The Impact of Specific Supplier Development Efforts on Buyer Competitive Advantage: An Empirical Model

Abstract

This paper examines the relationships between supplier development efforts and buyer competitive advantage from the buyer's perspective, and seeks to understand how specific supplier development efforts may impact on a buyer's operational performance. We conducted a survey of 142 electronics manufacturing companies in Hong Kong, and applied structural equation modeling (SEM) to test a structural model that postulates the impacts of various efforts of supplier development on buyer competitive advantage. The results indicate that each effort of supplier development has a different effect on different dimensions of buyer competitive advantage. Specifically, we found that joint actions and trust appear to be the two most critical elements to enhance the operational effectiveness of a buyer, while asset specificity improves the market responsiveness of a buyer slightly. However, supplier development efforts like increasing supplier performance goals and recognizing supplier progress do not appear to be an effective means and thus should be practised with caution. This study provides significant insights into the specific impact of various supplier development efforts for both academics and practitioners.

Keywords: Supplier development, Operational effectiveness, Competitive advantage

1. Introduction

Supplier development can be defined as any effort a buying firm expends on a supplier to increase the performance and capabilities of the supplier to meet the buying firm's own short-term or long-term supply needs (Krause and Ellram, 1997a). This study investigates the impacts of supplier development efforts on buyer competitive advantage. The primary research objective is to develop a descriptive model that postulates the possible relationships between supplier development efforts and buyer competitive advantage. The model adopts the buying firm's perspective as a basis for understanding the performance implications of supplier development and investigating how different characteristics of supplier development efforts influence buyer competitive performance outcomes.

As more and more manufacturing firms have realized the importance of the performance of their suppliers to the establishment and sustaining of their competitive advantage (Goffin et al., 2006; Li et al., 2006), purchasing research has begun to focus on supplier development programs and study how these initiatives impact on buyer and supplier performance (Hahn et al., 1990; Monczka et al., 1993; Hartley and Choi, 1996; Goffin et al., 2006). Of interest to this study are the findings in the purchasing literature that improvement in buyer and supplier performance occurs as a result of implementing effective supplier development programs (Watts and Hahn, 1993; Krause, 1997; Gunasekaran and Ngai, 2005).

However, what specific efforts of supplier development will uniquely contribute to buyer competitive advantage? The extant literature has indicated that supplier development activities (Li et al., 2005), among others, include: (i) increasing supplier performance goals (Monczka et al., 1993); (ii) providing suppliers with training (Galt and Dale, 1991); (iii)

providing suppliers with equipment, technological support and even investments (Galt and Dale, 1991; Monczka et al., 1993); (iv) exchanging personnel between buyer and supplier organizations (Newman and Rhee, 1990); (v) evaluating supplier performance (Giunipero, 1990; Watts and Hahn, 1993); and (vi) recognizing supplier progress in the form of awards (Galt and Dale, 1991; Curkvoic et al., 2000).

The purchasing literature on supplier development has extensively discussed the issues concerning the establishment of supplier development programs, and the characteristics, benefits, and management of such programs (Liker and Choi, 2004). It provides valuable information for managers and practitioners to understand the reasons for becoming involved in supplier development, the process of establishing supplier development programs, and the possible benefits that can be gained from supplier development (Reed and Walsh, 2002; Goffin et al., 2006).

However, there is still a limitation in the current research on supplier development. Although the literature has provided extensive research support for the assertion that supplier development is an integrated means of achieving and sustaining competitive advantage (Hahn et al., 1990; Monczka et al., 1993; Hartley and Choi, 1996; Burt et al., 2003), these studies have not identified the specific efforts of supplier development that contribute to buyer competitive advantage (Robinson and Malhortra, 2005). In addition, the literature has not empirically examined the specific impacts of various key supplier development efforts on buyer competitive advantage. The key issues to be addressed in the present study concern the examination of the role played by supplier development efforts in predicting buyer competitive advantage, and the interpretation of the relationships between supplier development efforts and buyer competitive advantage in the context of Hong Kong's electronics industry.

We begin with a comprehensive review of the theoretical expositions of supplier development. We then describe how to use SEM to develop and analyze measurement models and structural models that link supplier development efforts to buyer competitive advantage based on the theoretical framework proposed in this study. The results of structural modeling are presented and analyzed, and finally the implications of the findings for future research and practice are discussed.

2. Literature Review and Hypothesis Development

There is considerable theoretical support for the assertion that buyers' performance is enhanced through supplier development, especially investments in specialized assets (Williamson, 1985; Asanuma, 1989; North, 1990; Buvik and Gronhaug; 2000). Barney (1991) argued, based on the resource-based view of the firm, that firms that are able to accumulate resources and capabilities that are valuable, non-substitutable, and difficult to imitate will achieve a competitive advantage over competing firms. Supplier development could be considered as actions taken by a buying firm to strengthen the competitive capability of its suppliers. Improvements in performance will happen within the unique exchange relationships developed between the buyer and supplier firms. This will become unique resources and capabilities of the buying firm (Chen, Lin and Huang, 2006). Hence, ultimately, the buying firm will reap benefits from its supplier development efforts.

Economists have long recognized that "resource owners increase productivity through cooperative specialization" (Alchian and Demsetz, 1972). Perry (1989) pointed out that gains from trade between trading partners are enhanced by investments in assets that are specialized to their exchange. This suggests that a firm can choose to seek efficiency advantages by creating assets that are specialized in conjunction with the assets of a trading partner (Dyer, 1996). Supplier development is obviously a relation-specific program. The

buying firm expects to realize an advantage over competing firms by converting general assets (such as money, raw materials, commodities, general people skills) into specific assets and capability (Schoemaker and Amit, 1994; De Toni and Nassimbeni, 2000).

However, as recognized in transaction cost economics (TCE), increased specialization within a production network cannot be achieved without a cost. When transacting firms make investments in specialization, transaction costs arise because of the fear of opportunism. A central premise of TCE is that transaction costs increase as transacting firms make greater asset-specific investments. The standard reasoning is that as asset specificity increases, more complex governance structures are required to eliminate or attenuate the costs incurred from bargaining with the supplier who owns the specialized assets and, hence, who has increased its negotiating power (Williamson, 1985). Thus, transaction costs are presumed to increase with an increase in asset specificity.

