier models, this model also considers the impact of knowledge transfer economy on buyer-supplier delivery performance. Knowledge transfer economy is expected to be positively associated with both supplier's delivery performance and buyer's delivery performance. Also, supplier's delivery performance is expected to have an impact on buyer's delivery performance.

H4e: There is a positive association between the supplier firm's knowledge transfer economy and the supplier firm's delivery performance.

H5e: There is a positive association between the supplier firm's knowledge transfer economy and the buyer firm's delivery performance.

H6e: There is a positive association between the supplier firm's delivery performance and the buyer firm's delivery performance.

### 3.3.8. Model 8: Knowledge Transfer Economy – Cost Performance

Figure 3.9 presents the proposed model of knowledge transfer economy – cost performance. Similar to Model 7, the impact of shared vision, competence trust and benevolence trust on knowledge transfer economy are studied. However, unlike Model 7, supplier's cost performance and buyer's cost performance are considered as performance outcomes. Thus, hypotheses H1e, H2e and H3e, are the same for Models 7 and 8.

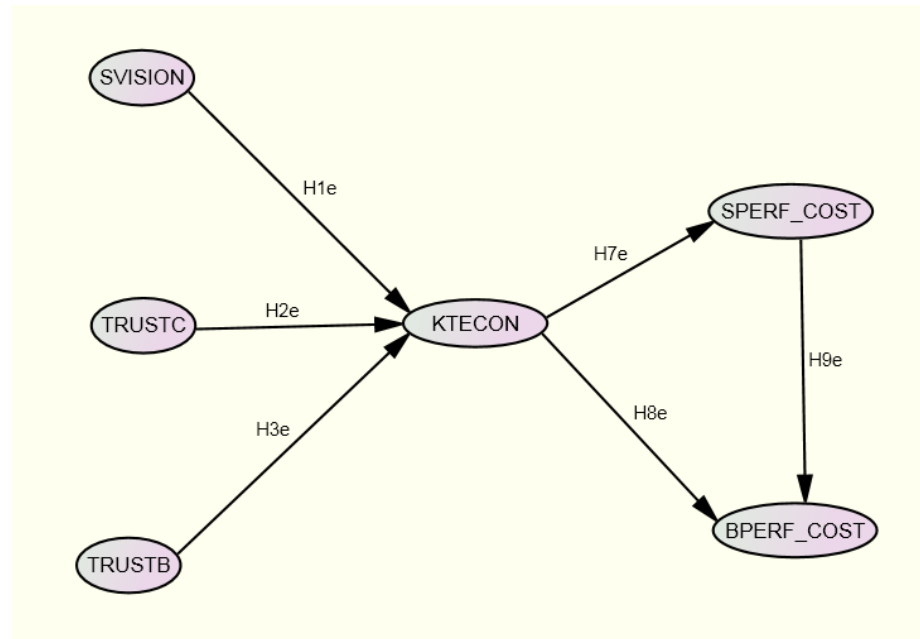
As argued in Model 1, this model also hypothesizes knowledge transfer economy to have a positive impact on supplier's cost performance and buyer's cost performance (Rogers et al. (2007; Modi and Mabert, 2007; Day, 1994; Lane et al., 2001; Quayle, 2000; Handfield et al., 2000).

H7e: There is a positive association between the supplier firm's knowledge transfer economy and the supplier firm's cost performance.

H8e: There is a positive association between the supplier firm's knowledge transfer economy and the buyer firm's cost performance.

H9e: There is a positive association between the supplier firm's cost performance and the buyer firm's cost performance.

Figure 3.9 Knowledge Transfer Economy – Cost Performance (Proposed Model)



### 3.4 Data collection

The conceptual model for examining knowledge transfer, its antecedents and consequences in supplier development has been introduced in the previous section. In order to test the relationships in the various models to be derived from the conceptual model the study shall conduct a large scale mail survey among U.S. buyer firms. This section describes the approach the study proposes to follow in conducting the survey of this dissertation. First, it reports the way the data shall be collected. Second, it clarifies the setup of the questionnaire.

#### 3.4.1 Sampling Frame

The sampling frame for the study will consist of a mailing-list of senior purchasing executives of U.S. manufacturing firms obtained from the Institute for Supply Management (ISM). The ISM has been widely used as a source of mailing-lists by researchers conducting research on supplier development (Modi & Mabert, 2007; Krause,

Handfield & Tyler, 2007; Carr & Kaynak, 2007; Krause, 1999; Krause & Ellram, 1997).

The sample frame will consist of Title 1 (Vice President/Director of Purchasing) and Title 2 (Purchasing manager, Materials Manager, Supervisor, Senior Buyer) members of the Institute for Supply Management (ISM). The members on the mailing list shall be drawn following two digits SIC codes, 34, 35, 36 and 37, providing a fair representation of the complex products manufacturing industry (Modi & Mabert, 2007).

#### *3.4.2. Key Informant Selection.*

Since the unit of analysis in this study is the buyer-supplier relationship, an appropriate informant to report on the knowledge transfer between buyer and supplier should come from the buyer because supplier development programs are initiated by the buyer firm. Senior purchasing executives (Title I and 2) shall be selected to complete the questionnaire because the purchasing department is the most important link in the buyer-supplier relationship and therefore the senior purchasing executive should be the most knowledgeable about supplier development (cf. Campbell's selection criteria, 1955). The data collection shall be limited to one single informant per buyer-supplier relationship for a number of reasons. To include multiple key respondents from the same organization would be less appropriate, because knowledge about a particular supplier development with one particular supplier is rather relationship-specific and may not be well spread throughout the organization. The senior purchasing executive's job autonomy is high and makes it difficult to find an additional knowledgeable informant at the buyer's side of the dyad. An alternative could be to also ask an informant from the supplier-side of the dyad. However, we shall not do this because of time limitations.

### *3.4.3 Data Collection Methodology*

Supplier development research has employed various types of research designs: surveys (e.g., Modi & Mabert, 2007; Krause, Handfield & Tyler, 2007; Carr & Kaynak, 2007; Krause, 1999); case studies (e.g., Rogers et al., 2007; Sako, 2004) and mixed method approach using both case studies and survey (e.g., Hines, 1996). However, the survey research design has proved to be the most popular in the supplier development literature. Supplier development data on aspects such as knowledge transfer, trust, etc., are very difficult to get through archival sources. However, these data could be collected through case studies (interviews) with or surveys (mail, telephone, or face-to-face) of executive who are responsible or knowledgeable about their firm's supplier development programs. Although in-depth interviews provide rich information, it is beyond the scope of this study to collect data through interviews from a large sample. Instead, it was decided to collect the data through survey questionnaires administered to senior purchasing executives across a large sample of supplier development programs formed by U.S. manufacturing organizations.

A mail survey is considered to be appropriate for respondents who are widely dispersed, because they may not otherwise be accessible and may require time to gather information relevant to a response. This study will therefore utilize a cross-sectional mail survey within the United States to gather data and test the research hypotheses. In an effort to increase the response rate, a modified version of the methodology of Dillman (1978) will be followed. All mailings will be sent via first class mail to the respondents. Two thousand questionnaires shall be sent by mail to the purchasing executive of the organizations randomly selected from The ISM (Institute for Supply Management)

mailing list. A cover letter shall accompany the survey questionnaire informing the participants of the intent of the study (see appendix 1). Also to accompany the questionnaire shall be a post-paid return envelope. Reminder post cards will be sent to all potential respondents 10 days after the initial mailing. For those who do not respond, additional cover letters and surveys will be mailed 28 days after the initial mailing.

#### *3.4.4 Survey Instrument*

The survey instrument (the questionnaire) was designed in generating a good response from respondents by answering questions pertaining to their firm's involvement in a supplier development program with a chosen supplier. If a firm had been involved with more than one supplier, they were instructed to choose one of the suppliers randomly.

The questionnaire consists of five main sections. In the first section, the instructions and guidelines were explained. Respondent were asked to indicate whether they had been involved in a supplier development in the last three years. If they were in agreement then they could proceed to complete the questionnaire if their firm had given consent to participating in the study. Otherwise, the responded was not required to complete the questionnaire if their firm had not been involved in supplier development in the near past or if their organization had not consented to participating in the study. Also, in section A the respondents were asked to indicate if they needed to get a copy of the results from the study.

As a key informant for the selected supplier development, the respondents shall report about their organization's dealings with the supplier (and how they perceived the dealings of the supplier with their organization) by answering the questions in section B,

C, and D. The list of questions was divided into parts corresponding to the main building blocks of the conceptual model: Supplier development and antecedents of knowledge transfer, knowledge transfer, and consequences of knowledge transfer i.e., buyer-supplier performance (as presented in appendix 2). All the scales in these 3 sections consisted of seven-point Likert scales. A 7-point Likert scale is preferred in order to ensure higher statistical variability among the survey responses (Ahire et al., 1996). Simplicity in scoring is sought by using a balanced 7- point Likert-type scale that is easy to master. For the supplier development scale, each respondent is asked to indicate the degree to which the supplier was involved in the given statement, such that 1 = Not at all, 4 = Neutral and 7 = To a large degree. For the scales for shared meaning, supplier's learning intent and trust in supplier, each respondent is asked to indicate the extent to which they disagreed or agreed with the given statement, such that 1 = Strongly Disagree, 4 = Neutral and 7 = Strongly Agree. As for the scales on the buyer-supplier performance, each respondent is asked to indicate the extent to which the performance had decreased or increased for each of the given statement, such that 1 = Decreased Significantly, 4 = Not Increased and 7 = Increased Significantly. The survey instrument was pretested with a small group of managers from different companies before sending out the final version. Pretesting helped to modify the language suitably and reject items that were difficult to understand, or involved unnecessary repetition. The Appendix 2 provides details of individual items used to measure each theoretical construct.

In the last section, along with demographic information about the buyer, respondents were asked to express their confidence in correctly filling out the survey

questions by asking them: “How confident do you feel in answering the questions in this questionnaire?” The questionnaire is included in Appendix 2

#### *3.4.5 Unit of Analysis*

Because supplier development involves both the buyer and the supplier, the interaction between the two firms shall be studied. Therefore, the unit of analysis in this study is the supplier development within a buyer–supplier dyad. The level at which data shall be obtained is the individual. One individual from the buying organization shall provide data per each buyer-supplier relationship in a supplier development project. In each of these cases the individual from the buyer is representing both the buyer and the supplier organization.

### *3.5. Preliminary Analysis*

#### *3.5.1. Non-normality*

Multivariate normality will be evaluated using Mardia’s test for multivariate normality. In addition, univariate indices of skewness and kurtosis will be examined to determine if the absolute value of any of these indices is greater than 2.0. If non-normality appears to be problematic, then bootstrapping will be pursued as a remedy. P values and confidence intervals will be estimated using bias-corrected methods. The number of bootstrap replicates will be 1000. In place of the traditional chi square test, the Bollen-Stine bootstrapped version of the test will be performed.



### *3.5.2. Reliability and Validity of Measurement Instrument*

For all multi-item measures, the coefficient alphas and factor structures of the measures will be evaluated to ensure that they are behaving in a way that one would expect based on their psychometric histories. Some of the variables in the path diagrams reflect variable categories with multiple variables or dimensions. The intercorrelations of variables will routinely be examined, and coupled with substantive criteria and the results of confirmatory factor analyses, decisions will be made about combining indices or introducing latent constructs into the analysis.

Manifest variables are estimates of the underlying latent constructs they purport to measure. Each latent construct shall be measured by at least three manifest variables (Joreskog, 1977). Where only one manifest variable is available, the measure's internal reliability coefficient shall be included in the model (Kline, 1998). Moreover, measures selected need to demonstrate good psychometric properties. That is, they need to be both "reliable" and "valid" measures of the latent constructs they seek to address.

A measure is considered reliable when it gives consistent, or repeatable, results. It is considered valid when it measures what it says it measures. When measures have poor reliability and/or validity properties, ML estimates become statistically biased (Kline, 1998). Reliability shall be assessed through internal consistency coefficients. The resulting coefficient indicates repeatability. Coefficients of 0.8 or above suggest good reliability, whilst those in the range of 0.7 to 0.8 suggest adequacy. Coefficients below 0.5 shall be avoided (Kline, 1998) or improved before use in evaluating the models.

Validity shall be assessed by examining its content, criterion-related, convergent or discriminant validities. Content validity exists when experts agree that the measure is tapping into the relevant domain. Criterion-related validity assesses whether a measure taps into a particular domain, as assessed against some set criteria. That criteria is assessed either simultaneously (concurrent validity) or after the measure of interest (predictive validity). Convergent validity exists when measures that purport to measure the same construct have moderate to high correlations. Similarly, discriminant validity exists when measures that purport to measure different constructs have low to moderate correlations (Kline, 1998).

### *3.5.3. Measurement Error*

Measurement error will be taken into account through the use of multiple indicators of constructs. In cases where only a single indicator is available, the study will adopt the strategy suggested by Joreskog and Sorbom (1996). This involves constraining the error/unique variances for each measure to values corresponding to a priori determined levels of reliability. The reliability levels for the measures will be based on alpha coefficients or previous research.

### *3.6. Main Analysis*

Following the recommendations of Bollen and Long (1993), a variety of global fit indices will be used, including indices of absolute fit, indices of relative fit and indices of fit with a penalty function for lack of parsimony. These include the traditional overall chi square test of model fit (which should be statistically non-significant), the Root Mean Square Error of Approximation (RMSEA; which should be less than 0.08 to declare

satisfactory fit), the p value for the test of close fit (which should be statistically non-significant), the Adjusted goodness of fit index (AGFI; which should be greater than 0.90), Bentler and Bonett's Non-normed fit index (NNFI; which should be greater than 0.90) the Comparative Fit Index (CFI; which should be greater than 0.90); and the standardized root mean square residual (which should be less than 0.10). In addition to the global fit indices, more focused tests of fit will be pursued. These include examination of the standardized residual covariances (which should be between -2.00 and 2.00)

## CHAPTER IV

### Results

This chapter presents the results of the data collection process, the measurement instrument and the various models considered in the study.

#### *4.1. Research Design*

##### *4.1.1. Data Collection*

This study utilized a cross-section mail survey of manufacturing companies within the United States. The ISM was contacted to help with drawing a sample of senior purchasing executive of buying firms that could answer questions on supplier development. Because ISM was unable to draw a random sample, a list of 5000 Title 1 (Vice President/Director of Purchasing) and Title 2 (Purchasing manager, Materials Manager, Supervisor, Senior Buyer) members and/or non-members was requested. Since the study was interested in ISM members only, non ISM members were excluded from the list leaving 2190 ISM members from which a random sample of 2000 was drawn. Due to funding limitations a total of 1412 surveys were mailed. In an effort to increase the response rate, a modified version of the methodology of Dillman (1978) was followed. All surveys were sent via first class mail to the respondents. Attached to each survey was a cover letter informing the participants of the intent of the study and a post-

paid return envelope. Reminder post cards were sent to all respondents 10 days after the initial mailing. For those who did not respond, additional cover letters and surveys were mailed 28 days after the initial mailing. Of the 1412 surveys mailed, 24 were returned as undelivered by the postal services, 93 indicated that their firms did not have an active supplier development program, and 8 were returned for other reasons such as the potential respondent had passed away, lost employment etc.,. From the resulting sample size of 1287, 197 responses were received, resulting in a response rate of 15.30%. The responses were examined through various SPSS programs for accuracy, acquiescent effect (Cronbach, 1946), missing values, and unsuitable cases. Acquiescence is defined as the tendency to agree (or disagree) with items regardless of their content (Couch & Keniston, 1960). Hence, acquiescence could be a threat to the analysis as it may produce extreme outliers. Twelve responses were discarded due to excessive incomplete data on the major variables (Participant #: 30, 67, 109, 125, 129, 140, 146, 154, 168, 175, 178 & 194) and 9 respondents were dropped (Participant #: 17, 54, 66, 90, 126, 137, 141, 151 & 155) because they reported a low level of confidence (below 4 on the likert scale) in filling out the questions on the survey. These 9 respondents also showed signs of acquiescence effect. These deletions turned the sample size for analysis into 176 representing an effective response rate of 13.78%.

There was one missing data on one of the items measuring supplier development involvement and small amounts of missing data amounting to no more than a few cases on any of the control variables. There was no coherent pattern to the missing data. Because of minimal missing data, and the apparent lack of a pattern in the few missing

data observed, the mean was imputed for those cases with missing data instances (cf. Baker & Siryk, 1999).

#### *4.1.2. Respondent and Firm Characteristics*

The respondents were comprised of executives including 18 V.P of purchasing (9.5%), 61 director of purchasing (62.1%), 45 purchasing manager (23.7%), 14 materials manager (7.4%), 24 senior buyer (12.6%), and 28 other titles such as supply chain analyst, supplier development team lead, and purchasing coordinator (14.7%). On average, the respondents have more than 10 years of experience working with their respective companies. Their years of experience range from 1 year to almost 41 years. The respondent's characteristics are reported in Table 4.1.

The respondent firms were primarily medium to large companies. About 1.6% of the responding firms had annual sales volume of less than US\$ 1 million, 10.4% had between US\$ 1 million to US\$ 50 million, 13.1% between US\$ 50 million and US\$ 100 million, 23% between US\$ 100 million and US\$ 500 million, 9.3% between US\$ 500 million and US\$ 1000 million and about 42.6% of more than US\$ 1000 million. Approximately 1.1% of the companies employed less than 25 employees, 8% of the companies employed between 25 and 100 employees, 13.3% of the companies employed between 100 and 250 employees, 20.2% of the companies employed between 250 and 500 employees, 20.2% of the companies employed between 500 and 1000 employees and approximately 44.1% of the companies employed more than 1,000 employees. The respondent firm comprised of different firm types including 13.3% machining, 21.2% fabrication, 39.6% assembly, 8.6% processing, and 17.3% other firm types. About 21.9%

of the respondent firms employed multiple methods of manufacturing. Table 4.2 presents the company profiles.

Table 4.1  
*Respondent Characteristics*

*Titles of Respondents*

Title	Frequency	Percent
VP Purchasing	18	9.5
Director Purchasing	61	32.1
Purchasing Manager	45	23.7
Materials Manager	14	7.4
Senior Buyer	24	12.6
Others (e.g. supply chain analyst, Supplier development team lead,	28	14.7
	190 <sup>a</sup>	100

<sup>a</sup>Two respondents had 2 titles each

*Number of Years Employed at Firm*

Mean	11.7
Median	10
Minimum	1
Maximum	41
Range	40
Frequency	183 <sup>b</sup>

<sup>b</sup>No Response = 5

Table 4.2  
Company Profile

Number of Employees	Frequency	Percent
Less Than 25	2	1.1
25 - 100	15	8.0
101 - 250	25	13.3
251 - 500	25	13.3
501 - 1000	38	20.2
More Than 1000	83	44.1
	188	100

Annual Sales Volume (In Millions)	Frequency	Percent
Less Than \$1	3	1.6
\$1 - \$49	19	10.4
\$50 - \$99	24	13.1
\$100 - \$499	42	23.0
\$500 - \$999	17	9.3
More Than \$1000	78	42.6
	183 <sup>a</sup>	100

<sup>a</sup>No Response = 5

Firm Type	Frequency	Percent
Machining	34	13.3
Fabricating	54	21.2
Assembly	101	39.6
Processing	22	8.6
Other	44	17.3
	255 <sup>b</sup>	100

<sup>b</sup>No Response = 2, 21.9% of the respondents selected more than 1 Firm Type.



Table 4.2 (continued)  
*Company Profile*

Type of Material Procured	Frequency	Percent
Standard	17	9.1
Made-to-Order	97	52.2
Both	72	38.7
	186 <sup>c</sup>	100

<sup>c</sup>No Response = 2

*Length of Supplier Development with Supplier (years)*

Mean	4.2
Median	2.75
Minimum	0.25
Maximum	20
Range	19.75
Frequency	182 <sup>d</sup>

<sup>d</sup>No Response = 6

*Percent of supplier's output procured*

Mean	4.2
Median	2.75
Minimum	0.25
Maximum	20
Range	19.75
Frequency	182 <sup>d</sup>

<sup>d</sup>No Response = 6

*Percent of companies' output procured*

Mean	4.2
Median	2.75
Minimum	0.25
Maximum	20
Range	19.75
Frequency	182 <sup>d</sup>

<sup>d</sup>No Response = 6

#### *4.1.3. Non-Response Bias*

Although there is no generally accepted minimum percentage for response rates, non-response bias is always a concern in survey research. Non-response bias is the difference between the answers of non-respondents and respondents (Lambert and Harrington, 1990). One method for testing non-response bias is to test for significant differences between the responses of early and late waves of returned surveys (Armstrong and Overton 1977; Lambert and Harrington, 1990). This approach is based on the assumption that late responders are somewhat representative of the opinions of non-respondents. For this study, 25 of the main survey items were randomly selected for non-response bias analysis in addition to the 10 demographic and respondent characteristic variables. The sample of 176 firms was split into three parts, the first and the last 58 responses to be returned were used and a *t*-test performed on the mean responses of these two sets. The *t*-tests did not yield any significant differences (at 95% confidence interval) between the responses of the early and late responders. While this test does not totally rule out the possibility of non-response bias, it suggests that non-response may not be a problem.

#### *4.1.4. Common Method Variance*

As data was collected using a survey questionnaire, the study checked for common method variance (CMV), which may influence the modeled relationships. Using Harman's one-factor test (Podsakoff and Organ, 1986). Specifically, all the items were entered together into a factor analysis (principal components analysis with unrotated solution). In case that a single factor solution emerged or one general factor accounted for

most of the variance, CMV would pose a threat (Podsakoff and Organ, 1986). In this study, 39 items were included and the PCA analysis produced a ten-factor solution. The first factor explained 30.5% of the variance. The unrotated solution did not reveal one general factor. Therefore, CMV is not a concern.

#### *4.2. Descriptive Statistics*

Prior to analysis the data was examined through various SPSS programs for fit between their distributions and the assumptions of multivariate analysis. Using boxplots and z-scores eight cases (participant #: 50, 59, 60, 64, 69, 131, 168 & 181) were found to be univariate outliers and were deleted from the analysis. Three multivariate outliers (participant #: 25, 88 & 107) were detected using Mahalanobis coefficient ( $p < 0.001$ ), and the data from these cases were also deleted. Finally, 167 response sets were used in further analyses.

Further, data were screened for instances of multicollinearity via analysis of tolerance (TOL) and variance inflation factor (VIF) by regressing the 51 key items against one of the outcome item BPERF6. Multicollinearity was not present as all TOL indices were greater than .10 and all VIF measures were less than 5, which met noted cut-off points for these measures of greater than .10 and less than 10, respectively (Belsley, Kuh, & Welsch, 1980; Hair, Anderson, Tatham, & Black, 1995).

Table 4.3 shows each item's mean, standard deviation, skewness, and kurtosis. In terms of standard deviation, there was a range from .82 to 1.82. Skewness ranged from -1.34 to .32 and kurtosis ranged from -.87 to 3.36. Values of skewness and kurtosis below

Table 4.3 Descriptive statistics

Item	M	SD	Skewness	Kurtosis
1 Total quality management programs.	5.28	1.45	-1.10	1.10
2 New machine set up techniques programs.	4.23	1.76	-0.50	-0.76
3 Kaizen programs.	4.61	1.82	-0.71	-0.46
4 Lot size optimization techniques programs.	4.40	1.79	-0.65	-0.62
5 Both firms share the same business values.	5.55	1.23	-1.06	1.39
6 The parties often agree what is in the best interest of the relationship.	5.55	1.12	-1.20	2.43
7 This supplier shares our goals for this business.	5.70	1.08	-1.34	3.36
8 Both firms have similar organizational cultures.	4.61	1.61	-0.31	-0.66
9 Understanding the knowledge possessed by our firm.	5.59	0.98	-0.86	2.05
10 Absorbing our firm's understanding of the knowledge we possessed.	5.39	0.97	-0.44	1.15
11 Analyzing the feasibility of adopting the knowledge possessed by our firm.	5.17	1.04	-0.50	1.01
12 Communicating their needs to our firm with respect to the knowledge acquired.	5.26	1.03	-0.50	0.95
13 Supplier's objectives was to learn about our skills, techniques and capabilities.	5.25	1.28	-0.74	0.33
14 This supplier aggressively tries to learn from us.	5.20	1.26	-0.87	0.71
15 This supplier was very capable of performing its role.	5.28	1.27	-0.78	0.38
16 This supplier was known to be successful at the things it tries to do.	5.34	1.18	-0.94	0.98
17 This supplier was well qualified for the supplier development program.	5.43	1.29	-0.96	0.52
18 This supplier had much knowledge about the work that needed to be done	4.72	1.51	-0.39	-0.87
19 This supplier was genuinely concerned that our business succeeds.	5.85	1.06	-1.11	2.03
20 We trusted this supplier to keep our best interests.	5.66	1.08	-1.03	1.79
21 We found it necessary to be cautious with this supplier.	4.50	1.75	-0.44	-0.85
22 We believe the information that this supplier provides us.	5.52	1.04	-1.24	2.68
23 This supplier is not always honest with us.	5.47	1.56	-1.15	0.70
24 The knowledge was complete enough to become proficient with it.	5.30	0.95	-0.60	0.38
25 The knowledge was thorough enough to fully understand it.	5.36	0.99	-1.11	2.02
26 The knowledge was well understood by the supplier organization.	5.35	0.89	-0.34	0.10
27 This supplier appreciated the knowledge and requested for more.	5.46	1.06	-0.39	-0.48
28 The knowledge transferred contributed a great deal to multiple projects.	5.28	1.26	-0.64	0.15
29 This supplier was very satisfied with the quality of the knowledge.	5.52	1.02	-0.72	0.65
30 This supplier increased the perception about the efficacy of the knowledge.	5.26	1.06	-0.70	0.99
31 The knowledge helped in improving its organizational capabilities.	5.41	1.12	-0.85	1.20
32 The rate at which the knowledge was transferred to our supplier was very fast.	4.59	1.20	-0.48	-0.30
33 The knowledge was transferred to our supplier in a timely fashion	5.04	1.08	-0.61	-0.01
34 It took a short time to acquire and implement the knowledge.	4.52	1.15	-0.42	-0.27
35 The knowledge was being transferred at a faster rate than they could handle.	4.97	1.47	-0.39	-0.81
36 The knowledge transferred was acquired and implemented at very low cost.	4.95	1.21	-0.70	0.40
37 Too many resources used to acquire and implement the new knowledge.	4.49	1.39	-0.29	-0.52
38 No wastage of money to acquire and implement the new knowledge.	5.03	1.17	-0.88	1.45
39 No wastage of time to acquire and implement the new knowledge.	4.90	1.23	-0.87	0.77
40 Percentage of orders meeting design specification.	5.47	0.83	-0.26	-0.57
41 Percentage of orders meeting quality requirements.	5.58	0.87	-0.43	-0.03
42 Percentage of on-time deliveries.	5.43	1.07	-0.78	0.95
43 Cost of purchased parts.	4.23	1.08	0.12	0.25
44 Average investment in purchased parts inventory.	3.97	1.12	0.24	0.42
45 Lead time for special/rush orders.	3.87	1.18	0.19	0.43
46 Time required to take a new item from development into production.	4.14	1.13	0.14	-0.15
47 Total costs of our products.	3.96	1.26	0.32	-0.19
48 Product costs.	4.07	1.15	0.32	0.07
49 Product quality.	5.20	1.03	-0.55	0.72
50 Delivery times of our products	4.70	1.27	-0.04	-0.77
51 Reliability of our product delivery.	5.05	1.19	-0.31	-0.56
52 Manufacturing flexibility.	4.88	1.16	-0.26	-0.23

the absolute value of 1 can be considered as acceptable (Miles and Shevlin, 2004). Nine items showed values of skewness greater than the absolute value of 1 and 13 items showed values of kurtosis greater than the absolute value of 1. Both the Kolmogorov-Smirnov and Shapiro-Wilk test of normality were significant ( $p < .001$ ) indicating that the data are non-normal. A visual check of boxplots, QQ-plots and histograms revealed slight to moderate deviation from normality and unimodal distribution for all items. These results indicate that slight to moderate deviations from normality exists for all the items.

Traditional maximum likelihood methods of SEM assume that the continuous variables in the model are multivariately normally distributed. The multivariate normal probability plot and Mardia's kurtosis value was used to check for multivariate normality. The multivariate probability plot indicated slight deviations from normality. Mardia's (1970) normalized estimate of multivariate kurtosis was 28.27, the critical ratio of which was 7.19 for the measurement model associated with the antecedent factors of knowledge transfer; the estimate of multivariate kurtosis was 19.85 with a critical ratio of 7.00 for the knowledge transfer factors; and the estimate of multivariate kurtosis was 12.73 with a critical ratio of 4.49 for the knowledge transfer outcome factors. These results represent departure from a multivariate normal distribution.

The Mardia values as small as not greater than 3 and as large as greater than 30 have been noted as a sign of multivariate kurtosis (Bentler & Wu, 1993; Newsom, 2005). The study's Mardia values obtained using AMOS 18 were all greater than for the measurement models associated with the antecedent factors of knowledge transfer, the knowledge factors and the knowledge transfer outcome factors. These results are an

indication of the presence of non-normality at the multivariate level. Given this, the decision was made to pursue parameter estimation using bootstrapping. The study performed 1,000 bootstrap replications for purposes of estimating standard errors,  $p$ -values, and confidence intervals for evaluating models using AMOS 18.

### *4.3. Measurement Instrument*

Using the two-step approach proposed by Anderson and Gerbing (1988), the first step was to purify the scales and then test the measurement models.

#### *4.3.1 Item Deletion and Scale Reliability*

A systematic, iterative process was used to determine which items should be eliminated from the scale using statistical analysis provided by SPSS 16 and AMOS 18. Item elimination was based on weak loadings ( $\lambda$ ), inter-item correlations ( $r_{i-i}$ ), item-total correlations ( $r_{i-t}$ ), item standard deviations ( $\sigma$ ), and standardized residual covariance ( $\delta$ ). Items that did not meet the criteria:  $\lambda > .60$ ,  $0.20 < r_{i-i} < 0.70$ ,  $r_{i-t} > 0.3$ ,  $\sigma > 1.10$  and  $|\delta| > 2.00$  were considered for elimination. The summarized results were as shown in Table 2.