However, Dyer (1996) found that Japanese transacting firms (parts suppliers and automakers) make greater asset-specific investments than their U.S. counterparts and that these investments are correlated with superior performance. These results are not particularly surprising since various studies have suggested that Japanese suppliers and final assemblers have close relationships and they are often part of a “keiretsu” group (Asanuma, 1989; Nishiguchi, 1994). However, it is particularly intriguing to find that Japanese transacting firms incur significantly lower transaction costs than their US counterparts, even though they have made greater asset-specific investments. These findings are important because they suggest that firms can simultaneously achieve the dual benefits of high asset specificity and low transaction costs – a condition that could be an important source of competitive advantage. Understanding how such a situation is achieved may provide important insights into effective inter-firm collaboration.

Buying firms take a variety of efforts to improve their suppliers' performance and capabilities. These efforts can be classified into the following categories.

Asset specificity represents transaction-specific investments in the supplier by the buying firm (Williamson, 1985; Krause, 1999). It is the most important and central part of transaction-specific supplier development, which includes a buyer's direct investments in human or physical assets that are dedicated to a particular supplier. Examples include (1) a buyer's direct investment in assets specialized to the buyer and supplier's exchange (e.g., customized equipment and tools), and (2) a buyer's investments in training suppliers with transaction-specific know-how or providing technical support personnel to suppliers (Joshi and Stump, 1999; Donk and Vaart, 2005). Dyer (1996) noted that relation-specific investments could make suppliers more willing to make customized items for their customers, allow both parties to communicate more efficiently, shorten product development cycles, and reduce procurement costs.

Joint action represents in-depth cooperation between buyers and suppliers on certain activities that are important for improving the performance of both parties (Joshi and Stump, 1999). For example, buyers may participate in the management of suppliers' operations, and suppliers may assist buyers in product development (Lin et al., 2005). As the extent and scope of joint activities increase, both the buyer and supplier firms move towards closer relationships (Heide and John, 1990).

Performance expectation represents buyers' expectation of suppliers' performance improvement (Krause, 1999). Lascelles and Dale (1989) indicated that increasing supplier performance goals is an efficient way to motivate suppliers. In addition, rewards for suppliers' improvement are a stimulating vehicle that offers market-based incentives to suppliers based on their performance. These are designed to induce suppliers to improve their performance based on their desire for increased business with the buying firm.

Trust too is an important factor. Transaction-specific investments will increase a buyer's dependence on the particular trading relationship with its suppliers, and expose it to greater risk and uncertainty (Krause, 1999; Fynes et al., 2005). Therefore, according to the transaction cost theoretic perspective (Williamson, 1985), buyers must safeguard against the hazards of opportunism of their suppliers. Usually, contracts are viewed as the primary formal means of safeguarding transactions (Dyer, 1996). However, trust has been argued as a more effective and less costly means for safeguarding specialized investments (Hill, 1995). Furthermore, Joshi and Stump (1999) suggested that the buyer's trust in the supplier should enhance the effect of buyer asset specificity on joint action in buyer-supplier relations.

As shown in Figure 1, a model that links supplier development efforts to buyer competitive advantage is proposed and investigated in this research. The model is developed based on the above theoretical expositions of various supplier development efforts and their possible links to buyer competitive advantage. In essence, the model is founded upon the belief that supplier development is a key component in determining the buyer firm's competitive success (Hahn et al., 1990; Monczka et al., 1993; Hartley and Choi, 1996). The model posits that each of the supplier development efforts yields competitive advantage improvement to the buyer firm (Wagner et al., 2005). The following hypotheses are formulated from the model.

H1: Asset specificity is directly related to operational effectiveness and market responsiveness.

H2: Joint action is directly related to operational effectiveness and market responsiveness.

H3: Performance expectation is directly related to operational effectiveness and market responsiveness.

H4: Trust is directly related to operational effectiveness and market responsiveness.

H5: Operational effectiveness is directly related to market responsiveness.

3. Methodology

3.1 The survey

The survey methodology was used to gather data and test the research hypotheses. The survey instrument was developed based on an extensive review of the literature. The review examined the literature in the areas of supplier development, buyer-supplier relationships, and transaction cost economics. In addition, the literature in the areas of partnership and strategic alliance was examined for identifying other constructs pertinent to this study.

The survey included multiple scale items for each of the research constructs. The survey instrument was pre-tested with three purchasing executives, one from each of three electronics manufacturing companies that participated in the pilot study. They were invited to review the questionnaire to ensure readability, eliminate ambiguity, make sure that closed-ended questions had a complete array of possible responses, and identify any other concerns that came to their attention. The questionnaire was also critiqued by two academics with expertise in purchasing and supply, who were invited to review the survey items for ambiguity and clarity, and to evaluate whether individual items appeared to be appropriate measures for their respective constructs. Minor modifications were made to the research instru-

ment based on the comments from these two sources. The finalized questionnaire was then used for conducting the survey.

3.2 Measures

Asset specificity: Four items were selected as indicators of this construct. These include: “provide this supplier with training in statistical process control (Galt and Dale, 1991)”; “assign support personnel to this supplier’s facilities (Newman and Rhee, 1990)”; “provide this supplier with capital for new investments at their facilities”; and “provide this supplier with equipment or tools for process improvement (Galt and Dale, 1991)”.

Joint action: Two items were chosen as indicators of joint action. These include: “collaborate with this supplier in eliminating non-value added activities existing in their processes (Hahn et al., 1990)”; and “involve the supplier in the buyer’s product design and development (Watts and Hahn, 1993)”.

Performance expectation: The indicators of performance expectation include: “increase supplier performance goals (Monczka et al., 1993)”; and “recognize supplier progress in the form of awards (Galt and Dale, 1991)”.

Trust: The indicators of trust include: “we believe the information provided by the supplier”; “the supplier is concerned that our business succeeds”; and “the supplier keeps our interests in mind (Doney and Cannon, 1997)”.

Operational effectiveness: Low cost and high quality are important elements of manufacturing-based competitive advantage (Hayes and Wheelwright, 1984). Researchers (Hayes and Wheelwright, 1984; Porter, 1985; Brooks, 1998; Li et al., 2006) generally believe that the objective of operations management is to produce better products or services at as low a cost as possible. Therefore, better quality and lower cost are important indicators of operational effectiveness in the current study. The items of operational effectiveness include:

"the supplier development effort has helped reduce our product cost"; and "the supplier development effort has helped improve our product quality".

Market responsiveness: The literature suggests that market responsiveness is another important competitive advantage with which manufacturers can compete effectively in the face of intensified competition (Porter, 1980, 1985; Nidumolu and Knotts, 1998; Lai, 2003). Market responsiveness was also found as the second important core competence in the minds of top managers in a survey conducted by Harmsen (2000). Two items were chosen as indicators of market responsiveness in the current study, which include: "our products can be produced faster than before, due to improved supplier quality"; and "our capability of responding to changes in the market has been improved".