With reference to Table 4.4, the Supplier Development Involvement scale consisted of four items initially. The internal consistency of the SDINV dimension was regarded as sufficiently high with  $\alpha = 0.64$ . The values of the inter-item correlations ( $r_{i-i}$ ) ranged from 0.27 to 0.41 which implied that the items were adequately associated. The item-total correlations ( $r_{i-t}$ ) ranged from 0.38 to 0.46, above the cut-off of .30, indicating that these items were mainly measuring the same underlying construct. Two items SDINV1 and SDINV2 were considered for elimination because the factor loadings were below the set criteria of  $\lambda > 0.60$  (SDINV1,  $\lambda = .491$  and SDINV2,  $\lambda = .531$ ). SDINV1

Table 4.4 Item Deletion and Scale Reliability

Construct	Items		Items with $\lambda < .60$	$\alpha$ if item deleted	$r_{i-i}$	$r_{i-t}$	$ \delta  > 2$
	SD < 1.10	SD > 1.10					
Supplier Development Involvement (SDINV) 4 items : SDINV1 –SDINV4 $\alpha = .64$	-	SDINV1 SDINV2 SDINV3 SDINV4	SDINV1 SDINV2	.61 .59	.27 - .41	.38 - .46	-
Shared Vision (SVISION) 4 items: SVISION1 – SVISION4 $\alpha = .83$	-	SVISION1 SVISION2 SVISION3 SVISION4	SVISION4	.84	.43 - .66	.52 - .70	-
Supplier's Learning Intent (SLINT) 6 items: SLINT1 – SLINT6 $\alpha = .85$	SLINT1 SLINT2	SLINT3 SLINT4 SLINT5 SLINT6	SLINT4 SLINT5 SLINT6	.83 .82 .82	.35 - .73	.55 - .70	SLINT5 – SLINT6 = 5.1
Trust In Supplier – Competence (TRUSTC) 4 items: TRUSTC1 - TRUSTC4 $\alpha = .89$	-	TRUSTC1 TRUSTC2 TRUSTC3 TRUSTC4	-	-	.56 - .77	.68 - .85	-
Trust In Supplier – Benevolent (TRUSTB) 5 items: TRUSTB1 – TRUSTB5 $\alpha = .81$	-	TRUSTB1 TRUSTB2 TRUSTB3 TRUSTB4 TRUSTB5	TRUSTB3 TRUSTB5	.81 .73	.28 - .77	.40 - .65	TRUSTB3 – TRUSTB5 = 3.42
Knowledge Transfer Comprehension (KTCOMP) 4 items: KTCOMP1 – KTCOMP4 $\alpha = .81$	KTCOMP1 KTCOMP2 KTCOMP3	KTCOMP4	KTCOMP4	.85	.37 - .70	.46 - .72	-
Knowledge Transfer Usefulness (KTUSE) 4 items: KTUSE1 – KTUSE4 $\alpha = .86$	-	KTUSE1 KTUSE2 KTUSE3 KTUSE4	-	-	.55 - .63	.68 - .72	-
Knowledge Transfer Speed (KTSPEED) 4 items: KTSPEED1 – KTSPEED4 $\alpha = .40$	-	KTSPEED1 KTSPEED2 KTSPEED3 KTSPEED4	KTSPEED4	.78	.20 - .68	.32 - .54	KTSPEED3 – KTSPEED4 = 2.12
Knowledge Transfer Economy (KTECON) 4 items: KTECON1 – KTECON4 $\alpha = .67$	-	KTECON1 KTECON2 KTECON3 KTECON4	KTECON1 KTECON2	.59 .76	.18 - .75	.20 - .63	-
Supplier Performance Delivery (SPERF_DELI) 3 items: SPERF1 – SPERF3 $\alpha = .70$	SPERF1 SPERF2	SPERF3	SPERF3	.79	.26 - .65	.36 - .65	-
Supplier Performance Cost (SPERF_COST) 4 items: SPERF4 – SPERF7 $\alpha = .80$	-	SPERF4 SPERF5 SPERF6 SPERF7	SPERF4	.80	.40 - .67	.52 - .71	-
Buyer Performance Delivery (BPERF_DELI) 4 items: BPERF3 – BPERF6 $\alpha = .77$	-	BPERF3 BPERF4 BPERF5 BPERF6	BPERF6	.77	.26 - .64	.45 - .73	-
Buyer Performance Cost (BPERF_COST) 2 items: BPERF1 – BPERF2 $\alpha = .83$	-	BPERF1 BPERF2	-	-	.70	.70	-

was deleted while SDINV2 was left on the scale because if deleted it was going to bring down the coefficient alpha ( $\alpha$ ) to below .60. The SDINV construct was left with three items and an internal consistency,  $\alpha = .61$ . For the Shared Vision (SVISION) construct, the inter-item correlations ranged between 0.43-0.66, indicating well related items. The item-total correlations ranged from 0.52 to 0.70 which met the cut off value of  $> 0.30$ . The initial overall internal consistency was  $\alpha = 0.83$ . Item SVISION4 had a factor loading,  $\lambda = 0.56$  which was below the set criteria of  $\lambda > 0.60$ . Item SVISION4 was deleted leaving the SVISION construct with three items and an internal consistency,  $\alpha = .84$ .

The third construct, Supplier's Learning Intent (SLINT) had an initial internal consistency,  $\alpha = 0.85$ . The inter-item correlations ranged between 0.35 - 0.73, indicating well related items and the item-total correlations ranged from 0.55 - 0.70 which met the cut off value of  $> 0.30$ . Three items had factor loadings which were below the set criteria of  $\lambda > 0.60$ : SLINT4,  $\lambda = 0.55$ ; SLINT5,  $\lambda = 0.56$ ; SLINT6,  $\lambda = 0.57$ . The standardized residual covariance between SLINT5 and SLINT6 was  $\delta = 5.10$  exceeding the criteria of  $\delta < |2.00|$ ). Two items, SLINT5 and SLINT6 were deleted from the scale, SLINT4 was retained based on the recommendation that, if necessary, a poor performing item can still be retained to satisfy statistical analysis requirement (Hair, Black, Cabin, Anderson & Tatham, 2006). After deleting the two items the internal consistency for the scale dropped to  $\alpha = .82$ .

The fourth construct of Trust In Supplier – Competence (TRUSTC) had an initial coefficient alpha,  $\alpha=0.89$ . The inter-item correlations ranged between 0.47-0.73 and the item-total correlations ranged from 0.67 to 0.83. This construct exhibited a strong



association among the four items. The factor loadings of the four items fulfilled the factor loadings criteria of  $\lambda > 0.60$ . Also, these four items did not violate the other criteria for deletion, hence they were all retained.

The other construct of trust, Trust In Supplier – Benevolent (TRUSTB) had an initial coefficient alpha,  $\alpha=0.81$ . The inter-item correlations ranged between 0.28-0.77 and the item-total correlations ranged from 0.40 to 0.65. This construct exhibited a strong association among the four items. Two items had factor loadings which were below the set criteria of  $\lambda > 0.60$ : TRUSTB3,  $\lambda = 0.33$  and; TRUSTB5,  $\lambda = 0.49$ . The standardized residual covariance between TRUSTB3 and TRUSTB5 was  $\delta = 3.42$  exceeding the criteria of  $\delta < |2.00|$ . Therefore, these two items were deleted from the scale. After deleting the two items the internal consistency for the scale went up to  $\alpha = .88$ .

The Knowledge Transfer Comprehension (KTCOMP) dimension consisted of 4 items had an initial overall coefficient alpha,  $\alpha=0.81$ . The inter-item correlations ranged from 0.16 - 0.65 and item-total correlation ranged from 0.42 to 0.67 indicating a fair association among the items which were measuring the underlying construct. However, 4 items were considered for deletion. KTCOMP4 was considered for deletion because the factor loading of  $\lambda = .49$  was lower than 0.60. The standard deviations ( $\sigma$ ) of KTCOMP1, KTCOMP2 and KTCOMP3 were 0.95, 0.99 and 0.89 respectively which were below the standard deviation criteria set at the value of 1.10, indicating narrow spread of the distributions on these items. One item, KTCOMP4 was deleted from the scale, KTCOMP1, KTCOMP2 and KTCOMP3 were retained based on the recommendation that, if necessary, a poor performing item can still be retained to satisfy statistical analysis requirement (Hair, Black, Cabin, Anderson & Tatham, 2006).

The second construct of knowledge transfer, Knowledge Transfer Usefulness (KTUSE) had an initial coefficient alpha,  $\alpha=0.86$ . The inter-item correlations ranged between 0.55-0.63 and the item-total correlations ranged from 0.68 to 0.72. This construct exhibited a strong association among the four items. The factor loadings of the four items fulfilled the factor loadings criteria of  $\lambda > 0.60$ . Also, these four items did not violate the other criteria for deletion, hence they were all retained.

The third construct of knowledge transfer, Knowledge Transfer Speed (KTSPEED) had an initial coefficient alpha,  $\alpha=0.40$ . The inter-item correlations ranged between 0.20-0.68 and the item-total correlations ranged from 0.32 to 0.54. This construct exhibited a strong association among the four items. One item, KTSPEED4, had factor loading of 0.28 which was below the set criteria of  $\lambda > 0.60$ . The standardized residual covariance between KTSPEED3 and KTSPEED 4 was  $\delta = 2.12$  exceeding the criteria of  $\delta < |2.00|$ . Therefore, KTSPEED4 was deleted from the scale. After deleting KTSPEED4 the internal consistency for the scale went up to  $\alpha = .78$ .

The last construct of knowledge transfer, Knowledge Transfer Economy (KTECON), had an initial internal consistency,  $\alpha = 0.67$ . The inter-item correlations ranged between 0.18 - 0.75, indicating fair association among the items and the item-total correlations ranged from 0.20 - 0.63 which did not meet the cut off value of  $> 0.30$ . Two items had factor loadings which were below the set criteria of  $\lambda > 0.60$ : KTECON1,  $\lambda = 0.45$  and; KTECON2,  $\lambda = 0.19$ . One item, KTECON2 was deleted from the scale, KTECON1 was retained based on the recommendation that, if necessary, a poor performing item can still be retained to satisfy statistical analysis requirement (Hair,

Black, Cabin, Anderson & Tatham, 2006). After deleting KTECON2 the internal consistency for the scale went up to  $\alpha = .76$ .

The Supplier Performance Delivery (SPERF\_DELI) consisted of 3 items had an initial overall coefficient alpha,  $\alpha=0.70$ . The inter-item correlations ranged from 0.26 - 0.65 and item-total correlation ranged from 0.36 to 0.65 indicating a fair association among the items which were measuring the underlying construct. However, all 3 items were considered for deletion. SPERF3 was considered for deletion because the factor loading of  $\lambda = .46$  was lower than 0.60. The standard deviations ( $\sigma$ ) of SPERF1, and SPERF2 were 0.83 and 0.87 respectively which were below the standard deviation criteria set at the value of 1.10, indicating narrow spread of the distributions on these items. All the three items were retained based on the recommendation that, if necessary, a poor performing item can still be retained to satisfy statistical analysis requirement (Hair, Black, Cabin, Anderson & Tatham, 2006).

For the Supplier Performance Cost (SPERF\_COST) construct had 4 items and an initial overall internal consistency was  $\alpha = 0.80$ . The inter-item correlations ranged between 0.40 - 0.67, indicating well related items. The item-total correlations ranged from 0.52 to 0.71 which met the cut off value of  $> 0.30$ . The Item SPERF4 had a factor loading,  $\lambda = 0.58$  which was below the set criteria of  $\lambda > 0.60$ . Because this value was close to set criteria it SPERF4 was retained, no items were deleted from this construct.

The Buyer Performance Delivery (BPERF\_DELI) construct had 4 items and an initial overall internal consistency was  $\alpha = 0.77$ . The inter-item correlations ranged between 0.26 - 0.64, indicating well related items. The item-total correlations ranged

from 0.45 to 0.73 which met the cut off value of  $> 0.30$ . The Item BPERF6 had a factor loading,  $\lambda = 0.58$  which was below the set criteria of  $\lambda > 0.60$ . Because this value was close to set criteria it SPERF4 was retained, no items were deleted from this construct at this stage.

The last construct to be considered was the Buyer Performance Cost (BPERF\_COST) which had only two items, BPERF1 and BPERF2. None of the two items violated any of the set criteria for item deletion, so they were not deleted from the scale.

Further assessments were utilized to validate each of the constructs. This is explained in the following section.

#### *4.3.2 Reliability and Validity of the Constructs*

The study used two methods to evaluate internal consistency. The first one, named coefficient  $\alpha$  (Bagozzi and Yi, 1988; Fornell and Larcker, 1981) and the second method used the average variance extracted (EVA) which estimates the amount of variance captured by a construct's measure relative to random measurement error (Fornell and Larcker, 1981). Estimates of  $\alpha$  above 0.70 and EVA above 0.50 are considered supportive of internal consistency (Bagozzi and Yi, 1988). The  $\alpha$  and EVA values for all constructs in the models are provided in Table 4.5. Except for supplier development involvement, these were higher than the stipulated criteria, and therefore indicative of good internal consistency.

Table 4.5 Cronbach alphas and average variance extracted for each factor

	Cronbach's alpha	AVE
Supplier Development Involvement (SDINV)	0.61	0.36
Shared Vision (SVISION)	0.84	0.64
Supplier's Learning Intent (SLINT)	0.82	0.63
Trust In Supplier – Competence (TRUSTC)	0.89	0.72
Trust In Supplier – Benevolent (TRUSTB)	0.88	0.71
Knowledge Transfer Comprehension (KTCOMP)	0.81	0.65
Knowledge Transfer Usefulness (KTUSE)	0.86	0.59
Knowledge Transfer Speed (KTSPEED)	0.78	0.57
Knowledge Transfer Economy (KTECON)	0.76	0.57
Supplier Performance Delivery (SPERF_DELI)	0.70	0.50
Supplier Performance Cost (SPERF_COST)	0.80	0.58
Buyer Performance Delivery (BPERF_DELI)	0.77	0.55
Buyer Performance Cost (BPERF_COST)	0.83	0.86

Discriminant validity was determined by examining the correlations between the latent constructs. As suggested by Kline (2005), correlations less than 0.85 were considered not significant. In short it was assumed that items under the factors correlated were not duplicating. Based on the cutoff point of correlation  $r < 0.85$  (Kline, 2005), all the correlations shown in Table 4.6 were below this value supporting discriminant validity. Also, Discriminant validity was assessed by calculating the 95% confidence interval from the data in Table 4.6 by adding and subtracting twice the standard error of a correlation between two latent constructs (Anderson and Gerbing, 1988). None of the confidence intervals contained 1 implying that none of the latent variables are highly correlated to assume that they are measuring the same attribute. Convergent validity was

supported with all *t*-values for indicators greater than 2.0 as shown in Table 4.7 (Pedhazur and Schmelkin, 1991).