3.3 Sample

According to the local Census and Statistics Department, there are approximately 1,000 establishments engaged in electronics manufacturing in Hong Kong. These companies constitute the population of our survey. Four hundred and fifty questionnaires were sent by mail or by fax to the purchasing managers of the companies randomly selected from the *Directory of Electronics Industry in Hong Kong* (Hong Kong Electronics Association, 2001). A total of 147 completed questionnaires were returned, out of which 142 were usable responses, yielding a 31.5% response rate.

As shown in Table 1, the participating companies varied widely in terms of gross annual sales and number of employees. The number of employees ranged from under 50 to over 3,000. Nearly 48% of the respondent firms had gross annual sales of US$100 million or more. Approximately 60% of the respondent firms had less than 100 suppliers in their supplier base, and 57% of the respondents' firms had obtained ISO 9000 certification.

Table 1 about here

4. Analysis and Results

We developed our research model based on the sample of 142 firms collected from the Hong Kong electronics industry. Table 2 provides the basic and descriptive statistical information about the original data.

4.1 Measurement Model

The measurement model specifies the linkages between the observed variables and the underlying theoretical factors (latent constructs), which are presumed to determine the responses to the observed variables (Anderson and Gerbing, 1982). In the present study, the four efforts of supplier development, namely asset specificity, joint action, performance expectation and trust, are exogenous latent constructs, which serve as independent variables in the measurement model for exogenous constructs. This measurement model is illustrated in Figure 2. Similarly, operational effectiveness and market responsiveness constitute the endogenous latent constructs, which serve as dependent variables to the endogenous constructs in the measurement model. This measurement model is illustrated in Figure 3.

Confirmatory factor analysis (CFA) was used to assess the exogenous and endogenous measurement models, respectively. The results are presented in Tables 2 and 3. Both the absolute and comparative goodness of fit indices are shown in Tables 2 and 3. It can be noted that the Chi-square statistics of all the models were insignificant, the GFI values were well above 0.9, and the RMSR values were below 0.1, suggesting a good fit between the implied covariance in the model and the observed covariance from the data. In addition, the comparative fit indices were well above the general criteria, providing evidence against the

hypothesis of being a null model. All these measures suggest that the models have a satisfactory model fit, implying that the selected indicators are a good representation of their corresponding underlying constructs.

Table 2 about here

Table 4 about here

4.2 Convergent and discriminant validity

Establishing the validity component of a measure involves two elements: convergent validity and discriminant validity (Campbell and Fiske, 1959). Measures that lack convergent and discriminant validity can cause problems in the interpretation of a study's results (O'Leary-Kelly and Vokurka, 1998). Convergent validity relates to the degree to which multiple methods of measuring a variable provide the same results (Churchill, 1979). The assumption is that if a measure is valid, it should yield the same results when utilized across different methods. Discriminant validity is the degree to which measures of different latent variables are unique (Devellis, 1991). That is, in order for a measure to be valid, the variance in the measure should reflect only the variance attributable to its intended latent variable and not to other latent variables.

Generally, convergent validity can be assessed from the measurement model by testing whether the reliability value (loading) of each individual indicator is above 0.50 with a significant t-value ($t > 2.0$) (Chau, 1997; Yeung, 1999). For the current study, all of the loadings of the indicators were higher than 0.50, except for one with a value of 0.489. Since this was reasonably close to 0.50, it was taken as acceptable. The t-values of the indicators were all above 2.0. These imply that the relationships between the indicators and the constructs are statistically significant, and provide satisfactory evidence of convergent

validity for these sets of indicators. Tables 4 and 5 show the reliability values of all the indicators.

Table 5 about here

Table 6 about here

High inter-factor correlations, especially as they approach 1.0, suggest that the two sets of items are measuring the same construct. Thus, discriminant validity is concerned with the extent to which questionnaire items load on only one construct (Develliis, 1991). Table 5 shows the correlations among the exogenous and endogenous constructs in the current research. Most of the correlations among the constructs were reasonably low, with the largest value being 0.671. According to Krause (1999), a correlation value of less than 0.7 indicates that discriminant validity is achieved between the constructs. Hence, discriminant validity is deemed acceptable in the current study.

Table 7 is about here

4.3. Development of the structural model

Model development strategy is an approach to structural modeling that employs model respecification as a theoretically driven method for improving a tentatively specified model (Chin and Todd, 1995; Hair et al., 1995). Generally, a single structural model is established and assessed statistically for its fit to the observed data (Hair et al., 1995; Kelloway, 1998). If the model does not fit well, researchers may modify it based on the SEM indices

obtained and subsequently retest the revised model. However, as modifications are often carried out in an exploratory or 'trial and error' manner, the final model is sometimes incorrect, in the sense that it has a good model fit but is invalid in representing a "true theory" (Chin and Todd, 1995; Baumgarner and Homburg, 1996). Chin (1995) warned that researchers should avoid the pitfall of slipping into an exploratory mode, where the final results may be unduly influenced by the vagaries of the data at hand.

SEM analysis works best in a confirmatory mode (Chin and Todd, 1995). Instead of modifying the proposed model according to modification indices, a few competing and alternative models can be proposed in an attempt to find out a best-fitting model. In SEM several models can be found to have an acceptable fit and the objective of the researcher is to determine the best fit among the nested models. Nested models have the same constructs as a general model but with fewer estimated relationships (Hair et al., 1995). A nested relationship exists between two models if one can obtain a good model fit with a fewer number of free parameters by constraining more parameters in the model (Kelloway, 1998). This idea is similar to the notion of model parsimony, which refers to the number of estimated coefficients or parameters required to achieve a specific level of fit. Blentler and Chou (1987) pointed out that in the ideal situation, a researcher has a series of submodels that shed light on the key features of the large model and these models are compared. If the goodness of fit measures of the more restricted model are comparable to those of the general model, the restrictions are accepted. Hence, a simpler model is preferred as it is more representative of the theory.

As indicated previously, the literature on suppler development has suggested that various supplier development efforts, i.e., asset specificity, joint action, performance expectation, and trust in suppliers, have significant influences on buyer competitive advantage, especially on operational effectiveness and market responsiveness. Therefore, four

competing structural models (Models A – D) that postulate the relationships between the four exogenous constructs and the two endogenous constructs were proposed, which are shown in Figure 4 to Figure 7. These four models were applied with different constraints on the parameters and tested by Analysis of Moment Structure (AMOS), respectively.

As presented in Figure 4, Model A is a nested model of the general model shown in Figure 1. Model A hypothesizes that asset specificity and trust have direct influence on operational effectiveness and market responsiveness. However, joint action and performance expectation are hypothesized to have no direct effects on market responsiveness (indicated by the dashed lines in Figure 4). In other words, joint action and performance expectation influence buyer competitive advantage only by improving operational effectiveness. This is in line with the emphasis in traditional supplier development literature of the role of joint action in reducing cost and improving quality (Burt et al., 2003), while it may not directly enhance responsiveness to market changes. This is because joint action involves mainly technical analyses such as quality assurances and value engineering. Model B is a nested model of Model A (see Figure 5), which further postulates that asset specificity has no direct effect on operational effectiveness. Although Dyer (1996) found that Japanese manufacturers experience both quality and cost benefits even though they have made greater asset-specific investments, it may not be the case in a Chinese operating context (Humphreys et al., 2004) and it is not entirely in line with the premise of TCE (other constraints on the parameters of Model B remain the same as those in Model A). Model C is a nested model of Model B. As shown in Figure 6, it is further hypothesized that trust has no direct impact on market responsiveness while the other constraints on the parameters remain the same as Model B. This is more in line with the teaching of traditional management literature that stresses the relationship between trust and operational effectiveness (e.g., Deming, 1986). It can be noted that both the constraints of Model A and Model B are imposed in Model C. Model D, as

shown in Figure 7, is a nested model of Model C, in which it is further hypothesized that trust has no direct impact on operational effectiveness. The objective here is to test whether trust, the 'soft' element in supplier development, is really related to operational effectiveness, in addition to the 'hard' elements of joint action and raising performance expectation. It can be seen that Model D is the most parsimonious model among the four proposed competing structural models.

4.4 Results of analysis of the structural models

The results of analysis of the four competing structural models are shown in Table 7. It can be seen that the goodness of fit indices of Models A – C meet the general criteria for both the absolute fit measures and comparative fit measures for SEM analysis. The χ^2 values were insignificant, implying sufficient evidence for model fit. The RMSR values were well below 0.1, indicating a low discrepancy between the implied covariance in each model and the observed covariance in the data. However, Model D is a poor fit model with the GFI, AGFI and NFI values all less than the suggested criteria for these indices, 0.90. Therefore, Model D was rejected even though it is the most parsimonious model.

The figures in Table 7 suggest that Models A, B and C all have acceptable goodness of fit indices. Although Model C is the most restricted model as compared to Models A and B, its χ^2 value increases insignificantly by 1.143 (change in χ^2 = 93.751 – 92.608 = 1.143). With a change in one degree of freedom, the χ^2 statistic is significant at the 0.01 level only if the χ^2 statistic increases by 6.635 or more. A more parsimonious model is always preferred if the χ^2 statistic does not increase significantly with the increase in the degrees of freedom. After comparison, it is concluded that Model C has good absolute fit and comparative fit, which are better than Model A, and as good as Model B. At the same time, Model C has better PNFI and PGFI values when compared with the other two models. In addition, all the

paths in Model C are significant as the t-values were greater than 2.0 as shown in Table 8. All these measured parameters suggest that Model C has a good representation of the 'true theory' and represents the most parsimonious good-fit model.

4.5 Interpretations of the structural model

The relationships among the various constructs in the final structural model are shown in Figure 8. The standardized regression weights and t-values are shown in Table 8. It can be seen that joint action and trust are positively and directly associated with operational effectiveness; however, performance expectation is negatively and directly associated with operational effectiveness. In addition, asset specificity is positively and directly associated with market responsiveness. This final model conveys several important messages regarding the impacts of various supplier development efforts on different dimensions of buyer competitive advantage, i.e., operational effectiveness and market responsiveness, and these will be discussed in the following section.

5. Discussion

This study tested four structural models of the impacts of specific supplier development efforts on buyer competitive advantage. Among the four competing structural models, the final model was selected since it is the most parsimonious good-fit model and it is believed to be representative of the real situation. This model provides important information that helps our understanding of the effects of asset specificity, joint action, performance expectation, and trust, on operational effectiveness and market responsiveness. At the same time, as shown in Figure 8, it also provides information about the relationships between the two dependent variables that represent performance improvement, namely market responsiveness and operational effectiveness. Since the current research focuses on

examining the relationships between supplier development efforts, trust and buyer competitive advantage, the relationship between operational effectiveness and market responsiveness will not be discussed in detail in this paper.

5.1 Relationship between asset specificity and market responsiveness

The ability to develop new products quickly and respond to market change rapidly is an important source of competitive advantage in many industries (Stalk and Hout, 1990; Li et al., 2006). The final structural model suggests that asset specificity has a direct and positive impact on market responsiveness. This finding is supported by the work of Dyer (1996), who examined the automotive industry and concluded that inter-firm asset specialization facilitates the ability of automakers to develop new models rapidly.

Williamson (1985) argued that a supplier who wins an initial contract will have an advantage in the next stage due to "learning, including the acquisition of undisclosed or proprietary technical and managerial procedures and task-specific labor skills". The acquisition of such knowledge allows the initial supplier to subsequently perform tasks more quickly than a new supplier, who must come up to speed and develop the requisite know-how. Further, a high level of inter-firm human asset specificity translates into knowledge of who knows what, who can help with what problem, or who can exploit new information. It includes awareness of where useful expertise resides within the two firms engaged in the exchange. In particular, when supplier and buyer engineers develop relation-specific know-how and have substantial experience working together, they are less likely to misread blueprints or misinterpret information (Nishiguchi, 1994). As asset specificity increases, the feedback loop becomes more efficient. Fewer communication errors will lead to more effective feedback, which in turn will result in faster product development and market responsiveness (Buvik and Gronhaug, 2000). Cohen and Levinthal (1990) supported this

viewpoint and indicated that asset specificity increases the absorptive capacity of the supplier-manufacturer dyad, thereby increasing the ability of both parties to learn from prior experience. Overall, asset specificity is able to increase the speed with which organizations can solve problems associated with new product development and market responsiveness. Consequently, asset specificity should facilitate a manufacturer's ability to respond to market change.

5.2 Relationship between joint action and operational effectiveness

The final structural model suggests that joint action has a direct and positive impact on operational effectiveness. This result is entirely reasonable since it has been suggested by many researchers that effective collaboration between functions, and between customers and suppliers, is a key way to enhance product quality and decrease operation cost (Womack et al., 1990; Dean and Bowen, 1994; Liker and Choi, 2004).