Table 4.6 Correlations among latent variables (lower triangle) and standard errors (upper triangle)

	SDINV	SVISION	SLINT	TRUSTC	TRUSTB	KTCOMP	KTUSE	KTSPEED	KTECON	SPERF_DELI	SPERF_COST	BPERF_DELI	BPERF_COST
Supplier Development Involvement (SDINV)		0.073	0.075	0.071	0.073	0.072	0.072	0.077	0.078	0.076	0.077	0.074	0.078
Shared Vision (SVISION)	0.359		0.067	0.065	0.052	0.070	0.062	0.070	0.070	0.074	0.078	0.078	0.077
Supplier's Learning Intent (SLINT)	0.270	0.514		0.074	0.052	0.071	0.064	0.070	0.076	0.074	0.078	0.076	0.077
Trust In Supplier – Competence (TRUSTC)	0.414	0.544	0.326		0.060	0.069	0.074	0.071	0.077	0.075	0.078	0.078	0.076
Trust In Supplier – Benevolent (TRUSTB)	0.364	0.742	0.742	0.639		0.062	0.065	0.069	0.073	0.076	0.077	0.075	0.077
Knowledge Transfer Comprehension (KTCOMP)	0.385	0.448	0.421	0.467	0.610		0.059	0.069	0.075	0.074	0.078	0.074	0.077
Knowledge Transfer Usefulness (KTUSE)	0.386	0.604	0.567	0.307	0.542	0.658		0.068	0.071	0.070	0.078	0.071	0.078
Knowledge Transfer Speed (KTSPEED)	0.132	0.430	0.442	0.422	0.467	0.460	0.479		0.073	0.075	0.078	0.076	0.078
Knowledge Transfer Economy (KTECON)	0.061	0.446	0.224	0.124	0.342	0.265	0.422	0.332		0.074	0.078	0.076	0.078
Supplier Performance Delivery (SPERF_DELI)	0.224	0.296	0.295	0.258	0.227	0.308	0.427	0.250	0.296		0.077	0.066	0.071
Supplier Performance Cost (SPERF_COST)	0.119	-0.090	0.013	0.034	-0.096	-0.047	0.060	0.051	-0.069	0.176		0.074	0.075
Buyer Performance Delivery (BPERF_DELI)	0.300	0.062	0.233	0.089	0.251	0.313	0.402	0.201	0.195	0.524	0.323		0.074
Buyer Performance Cost (BPERF_COST)	0.047	0.147	0.133	0.210	0.144	0.127	0.069	0.018	0.045	0.404	0.253	0.316	

Table 4.7 Ranges for *t*-values for all indicators of the constructs

Knowledge transfer factors	5.71 < <i>t</i> < 10.52
Antecedents of knowledge transfer	4.16 < <i>t</i> < 12.68
Performance outcomes of knowledge transfer	5.21 < <i>t</i> < 12.81

#### 4.4. Model Results

##### 4.4.1. Measurement Models

Three measurement models were assessed using confirmatory factor analysis (CFA), where all multi-item factors involved are assumed to covary with each other (Kline, 2005). Figure 4.1 and Table 4.8 presents the fit statistics for the knowledge transfer antecedent measurement model. The model had  $\chi^2 = 175.32$  ( $df = 109, p < .001$ ) and a 1.61  $\chi^2/df$  ratio. The  $\chi^2/df$  ratio was below the suggested cut off value of 3. The AGFI (.86) was above the cut-off point of  $\geq .80$ . Both the NNFI (.94) and the CFI (.96) values were above the cut-off of  $\geq .90$ . The RMSEA value of .06 was below the

Figure 4.1 Knowledge Transfer Antecedents – Measurement Model  
(Standardized estimates)

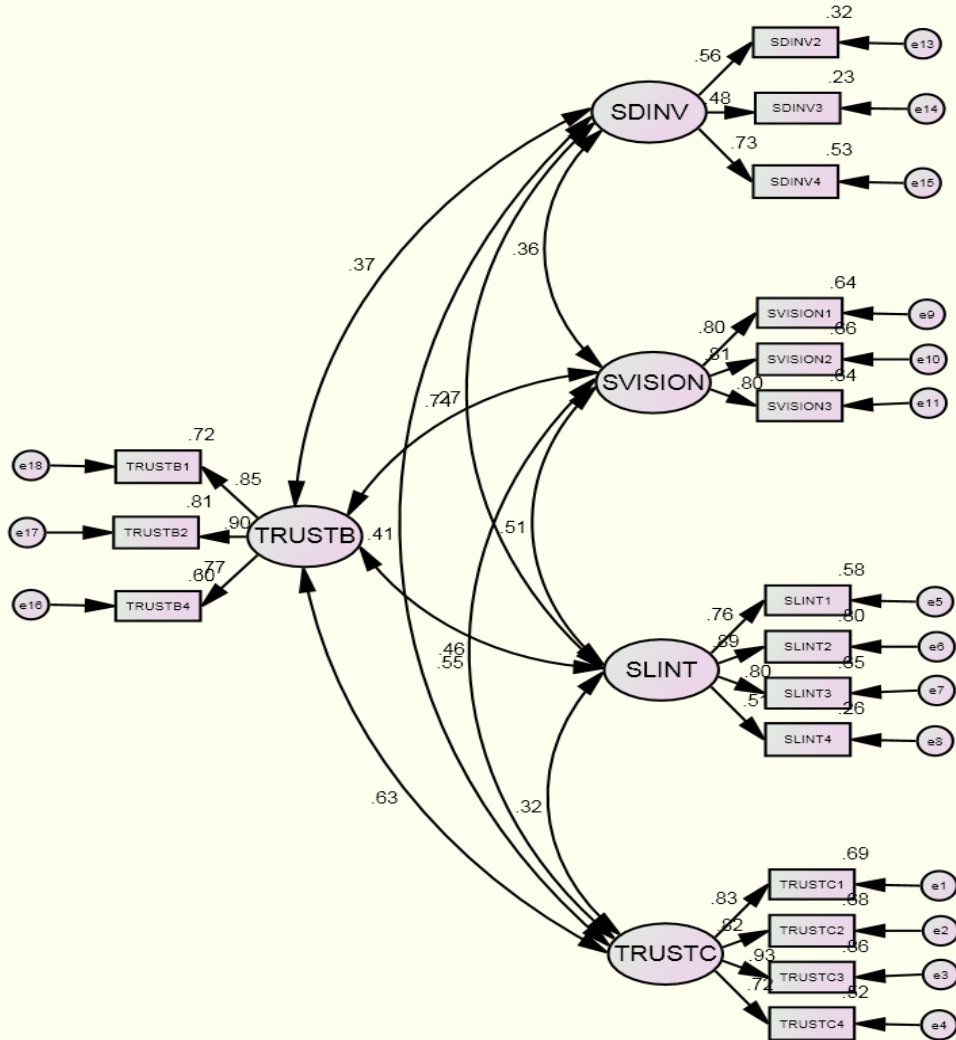


Table 4.8 Knowledge Transfer Antecedents Measurement Model

Model Fit Statistics	Value	Recommended
Chi-square	175.321	
	$p < 0.001$	
Degrees of freedom	109	
Chi-square/Degrees of freedom	1.608	$\leq 3$
Adjusted goodness of fit index (AGFI)	0.857	$\geq 0.80$
Bentler and Bonett's Non-nomed fit index (NNFI)	0.944	$\geq 0.90$
Bentler Comparative fit index (CFI)	0.955	$\geq 0.90$
Root Mean Square Error of Approximation (RMSEA)	0.061	$\leq 0.08$
Standardized Root Mean Square Residual (SRMR)	0.082	$\leq 0.10$

suggested value of  $\leq .08$ . The SRMR value (.08) was below the suggested cut-off point of  $\leq .10$ . Thus, the results from Table 4.8 suggested that the model fit the data acceptably.

Figure 4.2 and Table 4.9 presents the fit statistics for the knowledge transfer factors measurement model. The model had  $\chi^2 = 112.11$  ( $df = 48, p < .001$ ) and a 2.34  $\chi^2/df$  ratio. The  $\chi^2/df$  ratio was below the suggested cut off value of 3. The AGFI (.85) was above the cut-off point of  $\geq .80$ . Both the NNFI (.90) and the CFI (.93) values were above the cut-off of  $\geq .90$ . The RMSEA value of .09 was slightly above the suggested value of  $\leq .08$ . The SRMR value (.06) was below the suggested cut-off point of  $\leq .10$ . Thus, the results from Table 4.9 suggested that the model fit the data acceptably.

Figure 4.2 Knowledge Transfer Factors - Measurement Model  
(Standardized Estimates)

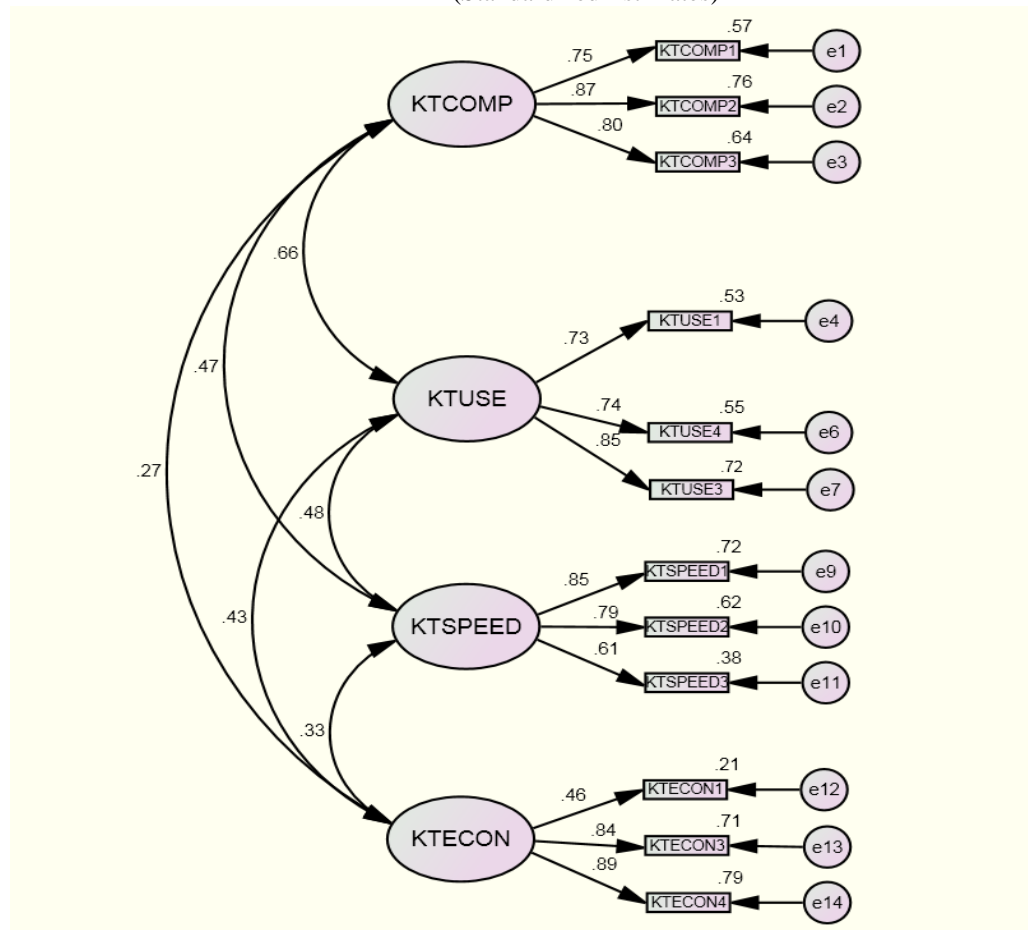




Table 4.9 Knowledge Transfer Factors Measurement Model

Model Fit Statistics	Value	Recommended
Chi-square	112.110 $p < 0.001$	
Degrees of freedom	48	
Chi-square/Degrees of freedom	2.336	$\leq 3$
Adjusted goodness of fit index (AGFI)	0.846	$\geq 0.80$
Bentler and Bonett's Non-nomed fit index (NNFI)	0.902	$\geq 0.90$
Bentler Comparative fit index (CFI)	0.928	$\geq 0.90$
Root Mean Square Error of Approximation (RMSEA)	0.090	$\leq 0.08$
Standardized Root Mean Square Residual (SRMR)	0.063	$\leq 0.10$

Figure 4.3 and Table 4.10 presents the fit statistics for the knowledge transfer factors measurement model. The model had  $\chi^2 = 109.78$  ( $df = 49$ ,  $p < .001$ ) and a 2.24  $\chi^2/df$  ratio. The  $\chi^2/df$  ratio was below the suggested cut off value of 3. The AGFI (.84) was above the cut-off point of  $\geq .80$ . Both the NNFI (.91) and the CFI (.93) values were above the cut-off of  $\geq .90$ . The RMSEA value of .09 was slightly above the suggested value of  $\leq .08$ . The SRMR value (.08) was below the suggested cut-off point of  $\leq .10$ . Thus, the results from Table 4.10 suggested that the model fit the data acceptably.

Figure 4.3 Knowledge Transfer Consequences – Measurement Model  
(Standardized Estimates)

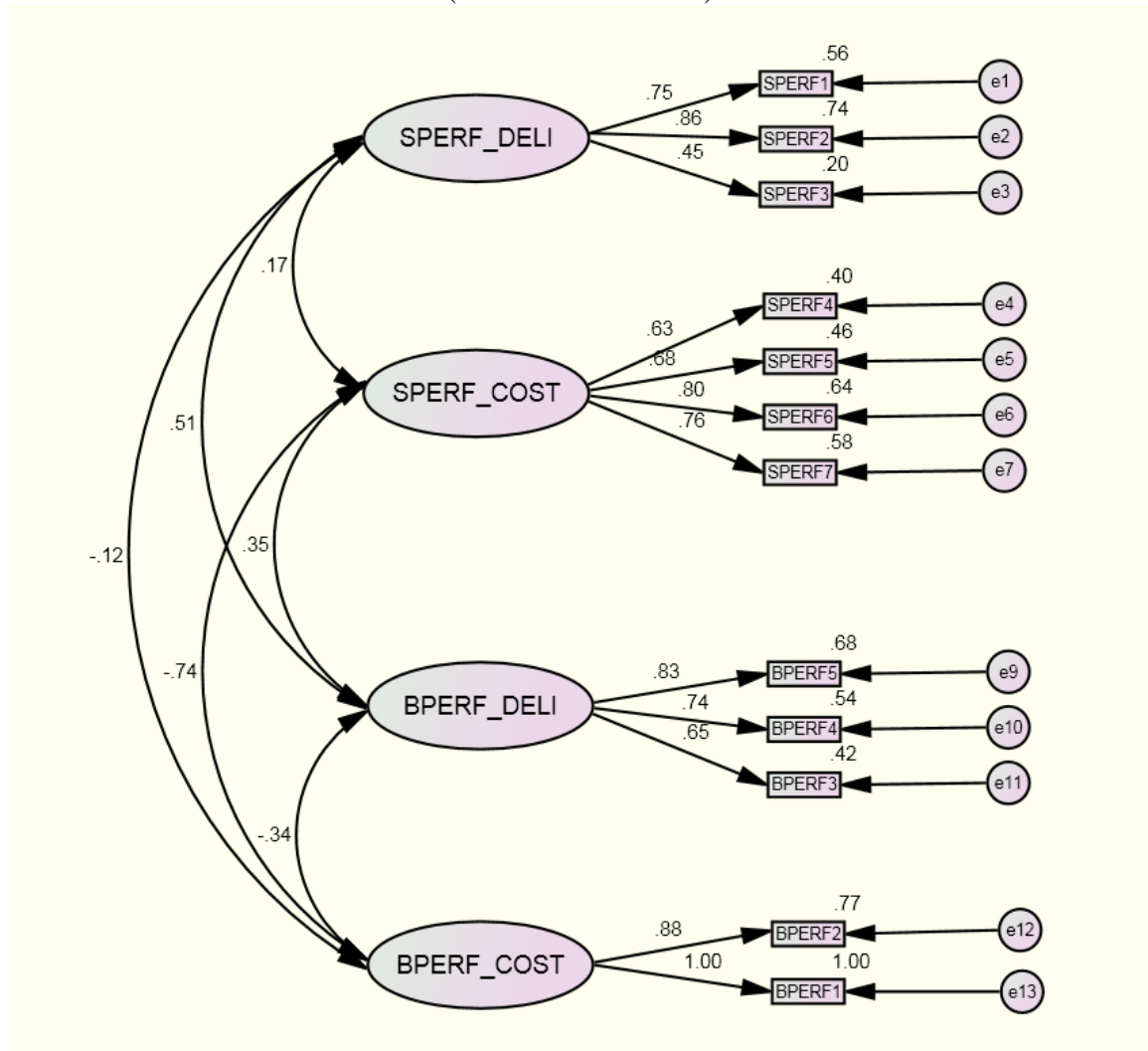


Table 4.10 Knowledge Transfer Consequences Measurement Model

Model Fit Statistics	Value	Recommended
Chi-square	109.777	
Degrees of freedom	49	
Chi-square/Degrees of freedom	2.240	≤ 3
Adjusted goodness of fit index (AGFI)	0.842	≥ 0.80
Bentler and Bonett's Non-nomed fit index (NNFI)	0.910	≥ 0.90
Bentler Comparative fit index (CFI)	0.933	≥ 0.90
Root Mean Square Error of Approximation (RMSEA)	0.086	≤ 0.08
Standardized Root Mean Square Residual (SRMR)	0.080	≤ 0.10

#### 4.4.2. Structural Models

Structural equation modeling (SEM) was utilized to simultaneously measure the hypothesized multiple linear relationships. Using Anderson and Gerbing's two-step approach (1988), the second step is to simultaneously test the hypothesized relationships among the factors using SEM.