Providing higher quality products at as a low a cost as possible can be considered the ultimate objective of operations management (Hayes and Wheelwright, 1984; Brooks, 1998). Therefore, increasing operational effectiveness lies in pursuing ways to enhance product quality and reduce cost at the same time. Previous studies have indicated that effective coordination in design and manufacturing can enhance quality (Clark and Fujimoto, 1991; Burt et al., 2003). As suppliers take on more responsibility for key components within the final product, the ability to reduce variations and to increase the reliability of the product is expected to correlate strongly with the ability of manufacturers to coordinate design and manufacturing effectively with suppliers. In addition, a closer relationship between the buyer and the supplier makes it possible for the buyer, on the one hand, to involve the supplier in eliminating non-value added activities existing in their processes, and, on the other hand, to establish just-in-time delivery systems between the two parties (Kulmala, Paranko and Uusi-

Rauva, 2002). This combination of factors can lead to benefits for both parties in terms of economizing on operation cost, such as inventory holding and transportation costs (Dyer, 1996).

More evidence of the direct and positive relation between joint action and operational effectiveness is obtained from studies on Japanese firms (Westney and Sakakibara, 1986; Clark and Fujimoto, 1991). Researchers have found that close linkages between design and manufacturing (both internally and with suppliers) are important reasons for the success of Japanese firms in developing high quality and low cost products.

5.3 Relationship between trust and operational effectiveness

The final structural model also suggests that trust in suppliers has a direct and positive impact on operational effectiveness. This result is consistent with previous studies on the nature of trust in buyer-supplier relationships (Dwyer al., 1987; Noordewier et al., 1990; Morgan and Hunt, 1994; Doney and Cannon, 1997; Scannell et al., 2000). As indicated in the previous sections, trust is a more effective and less costly means for safeguarding specialized investments (Hill, 1995). Trust in a supplier can reduce conflict and enhance channel member satisfaction (Anderson and Narus, 1990; Narasimhan and Nair, 2005).

At a fundamental level, suppliers persuade buyers to purchase their firm's products. However, when buyers actively seek more collaborative relationships with suppliers, the latter perform an important function in facilitating and developing customer trust (Swan and Nolan, 1985). Research has shown that information provided by a trusted party is used more, and thus provides greater value to the recipient (Moorman et al., 1992). The reason that trusted suppliers and manufacturers are able, for example, to improve quality lies in the belief that they recognize the value of shared information between the two parties, and they are able to assimilate it and apply it in more efficient ways (Cohen and Levinthal, 1990). The more

transacting firms share information about the factors that influence quality (i.e., learn from prior cumulative experience), higher quality can be expected to achieve (Dyer, 1996).

It has been suggested that collaborative relationships rely on relational forms of exchange characterized by high levels of trust (Dwyer et al., 1987; Morgan and Hunt, 1994; Narasimhan and Nair, 2005). The high levels of trust characteristic of relational exchange enable parties to focus on the long-term benefits of the relationship (Ganesan, 1994), ultimately enhancing competitiveness and reducing transaction costs (Noordewier et al., 1990; Doney and Cannon, 1997).

5.4 Relationship between performance expectation and operational effectiveness

The final structural model suggests that performance expectation has a direct and negative impact on operational effectiveness. This result is unexpected since as indicated in previous sections, increasing supplier performance goals and rewarding supplier improvement have been recognized as efficient ways to motivate suppliers to enhance performance (Lascelles and Dale, 1989; Krause, 1997, 1999; Li et al., 2006).

Monczka et al. (1993) argued that buying firms should challenge suppliers to achieve higher levels of performance. Only by aggressively increasing supplier performance expectation can a buying firm expect supplier contributions to increase at an accelerated rate. Moreover, only those suppliers that meet these goals should be kept in the supplier base (Krause, 1997). Lascelles and Dale (1989) also noted that supplier improvement should be recognized by buyers through offering improvement rewards, such as future contracts or long-term contracts.

The inconsistent results in the current study may be due to the peculiar situation of Hong Kong's electronics industry, in which the majority of the manufacturers are OEM companies. Generally, the OEM form of contract for suppliers is typically of short-term duration and relies on the flexibility of suppliers to respond to market needs. In addition,

OEM manufacturers themselves are not sure of obtaining future work from their customers. Consequently, this makes it difficult for OEM manufacturers to reward their suppliers who achieve improvement by guaranteeing long-term contracts or even future contracts. For example, a purchasing professional from a Hong Kong electronics company lamented that the customers are becoming too demanding for both high quality and low cost. However, they are not willing to invest too much in a particular customer. This indicates that too stringent performance objectives without long-term commitments will only frustrate suppliers and weaken their confidence in improving their performance. Therefore, when buying firms want to increase supplier performance by raising their performance expectation, they should be cautious and should make sure that their expectations are realistic and attainable by their suppliers, especially when long-term contracts cannot be guaranteed.

6. Conclusions

Through developing a series of competing models for structural analysis, this paper investigated the impacts of specific efforts of supplier development on buyer competitive advantage in detail. The results suggest that each supplier development effort has a different effect on different dimensions of buyer competitive advantage. The findings also suggest that supplier development should be undertaken in consideration of the needs for, and the benefits to be expected benefits from, the development efforts.

The findings of this study confirm the general positive impact of supplier development efforts on buyer-supplier performance improvement. Our study indicates that joint actions and trust are the two most critical factors in supplier development to enhance competitive performance of the buyer. Accordingly, organizations pursuing supplier development should work closely with their suppliers on product design and to eliminate non-value added activities. A high level of trust cultivates a long-term beneficial relationship

between a buyer and a supplier, and reduces transaction costs between them. In addition, we also found that asset specific investments such as providing training, equipment and supporting personnel help achieve market responsiveness, although such their impact is relatively weaker. However, increasing supplier performance goals and recognizing their efforts does not seem to be an effective way to improve the performance of buyers and should be practised with caution. Given the resource implications associated with developing suppliers, this study provides useful insights and challenges from both an academic and practical perspective.

However, the current research, like any other study, has several limitations. First, although focusing on one industry can control extraneous variations and create more accurate, context-specific measures, future research could establish the nature of supplier development activities in other industrial settings, particularly those areas that are important to the economic development of Hong Kong. This will provide a better understanding of how the variables that influence supplier development involvement and buyer-supplier performance are affected in different industry contexts.

Second, the current research used the same set of data to develop measures, and test the path models and structural models developed in this study. Although using the same data set to develop measures and test models is a common practice in empirical research, using a new set of data to test the relationships among the factors in the final model would enhance the validity of the final model. In other words, further studies involving the collection of additional data would provide further support to validate the proposed model.

Third, theory development would be enhanced by multiple research methods such as surveys, experiments, and qualitative studies. A multi-method approach within a consistent framework could provide a mechanism for knowledge accumulation, research convergence, and better prediction. For example, while surveys are valuable in developing the framework

of the links between supplier development and buyer competitive, case studies would be useful for further understanding the intensity, duration, frequency, and effectiveness of the various supplier development strategies and their related benefits.

Acknowledgement

This study was supported in part by The Hong Kong Polytechnic University under grant number A636 from the *Area of Strategic Development in China Business Services*.

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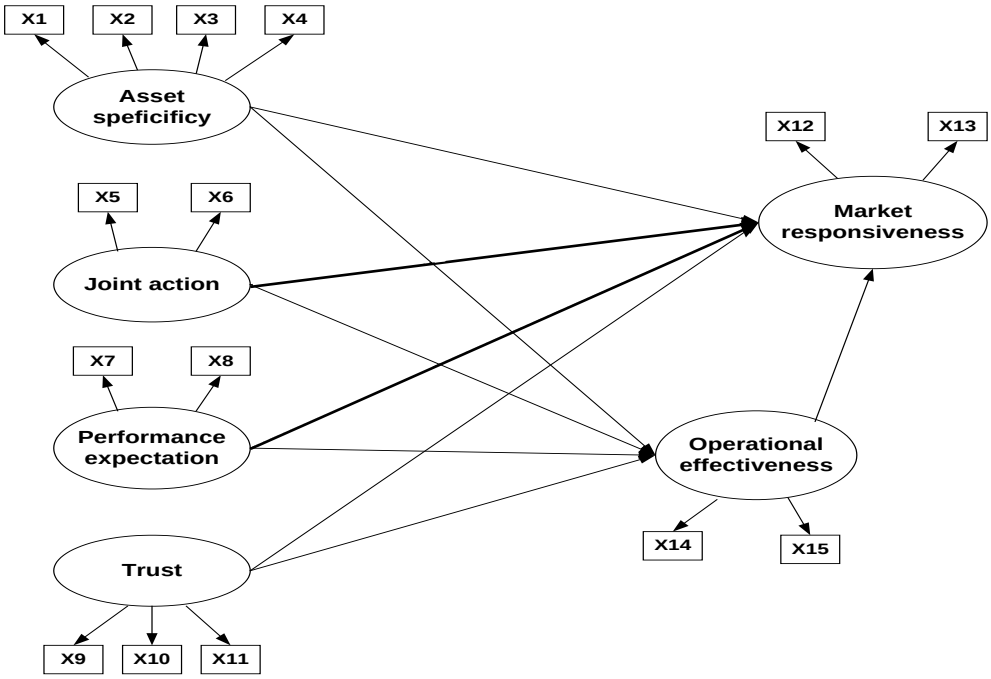

Figure 1. The proposed model of linking supplier development to buyer competitive advantage