##### 4.4.2.1. Model 1: Knowledge Transfer Comprehension - Delivery Performance

Figure 4.4 represents the Knowledge Transfer Comprehension - Delivery Performance model, with its associated path coefficients. Table 4.11 shows the results for the proposed model.

Figure 4.4 Model 1: Knowledge Transfer Comprehension - Delivery Performance  
Assessment of Model Fit (Standardized Estimates)

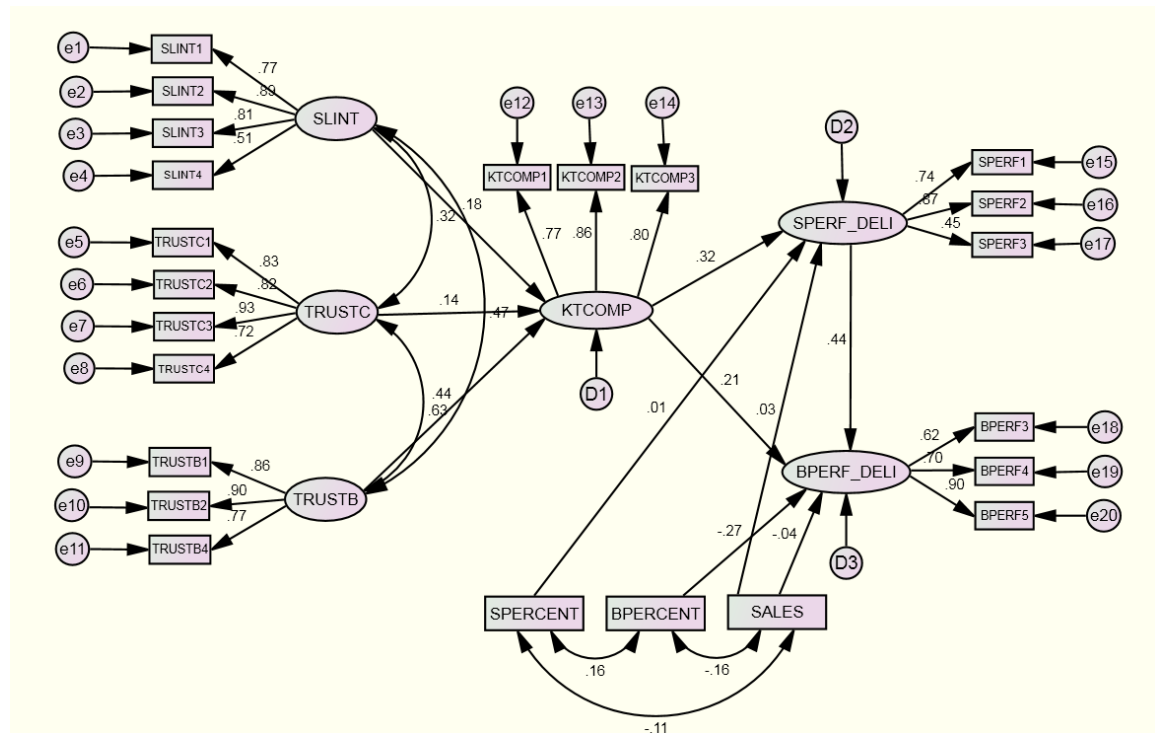


Table 4.11 Results of structural equation modeling for the knowledge transfer comprehension models

	Delivery Performance Model	Cost Performance Model
Structural paths		
Supplier's learning intent → Knowledge transfer comprehension	.18*	.17*
Competence - trust in supplier → Knowledge transfer comprehension	.14	.14
Benevolent - trust in supplier → Knowledge transfer comprehension	.43***	.44***
Knowledge transfer comprehension → Supplier's delivery performance	.32***	
Knowledge transfer comprehension → Buyer's delivery performance	.21*	
Knowledge transfer comprehension → Supplier's cost performance		-.00
Knowledge transfer comprehension → Buyer's cost performance		.12
Supplier's delivery performance → Buyer's delivery performance	.44***	
Supplier's cost performance → Buyer's cost performance		.39**
Model fit statistics		
$\chi^2$	329.51	315.86
d.f.	217	217
$\chi^2$ /d.f.	1.52	1.46
AGFI	.82	.83
NNFI	.93	.94
CFI	.94	.94
RMSEA	.06	.05
SRMSR	.08	.08
Variance Explained ( $R^2$ )		
Supplier's delivery performance	.10	.04
Buyer's delivery performance	.36	.16

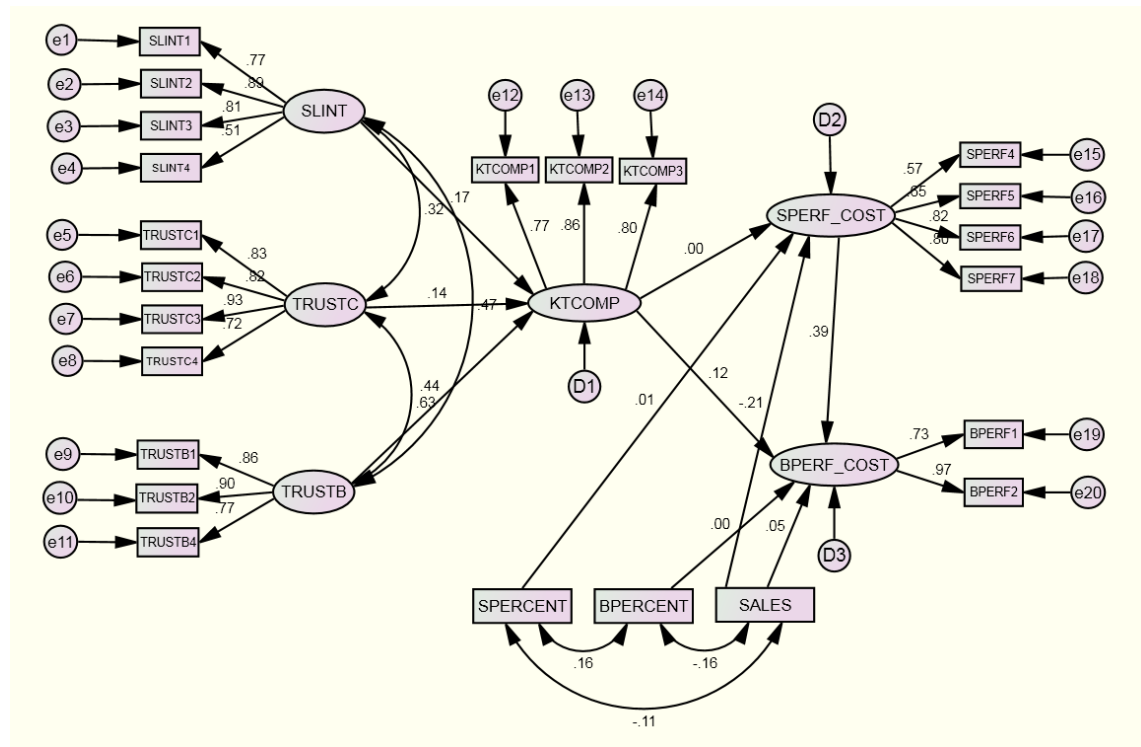
Note: †  $t$ -values significant at  $p < 0.10$ ; \*  $t$ -values significant at  $p < 0.05$ ; \*\*  $t$ -values significant at  $p < 0.01$ ; \*\*\*  $t$ -values significant at  $p < 0.001$

Results presented in Table 4.11 and Figure 4.4 (Model 1) indicate that supplier's learning intent and benevolent trust in supplier both positively influence the comprehension of knowledge transferred from the buyer to the supplier ( $p < 0.05$  and  $p < 0.001$ , respectively). Thus, our data provide strong support for Hypotheses 1c and 2c. However, Model 1 results do not support Hypothesis 3c, with competence trust in supplier not being significantly associated with the comprehension of knowledge transferred from the buyer to the supplier ( $p > 0.1$ ). On the outcome side of Model 1, the results show that comprehension of knowledge transferred has a positive and significant impact on both the supplier's delivery performance and the buyer's delivery performance ( $p < 0.001$  and  $p < 0.05$ , respectively) thereby supporting Hypotheses 4c and 5c. Finally, Model 1 provides support for Hypothesis 6c, with supplier's delivery performance being positively associated with the buyer's delivery performance ( $p < 0.001$ ).

4.4.2.2. Model 2: Knowledge Transfer Comprehension Model - Cost Performance

Figure 4.5 represents the Knowledge Transfer Comprehension - Cost Performance model, with its associated path coefficients. Table 4.11 shows the results for the proposed model.

Figure 4.5 Model 2: Knowledge Transfer Comprehension - Cost Performance  
Assessment of Model Fit (Standardized Estimates)



The results for hypotheses H1c, H2c, and H3c mirror those of hypotheses in the delivery performance model and therefore will not be stated. On the outcome side of Model 2 (see Table 4.11 and Figure 4.5), the results show that comprehension of knowledge transferred has no significant impact on both the supplier’s delivery performance and the buyer’s delivery performance ( $p > 0.1$  for both) thereby not supporting Hypotheses 7c and 8c. Finally, Model 2 provides support for Hypothesis 9c,

with supplier's delivery performance being positively associated with the buyer's delivery performance ( $p < 0.001$ ).

#### 4.4.2.3. Model 3: Knowledge Transfer Usefulness Model - Delivery Performance

Figure 4.6 represents the Knowledge Transfer Usefulness - Delivery Performance Model 3, with its associated path coefficient estimates. Table 4.12 shows the results for the proposed model.

Figure 4.6 Model 3: Knowledge Transfer Usefulness - Delivery Performance  
Assessment of Model Fit (Standardized Estimates)

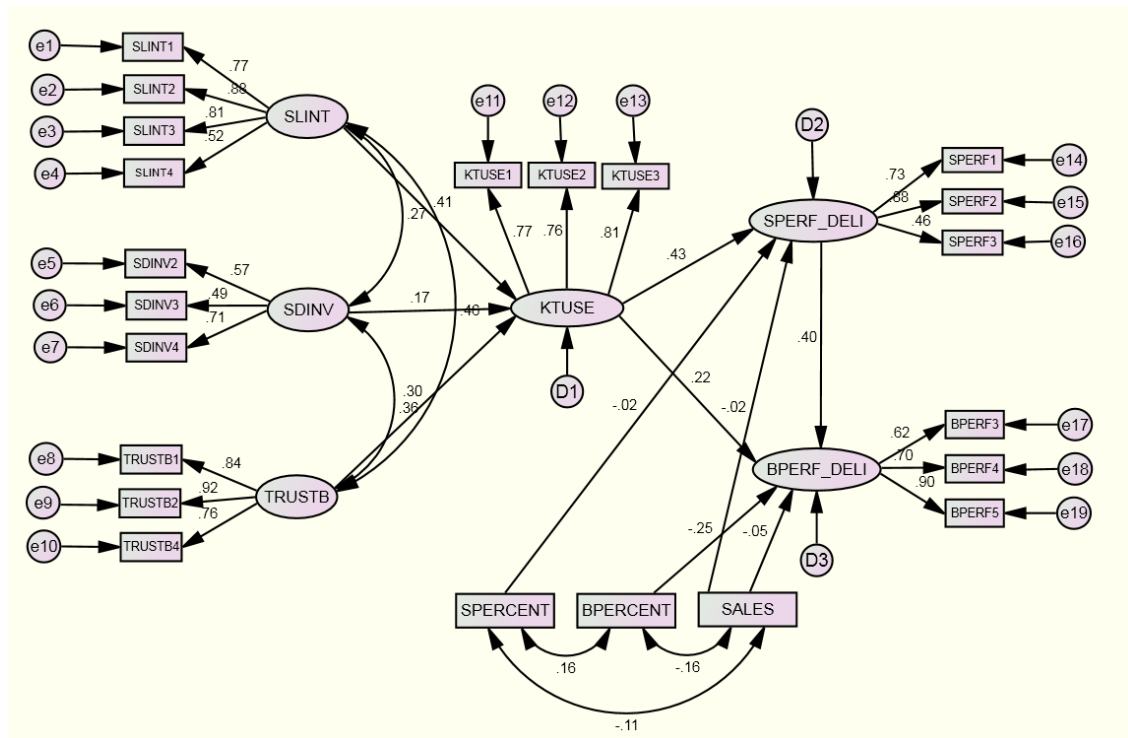


Table 4.12 Results of structural equation modeling for knowledge transfer usefulness models

	Delivery Performance Model 3	Cost Performance Model 4
Structural paths		
Supplier's learning intent → Knowledge transfer usefulness	.41***	.36***
Supplier development involvement → Knowledge transfer usefulness	.17 <sup>†</sup>	.16 <sup>†</sup>
Benevolent - trust in supplier → Knowledge transfer usefulness	.30***	.30***
Knowledge transfer usefulness → Supplier's delivery performance	.43***	
Knowledge transfer usefulness → Buyer's delivery performance	.22**	
Knowledge transfer usefulness → Supplier's cost performance		.10
Knowledge transfer usefulness → Buyer's cost performance		.20**
Supplier's delivery performance → Buyer's delivery performance	.40***	
Supplier's cost performance → Buyer's cost performance		.37***
Model fit statistics		
$\chi^2$	328.52	290.20
d.f.	196	197
$\chi^2$ /d.f.	1.68	1.47
AGFI	.80	.82
NNFI	.88	.92
CFI	.90	.93
RMSEA	.06	.05
SRMSR	.08	.08
Variance Explained ( $R^2$ )		
Supplier's delivery performance	.18	.06
Buyer's delivery performance	.35	.19