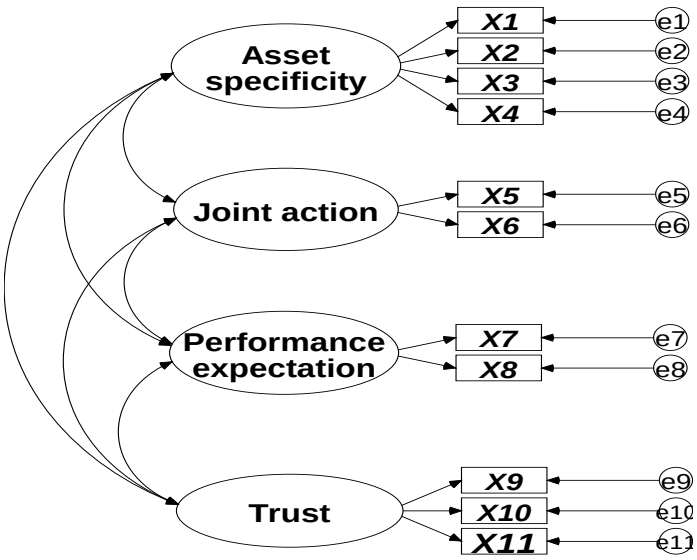

Figure 2. The measurement model for exogenous constructs

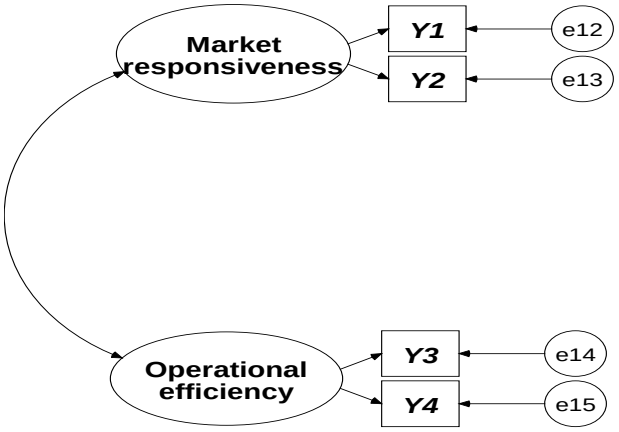

Figure 3. The measurement model for endogenous constructs

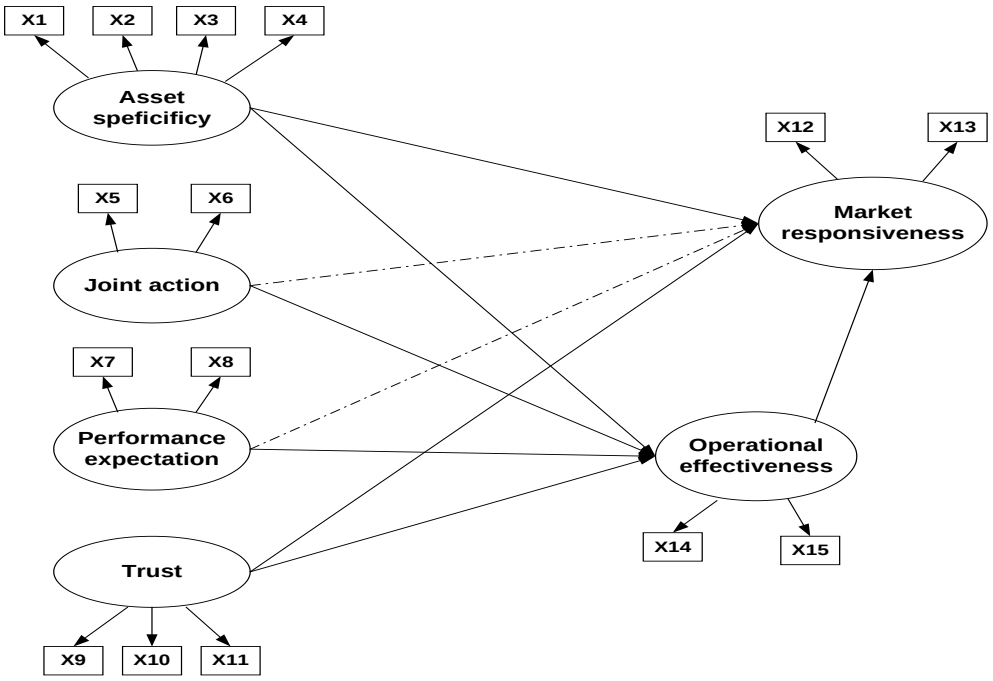

Figure 4. Structural model A

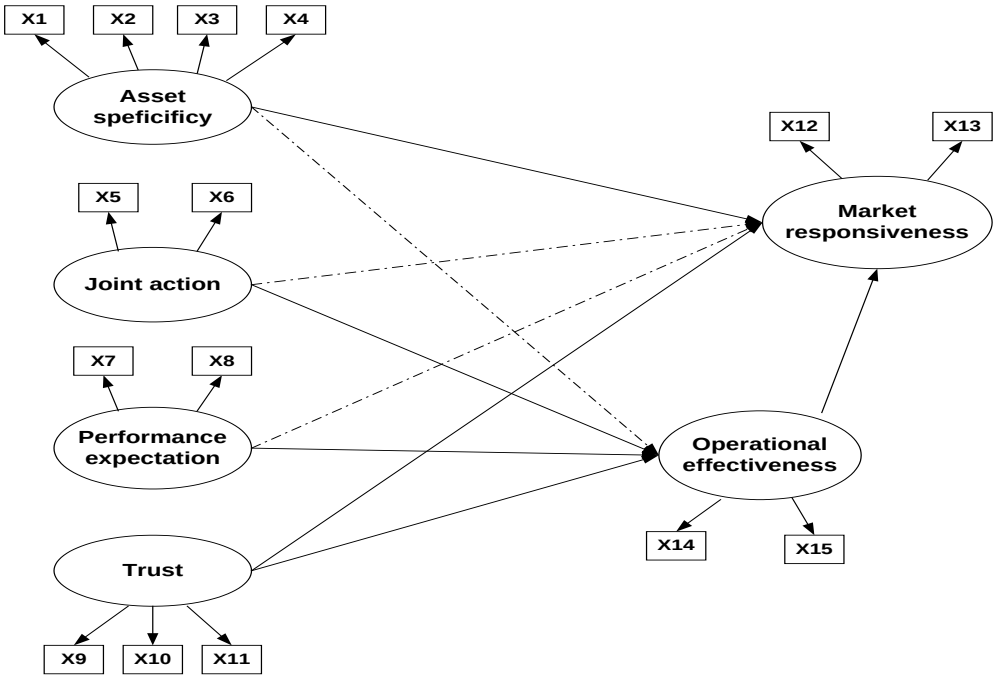

Figure 5. Structural model B

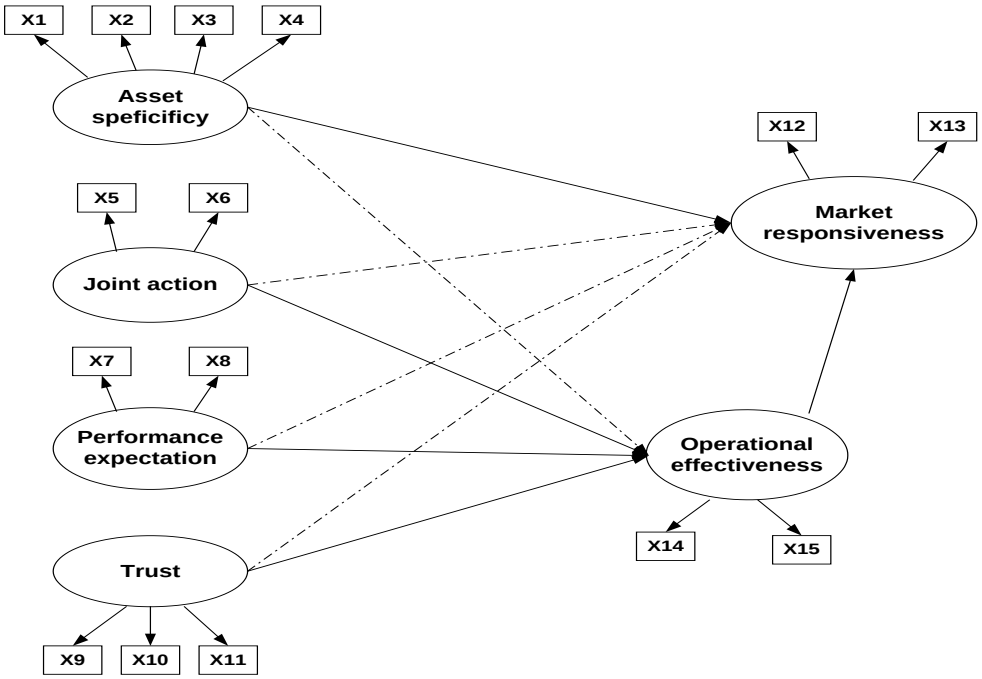

Figure 6. Structural model C

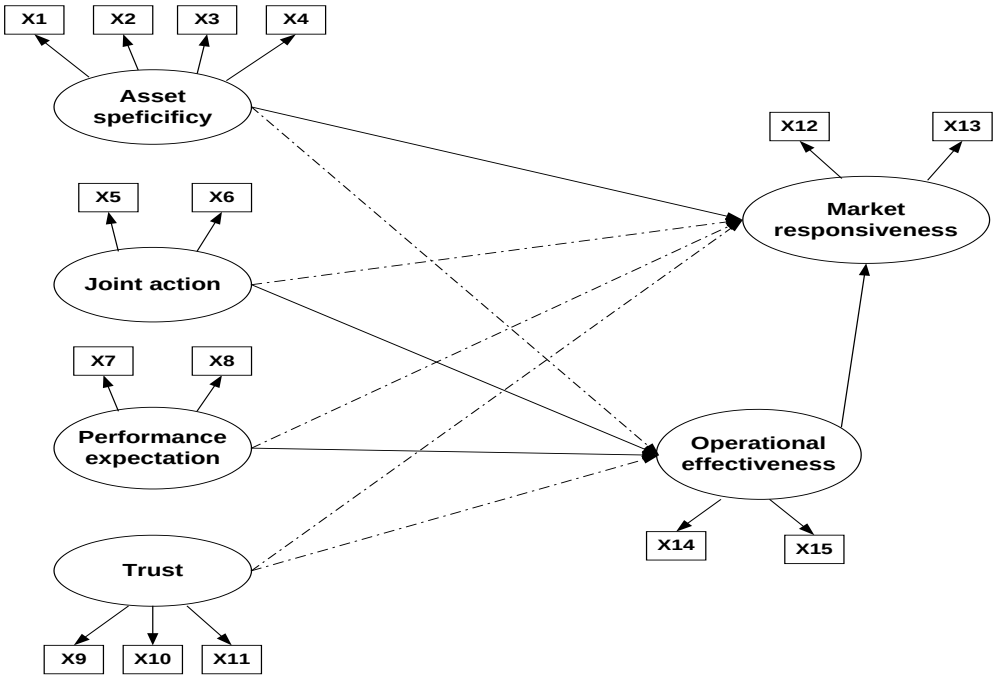

Figure 7. Structural model D

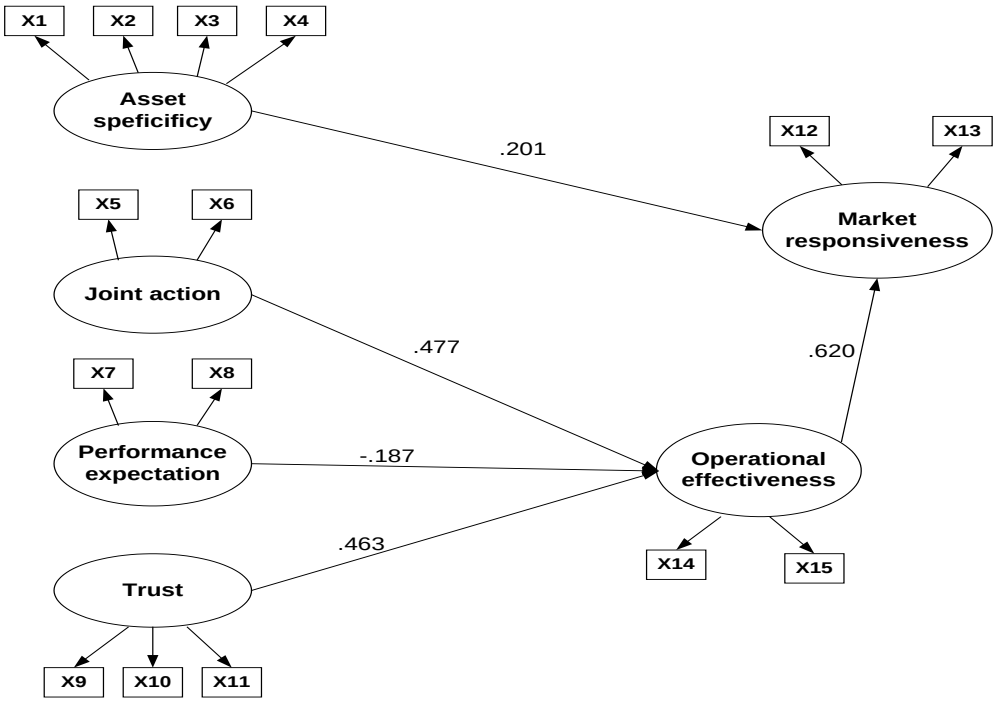

Figure 8. The final structural model

Characteristic	*Frequency*	*Per cent of sample*
Gross Annual Sales (US$)		
< $10M	26	18.3
$10-100M	48	33.8
$100-500M	41	28.9
$500-1,000M	20	14.1
> $1billion	7	4.9
Number of Employees		
<50	39	27.5
51-200	22	15.5
201-500	19	13.4
501-1,000	22	15.5
>1,000	40	27.9

Table 1. Selected characteristics of the sample

Indicator	Mean	Std. Deviation	Min.	Max.
Asset specificity				
Provide training	3.67	1.605	1	7
Provide support personnel	2.97	1.650	1	7
Provide equipment or tools	2.21	1.477	1	7
Provide capital for new investments	4.28	1.522	1	7
Joint action				
Eliminate non-value activities	1.34	1.602	1	7
Supplier participates in buyer product design	3.33	1.721	1	7
Performance expectation				
Increase supplier performance goals	4.85	1.347	1	7
Recognize supplier progress	3.28	1.656	1	7
Trust				
Believe the information provided by the supplier	5.24	.807	3	7
The supplier is concerned that our business succeeds	5.15	.922	2	7