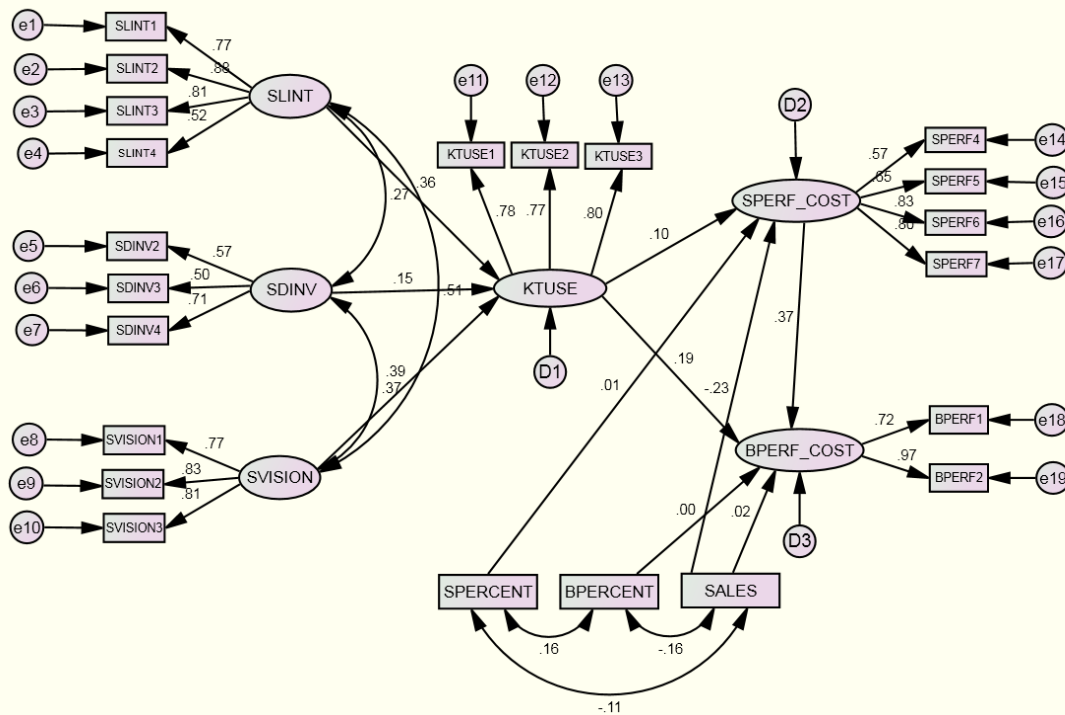
Note: <sup>†</sup>  $t$ -values significant at  $p < 0.10$ ; \*  $t$ -values significant at  $p < 0.05$ ; \*\*  $t$ -values significant at  $p < 0.01$ ; \*\*\*  $t$ -values significant at  $p < 0.001$

Results presented in Table 4.12 and Figure 4.6 (Model 3) indicate that supplier's learning intent, benevolent trust in supplier and supplier development involvement all positively influence the usefulness of transferred knowledge from the buyer to the supplier ( $p < 0.001$ ,  $p < 0.05$  and  $p < 0.001$  respectively). Thus, our data provide strong support for Hypotheses 1u, 2u and 3u. On the outcome side of Model 3, the results show that usefulness of transferred of knowledge has a positive and significant impact on both the supplier's delivery performance and the buyer's delivery performance ( $p < 0.001$  and  $p < 0.05$ , respectively) thereby supporting Hypotheses 4u and 5u. Finally, Model 3 provides support for Hypothesis 6u, with supplier's delivery performance being positively associated with the buyer's delivery performance ( $p < 0.001$ ).

#### 4.4.2.4. Model 4: Knowledge Transfer Usefulness Model - Cost Performance

The results for hypotheses H1u, H2u, and H3u are similar to those of hypotheses in the delivery performance model and therefore will not be stated. On the outcome side of Model 4 (see Table 4.12 and Figure 4.7), the results show that usefulness of transferred knowledge has a positive and significant impact on the buyer's cost performance ( $p < 0.01$ ) thereby supporting Hypotheses 8u. However, Model 4 results do not support Hypothesis 7u, with usefulness of transferred knowledge not being significantly associated with the supplier's cost performance ( $p > 0.1$ ). Finally, Model 4 provides support for Hypothesis 9u, with supplier's cost performance being positively associated with the buyer's cost performance ( $p < 0.001$ ).

Figure 4.7 Model 4: Knowledge Transfer Usefulness - Cost Performance  
Assessment of Model Fit (Standardized Estimates)





#### 4.4.2.5. Model 5: Knowledge Transfer Speed Model - Delivery Performance

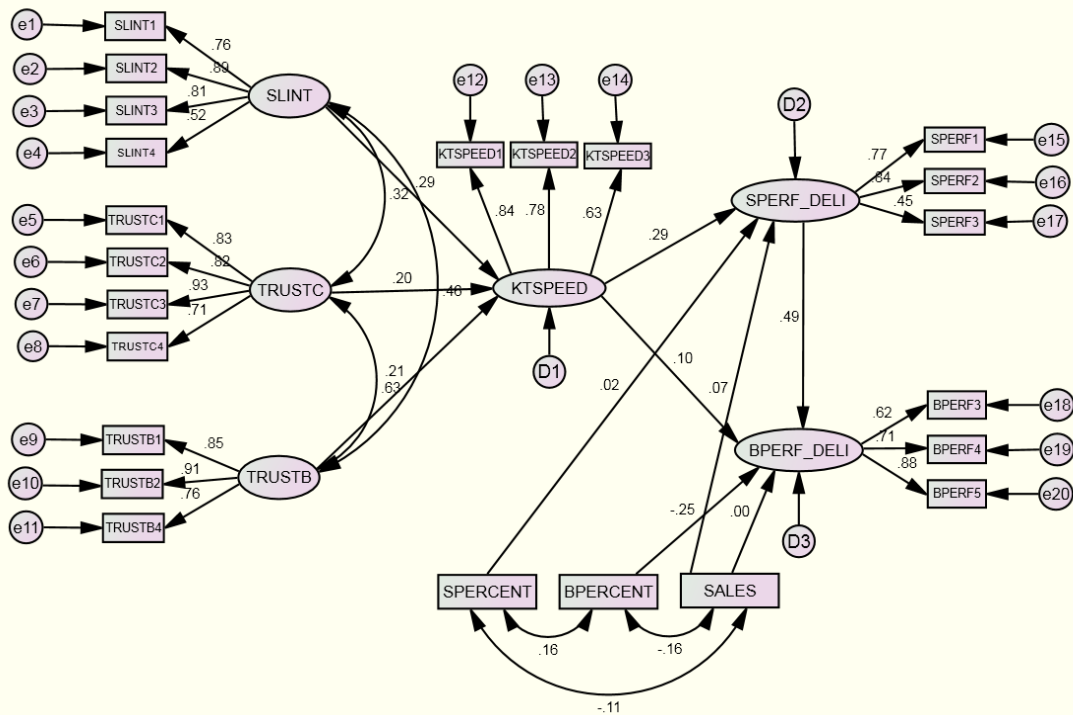
Results presented in Table 4.13 and Figure 4.8 (Model 5) indicate that supplier's learning intent, competence trust in supplier and benevolent trust in supplier all positively influence the speed of transferred knowledge from the buyer to the supplier ( $p < 0.001$ ,  $p < 0.05$  and  $p < 0.05$  respectively). Thus, our data provide strong support for Hypotheses 1s, 2s and 3s. On the outcome side of Model 5, the results show that speed of knowledge transfer has a positive and significant impact on supplier's delivery performance ( $p < 0.001$ ) thereby supporting Hypotheses 4s. However, Model 5 results do not support Hypothesis 5s, with speed of knowledge transfer not being significantly associated with the buyer's delivery performance ( $p > 0.1$ ). Finally, Model 5 provides support for Hypothesis 6s, with supplier's delivery performance being positively associated with the buyer's delivery performance ( $p < 0.001$ ).

Table 4.13 Results of structural equation modeling for knowledge transfer speed models

	Delivery Performance Model 5	Cost Performance Model 6
<b>Structural paths</b>		
Supplier's learning intent → Knowledge transfer speed	.30**	.28**
Competence - trust in supplier → Knowledge transfer speed	.20 <sup>†</sup>	.22*
Benevolent - trust in supplier → Knowledge transfer speed	.21 <sup>†</sup>	.19
Knowledge transfer speed → Supplier's delivery performance	.29**	
Knowledge transfer speed → Buyer's delivery performance	.10	
Knowledge transfer speed → Supplier's cost performance		.06
Knowledge transfer speed → Buyer's cost performance		.12
Supplier's delivery performance → Buyer's delivery performance	.49***	
Supplier's cost performance → Buyer's cost performance		.38***
<b>Model fit statistics</b>		
$\chi^2$	366.15	321.97
d.f.	217	218
$\chi^2$ /d.f.	1.69	1.48
AGFI	.80	.83
NNFI	.90	.93
CFI	.91	.94
RMSEA	.06	.05
SRMSR	.09	.08
<b>Variance Explained (<math>R^2</math>)</b>		
Supplier's delivery performance	.09	.05
Buyer's delivery performance	.35	.16

Note: <sup>†</sup>  $t$ -values significant at  $p < 0.10$ ; \*  $t$ -values significant at  $p < 0.05$ ; \*\*  $t$ -values significant at  $p < 0.01$ ; \*\*\*  $t$ -values significant at  $p < 0.001$

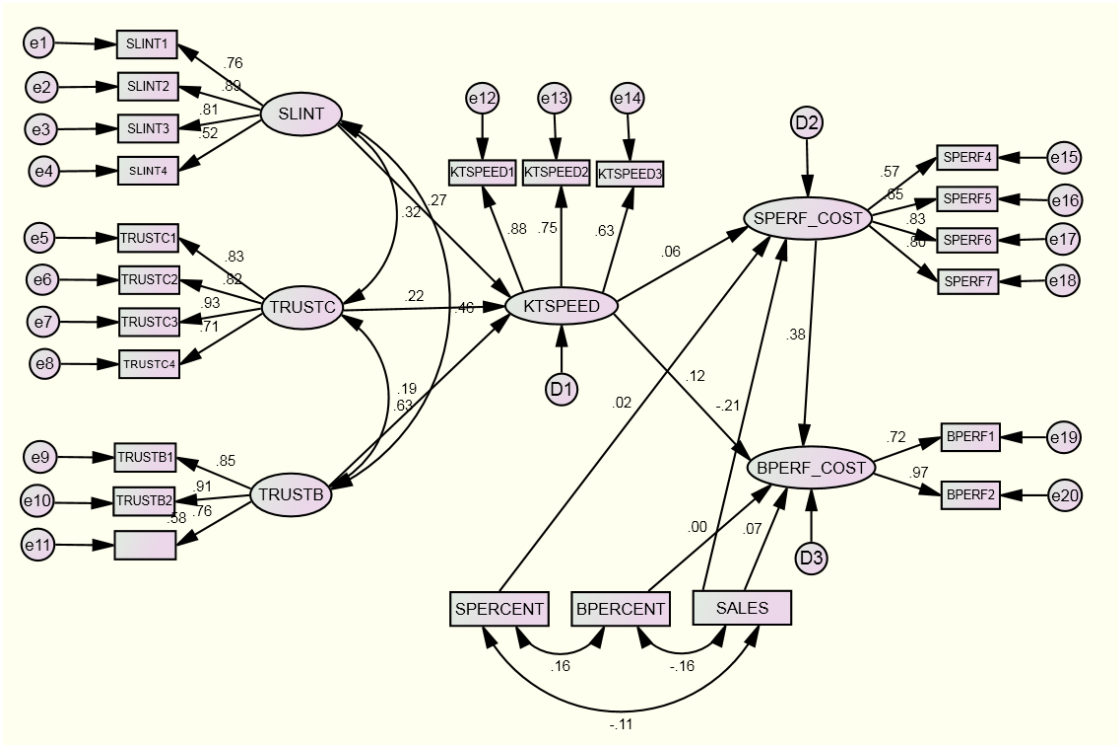
Figure 4.8 Model 5: Knowledge Transfer Speed - Delivery Performance  
Assessment of Model Fit (Standardized Estimates)



#### 4.4.2.6. Model 6: Knowledge Transfer Speed Model - Cost Performance

The results for hypotheses H1s, H2s, and H3s are similar to those of hypotheses in the delivery performance model and therefore will not be stated. On the outcome side of Model 6 (see Table 4.13 and Figure 4.9), the results show that speed of knowledge transfer does not have significant impact on both supplier's cost performance and buyer's cost performance ( $p > .10$ ) thereby not supporting Hypotheses 7s and 8s. Finally, Model 6 provides support for Hypothesis 9s, with supplier's delivery performance being positively associated with the buyer's delivery performance ( $p < 0.001$ ).

Figure 4.9 Model 6: Knowledge Transfer Speed - Cost Performance  
Assessment of Model Fit (Standardized Estimates)



4.4.2.7. Model 7: Knowledge Transfer Economy Model - Delivery Performance

Results presented in Table 4.14 and Figure 4.10 (Model 7) indicate that shared vision positively influence the economy of knowledge transfer from the buyer to the supplier ( $p < 0.01$ ). Thus, the data provide strong support for Hypothesis 1e. Although competence trust in supplier was marginally significant, the sign on the coefficient was negative contrary to the hypothesized positive association. Thus, the data does not support Hypothesis 2e. Hypothesis 3e was not supported, with benevolent trust in supplier not being significantly associated with the economy of transferred knowledge from the buyer to the supplier ( $p > 0.1$ ). On the outcome side of Model 7, the results show that economy of knowledge transfer has a positive and significant impact on supplier's delivery performance ( $p < 0.01$ ) thereby supporting Hypotheses 4e. However,

Figure 4.10 Model 7: Knowledge Transfer Economy - Delivery Performance Assessment of Model Fit (Standardized)

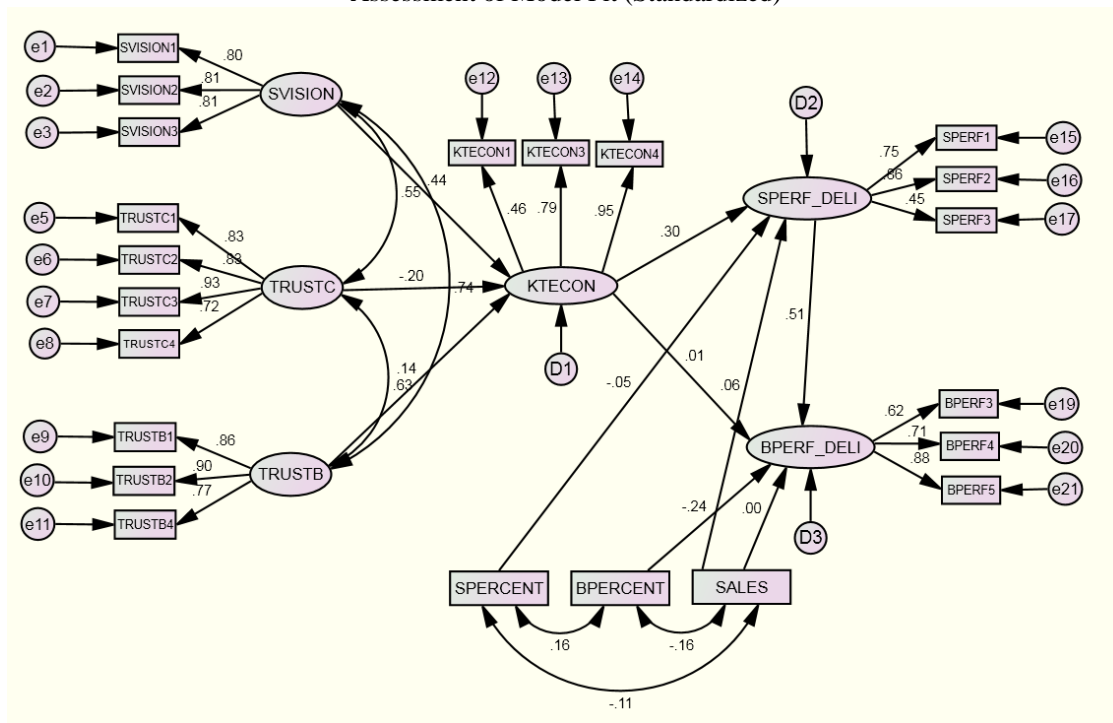


Table 4.14 Results of structural equation modeling for knowledge transfer economy models

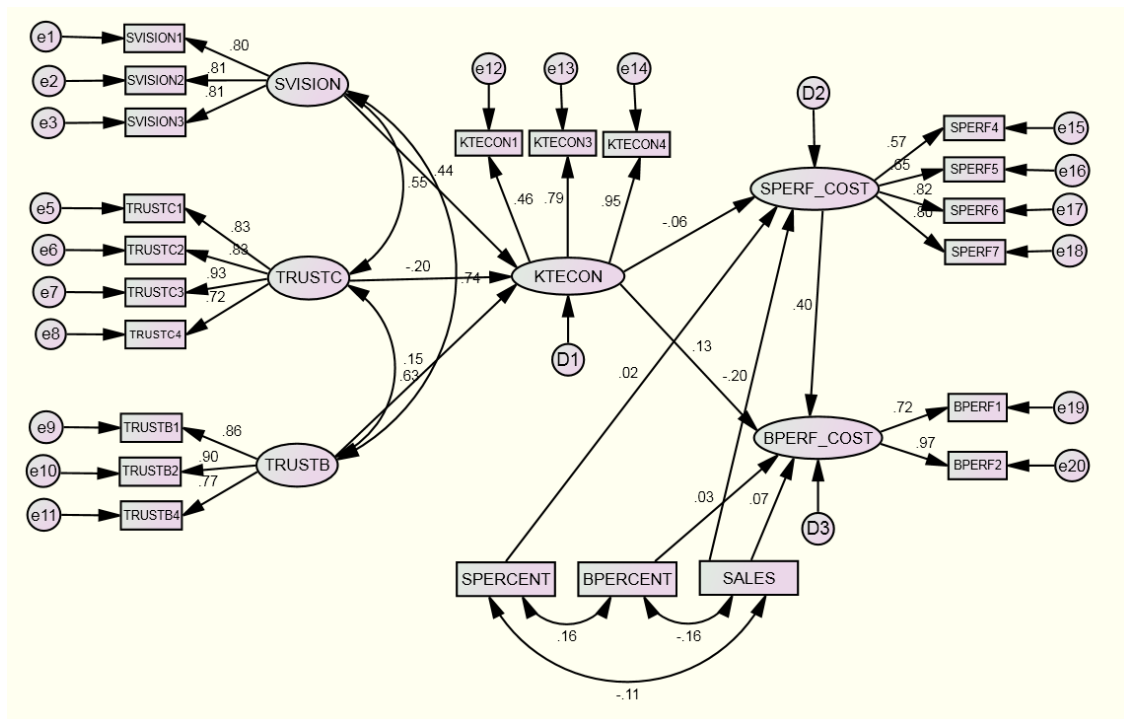
	Delivery Performance Model 7	Cost Delivery Model 8
<b>Structural paths</b>		
Shared vision → Knowledge transfer economy	.44**	.44**
Competence - trust in supplier → Knowledge transfer economy	-.20 <sup>†</sup>	.15
Benevolent - trust in supplier → Knowledge transfer economy	.14	-.20 <sup>†</sup>
Knowledge transfer economy → Supplier's delivery performance	.30**	
Knowledge transfer economy → Buyer's delivery performance	.01	
Knowledge transfer economy → Supplier's cost performance		-.06
Knowledge transfer economy → Buyer's cost performance		.13
Supplier's delivery performance → Buyer's delivery performance	.51***	
Supplier's cost performance → Buyer's cost performance		.40***
<b>Model fit statistics</b>		
$\chi^2$	328.39	291.02
d.f.	196	197
$\chi^2/d.f.$	1.68	1.48
AGFI	.81	.83
NNFI	.91	.93
CFI	.92	.94
RMSEA	.06	.05
SRMSR	.08	.08
<b>Variance Explained (<math>R^2</math>)</b>		
Supplier's delivery performance	.09	.05
Buyer's delivery performance	.32	.16

Note: <sup>†</sup> *t*-values significant at  $p < 0.10$ ; \* *t*-values significant at  $p < 0.05$ ; \*\* *t*-values significant at  $p < 0.01$ ; \*\*\* *t*-values significant at  $p < 0.001$

Model 7 results (see Figure 4.7 and Table 4.14) do not support Hypothesis 5e, with economy of knowledge transfer not being significantly associated with the buyer's delivery performance ( $p > 0.1$ ). Finally, Model 7 provides support for Hypothesis 6e, with supplier's delivery performance being positively associated with the buyer's delivery performance ( $p < 0.001$ ).

#### 4.4.2.8. Model 8: Knowledge Transfer Economy Model - Cost Performance

Figure 4.11 Model 8: Knowledge Transfer Economy - Cost Performance  
Assessment of Model Fit (Standardized)



The results for hypotheses H1e, H2e, and H3e are similar to those of hypotheses in the delivery performance model and therefore will not be stated. On the outcome side of Model 8, the results show that economy of knowledge transfer does not have significant impact on both supplier's cost performance and buyer's cost performance ( $p > .10$ ) thereby not supporting Hypotheses 7e and 8e. Finally, Model 8 provides support for

Hypothesis 9e, with supplier's delivery performance being positively associated with the buyer's delivery performance ( $p < 0.001$ ).

#### *4.5 Conclusion*

This chapter presented the results of the data collection, measurement instrument validation as well as the evaluation of the knowledge transfer measurement models and the structural models. The results of the data collection yielded 176 useable samples. The results of the measurement validation process shows that the constructs used in this study are reliable valid as well as unidimensional. All the research questions were evaluated using the SEM approach. Based on the model fit indices and cut-off values, the research models were found to fit the data adequately. Chapter V provides more detailed discussion on the results as well as their managerial significance.

## CHAPTER V

### Discussion and Implications

The objective of this dissertation has been to study the effectiveness and efficiency of knowledge transfer in supplier development. Drawing on theoretical perspectives from the social capital and the knowledge based view of the firm, this study builds and tests theoretical models of key knowledge transfer antecedents on knowledge transfer and the influence of knowledge transfer on buyer-supplier performance. In this chapter, main findings are discussed and wherever appropriate the implications of the results are presented.

#### *5.1. Knowledge Transfer in Supplier Development*

In assessing knowledge transfer in supplier development, a multidimensional approach was used, building on the work of Perez-Nordtvedt et al., (2008). In studying the knowledge transfer in supplier development the study borrowed the concept of knowledge transfer from the knowledge transfer literature. Also, the study makes distinctions between two dimensions of knowledge transfer: effectiveness and efficiency of knowledge transfer. The former incorporates comprehension and usefulness of knowledge transfer while the latter incorporates the speed and economy of knowledge transfer. Even though there is low to moderate correlation among the four knowledge transfer components, they are clearly distinct aspects of knowledge transfer. This notion

of separate dimensions is enforced by the finding that the four components of knowledge transfer may have different antecedents and consequences. Distinguishing these separate dimensions is of vital importance in understanding the knowledge transfer in supplier development.

### *5.2. The Antecedents of Knowledge Transfer*

In answering our second objective, on the antecedents of knowledge transfer in supplier development, the study developed and tested comprehensive models containing antecedents drawn from the supplier development literature and the knowledge transfer literature. As expected, the supplier's learning intent was found to be significantly and positively associated with the comprehension, usefulness and speed of knowledge transfer. In other words, suppliers that seek to learn and want the knowledge transfer to occur are better placed to comprehend the transferred knowledge and be able to use the knowledge on multiple projects and improve their capabilities. Moreover, the desire to learn also leads to a speedier transfer of knowledge from the buyer to the supplier. Thus, supplier's learning intent is key to the effectiveness and efficiency of knowledge transfer in supplier development. These findings are consistent with the work of Pérez-Nordtvedt et al. (2008), who found that recipient's learning intent was significantly and positively associated with the comprehension and speed of knowledge transfer. Second, this study has been able to disentangle the differential effects of competence trust and benevolence trust on knowledge transfer. Interestingly, the study found that competence trust has a much stronger effect on the efficiency of knowledge transfer (speed and economy) than benevolence trust. However, benevolence trust has a much stronger effect on the effectiveness of knowledge transfer (comprehension and usefulness) than competence



trust. In the context of supplier development, competence implies that the supplier is well qualified for the supplier development program, has much knowledge about the work that needs to be done in the supplier development program and is capable of performing its role in the supplier development program. Therefore, a competent supplier is not likely to require the utilization of too much company resources during the knowledge transfer process but is likely to rapidly transfer the knowledge. This is consistent with findings of Lui and Ngo (2004) and Perez-Nordtvedt et al. (2008). Benevolent suppliers promote a good relationship with their buyers which not only make it easier on the part of the supplier to comprehend knowledge being transferred, but also make knowledge transfers useful to suppliers. This finding is consistent with the work of Perez-Nordtvedt et al. (2008) and the work of Levin and Cross (2004), who found that competence-based trust enhanced the receipt of useful knowledge. Also, this finding supports the notion from the trust literature (Mayer et al., 1995) that trust should be treated as a multidimensional construct unlike the current approach in the supplier development research that treats trust as a unidimensional construct. Third, supplier development involvement was significantly and positively associated with usefulness of knowledge transfer. This result indicates that participation in the transfer of collective or complex manufacturing knowledge is useful to the suppliers. This helps suppliers implement kaizen routines, redesign work stations, reorganize process flow, modify equipment, and establish problem-solving groups. Finally, shared vision between suppliers and buyers was significantly and positively associated with economy of knowledge transfer. In other words, this finding is supportive of the notion that if goals and values are shared, buyers and suppliers can be expected to create a shared understanding of what constitutes

improvement and how to accomplish it (Krause et al., 2007). This is consistent with findings of Inkpen (2008). Also, this finding supports the notion that strategic similarity between knowledge recipient and knowledge source makes knowledge flow easily, consistent with findings of Darr and Kurtzberg (2000).

### *5.3. The Consequences of Knowledge Transfer in Supplier Development*

The study conveys the message that knowledge transfer is helpful in building stronger buyer-supplier relationships. Also, the study was able to disentangle the differential effects of the knowledge transfer constructs on the buyer-supplier performance consequences. Interestingly, the study found that the effectiveness of knowledge transfer influenced both the supplier delivery performance and the buyer delivery performance. However, the role of the knowledge transfer efficiency is confined to facilitating the supplier delivery performance only. The effectiveness of knowledge transfer leads to:

- *improved supplier delivery performance*: the performance of the supplier improves in terms of percentage of orders meeting design specification, percentage of orders meeting quality requirements and percentage of on-time deliveries.
- *improved buyer delivery performance*: the performance of the buyer improves in terms of product quality, delivery times of our products, reliability of our product delivery, manufacturing flexibility.

The efficiency of knowledge transfer leads to *improved supplier delivery performance*: the performance of the supplier improves in terms of percentage of orders

meeting design specification, percentage of orders meeting quality requirements, percentage of on-time deliveries. Contrary to expectations, efficiency of knowledge transfer does not result in improvements of the supplier's and buyer's cost and delivery performance. One plausible explanation for this might be that efficiency of knowledge transfer might not result in immediate improvements in supplier's and buyer's cost and delivery performance. Considerable time might pass between the knowledge transfer and the improvement. The median length of supplier development from the respondents of the survey was 2.75 years. This period may not be enough for the buyers and suppliers to yield the full benefits of efficiency of knowledge transfer in the supplier development program.

Finally, as expected the supplier's performance directly influences the buying firm's performance. When the supplier has a higher level of delivery performance as a consequence of being involved in the supplier development program the buyer perceives that they have a higher level of delivery performance associated with the knowledge transferred to the supplier in the supplier development program. The same logic applies to the supplier cost performance and buyer cost performance.

#### *5.4. Study Implications and Contributions*

The study and its findings have important implications for both research and practice. This research makes an important contribution to the literature on the antecedents of successful knowledge transfer in supplier development. The first is a clear intent on the part of the supplier to learn from the buyer. Supplier's learning intent leads to better comprehension, better application and quicker absorption of the new knowledge that is transferred. Second, the research highlights the fact that suppliers who have

trusting relationship with their buyers are more likely to be successful at understanding, applying and rapidly gaining the new knowledge. The third factor relates to the extent of supplier development involvement of the supplier. The study found that suppliers who are involved in supplier development with their buyer are more likely to use the knowledge gained on multiple projects and improve their capabilities. The last factor relates to shared vision between the buyer and the supplier. The study found that commonality in goals, values, culture and strategies between the buyer and the supplier promotes an environment characterized by less conflict and misinterpretation. Such an environment is conducive to easier flow of knowledge.

Unlike extant research in supplier development literature which addresses either the direct effects of antecedent factors on supplier development or the direct effect of supplier development and/or its antecedent factors on buyer-supplier performance this study provides a more comprehensive understanding of the knowledge transfer phenomenon in supplier development by examining factors associated with both the effectiveness and efficiency associated with such transfer. This study also contributes to the knowledge transfer literature by validating the measures of knowledge transfer developed in the knowledge transfer literature. The study expects that these measures shall be useful to scholars interested in researching questions involving knowledge and knowledge transfer particularly in supplier development.

Finally, this research makes an important contribution to the literature on the consequences of successful knowledge transfer in supplier development. The study found that the effectiveness of knowledge transfer influenced both the supplier delivery performance and the buyer delivery performance. However, the role of the knowledge

transfer efficiency is confined to facilitating the supplier delivery performance only. The effectiveness of knowledge transfer leads to supplier improvements in terms of percentage of orders meeting design specification, percentage of orders meeting quality requirements and percentage of on-time deliveries. Also, the effectiveness of knowledge transfer leads to buyer improvements in terms of product quality, delivery times of our products, reliability of our product delivery, manufacturing flexibility. The efficiency of knowledge transfer leads to supplier improvements in terms of percentage of orders meeting design specification, percentage of orders meeting quality requirements, percentage of on-time deliveries.

This study offers two main insights that can be helpful to practitioners. First, the study offers evidence that benevolence based trust matters most in the effectiveness of knowledge transfer and that competence-based trust matters most in the efficiency of knowledge transfer. Awareness of this finding can help buyers target suppliers who are benevolent and competent to optimize knowledge transfer in supplier development. Also, awareness of this finding can direct buyers to design policies that will promote benevolence and competence among key suppliers in its supply base. In the long run the investments in interventions designed to promote trust are more likely to have a payoff for the organization in form of effective and efficient knowledge transfer in supplier organization. In addition, buyers should be cautious when selecting suppliers for supplier development. To achieve a more effective and efficient knowledge transfer to the supplier, buyers should choose suppliers that are trusted, have a desire to learn, who are likely to get involved in the supplier development activities and who are in sync with their goals, values, culture and strategies.

### *5.5. Conclusion*

This chapter presented a detailed discussion of the results from this research. Knowledge transfer constructs borrowed from the knowledge transfer literature were used to test knowledge transfer models in the context of supplier development. The results show that suppliers' learning intent and benevolence trust positively impact both the effectiveness and efficiency of knowledge transfer. Supplier development involvement was found to have a positive effect on knowledge transfer effectiveness while shared vision and competence trust had positive effect on knowledge transfer efficiency. These results were found to be consistent with previous research on these constructs. The study also found that the effectiveness of knowledge transfer influenced both the supplier delivery performance and the buyer delivery performance. However, the role of the knowledge transfer efficiency was confined to facilitating the supplier delivery performance only.

## CHAPTER VI

### Summary and Conclusion

The literature on supplier development has shown gaps in the treatment of knowledge transfer. This research attempts to fill this gap by testing models constructed using constructs from the supplier development literature and the knowledge transfer literature. The study addressed three main research questions set out at the beginning: *What are the key relevant variables of knowledge transfer in supplier development? What are the key antecedents of knowledge transfer in supplier development and? What are the key buyer-supplier performance consequences of Knowledge transfer in supplier developments?*

#### *6.1. Summary of the Results*

From the knowledge transfer literature four components of knowledge transfer were identified based on their relevance to the supplier development context: comprehension, usefulness, speed and economy of knowledge transfer. Also, the study identified five key antecedents of knowledge transfer in supplier development: supplier's learning intent, supplier development involvement, supplier's competence trust, supplier's benevolent trust and shared vision. The study used the tradition buyer-supplier performance as the consequence of knowledge transfer. The measures used in the study

were adopted from the knowledge transfer literature and the supplier development literature. With an exception of supplier development involvement all the measures performed very well in terms of reliability, validity and unidimensionality. Data for the study was collected from US manufacturing firms' two digits SIC codes: 34, 35, 36, & 37 following the Dillman's approach. A sample of 167 was collected and used for testing the models.

The results show that suppliers' learning intent and benevolence trust positively impact both the effectiveness and efficiency of knowledge transfer. Supplier development involvement was found to have a positive effect on knowledge transfer effectiveness while shared vision and competence trust had positive effect on knowledge transfer efficiency. The study also found that the effectiveness of knowledge transfer influenced both the supplier delivery performance and the buyer delivery performance. However, the role of the knowledge transfer efficiency was confined to facilitating the supplier delivery performance only.

### *6.2. Study Limitations and Future Research Directions*

As with any research, the results presented in this study must be viewed in conjunction with their limitations. First, while tests for common method variance (CMV) using Harman's one-factor test (Podsakoff and Organ, 1986) indicated that CMV was not a concern, it is impossible to rule out a potential bias from common method variance in survey data collection with a single informant, despite all of the precautions in the questionnaire development and pre-testing that were taken.

Second, despite the study's instruction to respondents to randomly select one supplier development relationship from the buyer's portfolio, there might still be an



overrepresentation of more salient and more successful supplier development relationship in our sample leading to sampling bias.

Third, as this research is cross-sectional in nature, it cannot establish causality among variables. Only a longitudinal research design could provide better answers to questions of causality as well as the evolution of key variables such as the improvement of buyer-supplier cost and delivery performance over time (e.g., over the duration of the buyer-supplier relationship). It appears that the use of longitudinal data and ‘fine-grained’ methodologies such as multiple case studies in the study of the knowledge transfer phenomenon (Harrigan, 1983) is the next logical step in advancing this line of inquiry. In order to more fully advance knowledge transfer research, it is important to combine both positivist and interpretive approaches as they are mutually complementary and supportive (Lee, 1991).

Fourth, this research only included four antecedent variables and did not include moderating variables, i.e., constructs that might either foster or hamper the relationship between the antecedent variables and knowledge transfer variables or between the knowledge transfer variables and the buyer-supplier performance outcomes in our model. Because of focusing on the four antecedent variables, the impact of antecedents on knowledge transfer may not be fully explained (internal validity). Moderating variables are of particular interest for practitioners. A better understanding of moderating variables would help answer the intriguing question: “What should a buying firm do so that the outcomes of knowledge transfer in supplier development become even more positive?” A promising research direction would be to explore more knowledge transfer antecedent variables and the role of moderators in the knowledge transfer in supplier development

model. A moderator variable would systematically modify either the form and/or strength of the relationship between knowledge transfer components and their antecedents and buyer-supplier performance outcomes. It would be worthwhile to investigate the “classical” moderator/antecedent variables, such as service versus product offerings, uncertainty, commitment, or communication. Another moderator that could be of interest in the context of knowledge transfer in supplier development is the life cycle of the knowledge transfer. A starting point would be Szulanski (1996) four phases of the transfer process (i.e., initiation, implementation, ramp-up and integration).

Another limitation of this study was that the study utilized data collected from the buyer. Instead of analyzing knowledge transfer in supplier development only from the buyer’s perspective, it is worthwhile to collect data from both sides of the buyer–supplier dyad to determine interrater reliability and interrater agreement (Modi and Mabert, 2007). For some measures such as trust and shared vision, dyadic data could be used to assess the convergence of answers from the buyer and a supplier informant.

The final limitation discussed relates to the issue of generalizability of the findings, based on the fact that this study was limited only to manufacturing firms in the U.S. belonging to the following two digits SIC codes: 34, 35, 36, & 37. This might restrict the immediate generalizability of the findings to service firms and other geographical areas such as Europe or Asia. Therefore, future studies should attempt to examine the relationships across a broader subset of industries.

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## APPENDICES

Appendix 1  
*Cover Letter*

<Date>  
<<FullName>>  
<<Title>>  
<<Company>>  
<<Address1>>  
<<Address2>>

Dear <<FullName>>:

I am writing to ask for your help in a study on supplier development programs. The intent of this study is to investigate how knowledge transfer and related factors affect performance outcomes in a supplier development effort. This study aims at identifying factors that can give buyers insight into the circumstances in which they are likely to effectively and efficiently share their knowledge with suppliers. In order to validate these factors with real-world practices, I am collecting extensive empirical data. Your help in providing this information, as relevant to your supplier development practices, will be of great importance to this study as well as the growing need for a cohesive supplier development theory.

As part of the Institute for Supply Management's (ISM) mission to lead supply management, ISM encourages the pursuit of academic research. As a member of ISM, you have been selected to participate in this research project. Responding to the survey is completely voluntary. ISM Policy allows for the release of limited member information to researchers, to be used only for specific approved research projects. The success of this study depends on your contribution, therefore, I would greatly appreciate it if you would fully complete and return the attached questionnaire in the self-addressed envelope provided within the next two weeks. It should take you 15 minutes or less to fill out and if you have any questions, please feel free to contact me at (216) 269-6348 or my supervisor at (216) 687-4776.

I assure you that you will be completing the questionnaire anonymously and that you and your company will not be identifiable. The results of this survey will be reported only in summary form. No mention of particular companies or participants will be given. If you have any questions about your rights as a research participant, you can contact the Cleveland State University's Institutional Review Board at (216) 687-3630.

Please let me know if you would like a copy of the findings from this study by sending me your particulars using my email address: c.sichinsambwe@csuohio.edu. I will be more than happy to forward a copy of the report. Thank you very much for your great contribution to this significant study.

Sincerely,

Chanda Sichinsambwe  
Doctoral Candidate  
Operations & Supply Chain Management Department  
Cleveland State University

## Appendix 2

### Cleveland State University Supplier Development Survey

Your firm is requested to answer the following questions pertaining to your firm's involvement in a supplier development program with a chosen supplier. If your firm has been involved with more than one supplier, please choose one of the suppliers randomly.

**Section A: Preliminaries**

1. Has your firm been involved with supplier development program(s) in the last 3 years? [  ] Yes [  ] No

If you answered **No** please stop, you will not be required to complete the questionnaire. Return the questionnaire in the SAE provided.

If you answered **Yes** please proceed.

**Section B: Factors Influencing Knowledge Transfer**

**Instructions:** Please circle the indicator that best describes the degree to which this supplier had invested in or participated in (i.e., been involved with) the following improvement packages during the supplier development program with your firm. Your firm participated in the supplier development either by 'teaching,' 'consulting,' or 'joint-participating' (e.g., your firm's and this supplier's employees jointly participated in someone else's programs).

**1 - Not at all                      4 – Neutral                      7 – To a large degree**

***Supplier Development Involvement***

1. Total quality management programs.	1	2	3	4	5	6	7
2. New machine set up techniques programs.	1	2	3	4	5	6	7
3. Kaizen programs.	1	2	3	4	5	6	7
4. Lot size optimization techniques programs.	1	2	3	4	5	6	7

**Instructions:** Think about the circumstances surrounding your relationship with this supplier. Please circle the indicator which best describes this relationship.

**1 – Strongly Disagree                      4 – Neutral                      7 – Strongly Agree**

***Shared Vision***

1. Both firms share the same business values.	1	2	3	4	5	6	7
2. The parties often agree what is in the best interest of the relationship.	1	2	3	4	5	6	7
3. This supplier shares our goals for this business.	1	2	3	4	5	6	7
4. Both firms have similar organizational cultures	1	2	3	4	5	6	7

\*\*\*Please proceed to the next page\*\*\*

**Instructions:** Please circle the indicator which best describes the extent to which this supplier is focused on learning from your firm.

**1 – Strongly Disagree                      4 – Neutral                      7 – Strongly Agree**

***Supplier's Learning Intent***

1. Understanding the knowledge possessed by our firm.	1	2	3	4	5	6	7
2. Absorbing our firm's understanding of the knowledge we possessed.	1	2	3	4	5	6	7
3. Analyzing the feasibility of adopting the knowledge possessed by our firm.	1	2	3	4	5	6	7
4. Communicating their needs to our firm with respect to the knowledge acquired.	1	2	3	4	5	6	7
5. One of this supplier's objectives in the supplier development program was to learn about our skills, techniques and capabilities.	1	2	3	4	5	6	7
6. This supplier aggressively tries to learn from us.	1	2	3	4	5	6	7

**Instructions:** Please indicate your perception of the level of trust in this supplier at the *beginning* of the supplier development program.

**1 – Strongly Disagree                      4 – Neutral                      7 – Strongly Agree**

***Trust In Supplier - Competence***

1. This supplier was very capable of performing its role in the supplier development program.	1	2	3	4	5	6	7
2. This supplier was known to be successful at the things it tries to do.	1	2	3	4	5	6	7
3. This supplier was well qualified for the supplier development program.	1	2	3	4	5	6	7
4. This supplier had much knowledge about the work that needed to be done in the supplier development program.	1	2	3	4	5	6	7

***Trust In Supplier - Benevolence***

1. This supplier was genuinely concerned that our business succeeds.	1	2	3	4	5	6	7
2. We trusted this supplier to keep our best interests.	1	2	3	4	5	6	7
3. We found it necessary to be cautious with this supplier. (R)	1	2	3	4	5	6	7
4. We believe the information that this supplier provides us.	1	2	3	4	5	6	7
5. This supplier is not always honest with us. (R)	1	2	3	4	5	6	7

\*\*\*Please proceed to the next page\*\*\*



**Section C: Knowledge Transfer**

**Instructions:** Your initial response to agreement or disagreement to each of the statements provided below is requested. Please circle the indicator which best describes your perceptions about this supplier's receipt and application of the knowledge provided in the supplier development program.

**1 – Strongly Disagree                      4 – Neutral                      7 – Strongly Agree**

***Comprehension***

1. The knowledge was complete enough that the supplier was able to become proficient with it.	1	2	3	4	5	6	7
2. The knowledge was thorough enough that the supplier was able to fully understand it.	1	2	3	4	5	6	7
3. The knowledge was well understood by the supplier organization.	1	2	3	4	5	6	7
4. This supplier appreciated the knowledge and requested for more advanced knowledge.	1	2	3	4	5	6	7

***Usefulness***

1. The knowledge transferred from our firm contributed a great deal to multiple projects at our supplier's firm.	1	2	3	4	5	6	7
2. This supplier was very satisfied with the quality of the knowledge that our firm provided.	1	2	3	4	5	6	7
3. This supplier dramatically increased the perception about the efficacy of the knowledge after gaining experience with it.	1	2	3	4	5	6	7
4. The transfer of knowledge from our firm greatly helped this supplier in terms of actually improving its organizational capabilities.	1	2	3	4	5	6	7

***Speed***

1. The rate at which the knowledge was transferred to our supplier was very fast.	1	2	3	4	5	6	7
2. The knowledge was transferred to our supplier in a timely fashion	1	2	3	4	5	6	7
3. It took our supplier a short time to acquire and implement the knowledge provided by our firm.	1	2	3	4	5	6	7
4. This supplier complained that the knowledge was being transferred at a faster rate than they could handle.	1	2	3	4	5	6	7

***Economy***

1. The knowledge transferred from our firm to this supplier was acquired and implemented at very low cost.	1	2	3	4	5	6	7
2. This supplier did require the utilization of too many company resources during the acquisition and implementation of the new knowledge. (R)	1	2	3	4	5	6	7
3. This supplier did not waste money during the acquisition and implementation of the new knowledge.	1	2	3	4	5	6	7
4. This supplier did not waste time during the acquisition and implementation of the new knowledge.	1	2	3	4	5	6	7

\*\*\*Please proceed to the next page – you are almost done\*\*\*

**Section D: Performance**

**Instructions:** Your response to the performance changes along each of these statements provided below is requested. Please circle the indicator which best describes the performance changes as a consequence of the involvement of this supplier in your firm's supplier development program.

**1 – Decreased Significantly      4 – Remained Constant      7 – Increased Significantly**

**Supplier Performance**

1. Percentage of orders meeting design specification.	1	2	3	4	5	6	7
2. Percentage of orders meeting quality requirements.	1	2	3	4	5	6	7
3. Percentage of on-time deliveries.	1	2	3	4	5	6	7
4. Cost of purchased parts. (R)	1	2	3	4	5	6	7
5. Average investment in purchased parts inventory. (R)	1	2	3	4	5	6	7
6. Lead time for special/rush orders. (R)	1	2	3	4	5	6	7
7. Time required for supplier to take a new item from development into production. (R)	1	2	3	4	5	6	7

**Buyer Performance**

1. Total costs of our products (R)	1	2	3	4	5	6	7
2. Product costs (R)	1	2	3	4	5	6	7
3. Product quality (R)	1	2	3	4	5	6	7
4. Delivery times of our products (R)	1	2	3	4	5	6	7
5. Reliability of our product delivery	1	2	3	4	5	6	7
6. Manufacturing flexibility	1	2	3	4	5	6	7

**Section E: General Information**

1. a. Circle one answer that best describes your position with your organization:
 

<input type="checkbox"/> V. P. Purchasing	<input type="checkbox"/> Director Purchasing	<input type="checkbox"/> Purchasing Manager
<input type="checkbox"/> Materials Manager	<input type="checkbox"/> Senior Buyer	<input type="checkbox"/> Other: _____
- b. Number of years with this organization \_\_\_\_\_
2. What percentage of this suppliers business does this firm represent? \_\_\_\_\_
3. What percent of buyer requirement is satisfied by this supplier? \_\_\_\_\_
4. How long has your firm been involved with this supplier in this supplier development program? \_\_\_\_\_ (yrs/months)
5. Number of employees at your firm?
 

<input type="checkbox"/> Less than 25	<input type="checkbox"/> 25 to 100	<input type="checkbox"/> 101 to 250
<input type="checkbox"/> 251 to 500	<input type="checkbox"/> 501 to 1000	<input type="checkbox"/> Over 1000
6. Annual sales volume at your firm? (In Millions)
 

<input type="checkbox"/> Less than \$1	<input type="checkbox"/> \$1 to \$49	<input type="checkbox"/> \$50 to \$99
<input type="checkbox"/> \$100 to \$499	<input type="checkbox"/> \$501 to \$999	<input type="checkbox"/> Over \$1000
7. Firm type?
 

<input type="checkbox"/> Machining	<input type="checkbox"/> Fabricating	<input type="checkbox"/> Assembly
<input type="checkbox"/> Processing	<input type="checkbox"/> Mixture of above	<input type="checkbox"/> Other _____
8. Type of material procured from this supplier?
 

<input type="checkbox"/> Standard	<input type="checkbox"/> Made-to-order	<input type="checkbox"/> Both
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9. How confident do you feel in answering the questions in this questionnaire (Please circle)?
 

Not confident 1   2   3   4   5   6   7 Very confident

\*\*\* Thank you very much for your help \*\*\*