The supplier keeps our interests in mind	5.11	.980	2	7
Market responsiveness				
The products can be produced faster	4.99	1.255	1	7
Responsiveness in the market has been improved.	4.70	1.259	1	7
Operational effectiveness				
Have helped to reduce product cost	5.11	1.130	2	7
Have helped to improve product quality	5.26	1.083	2	7

Table 2. Basic and descriptive statistical information about the original data

Goodness of fit measure	Criterion	Measurement model for exogenous constructs
Chi-square (χ^2)		46.567
Level of significance of Chi-square (P)	$P \geq .05$	.160
Chi-square/degree of freedom (χ^2/df)	≤ 3.0	1.225 (df = 38)
Goodness of fit Index (GFI)	$\geq .90$	.944
Adjusted Goodness of fit Index (AGFI)	$\geq .80$	.903
Normed Fit Index (NFI)	$\geq .90$	.928
Comparative Fit Index (CFI)	$\geq .90$	.986
Root Mean Square Residual (RMSR)	$\leq .10$	.009

Table 4. The goodness of fit indices for the measurement model of exogenous constructs

Goodness of fit measure	Criterion	Measurement model for endogenous constructs
Chi-square (χ^2)		1.563
Level of significance of Chi-square (P)	P ≥ .05	.211
Chi-square/degree of freedom (χ^2/df)	≤ 3.0	1.563 (df = 1)
Goodness of fit Index (GFI)	≥ .90	.995
Adjusted Goodness of fit Index (AGFI)	≥ .80	.945
Normed Fit Index (NFI)	≥ .90	.993
Comparative Fit Index (CFI)	≥ .90	.998
Root Mean Square Residual (RMSR)	≤ .10	.004

Table 4. The goodness of fit indices for the measurement model of endogenous constructs

Indicator	Loading	Loading	Loading	Loading
Asset specificity				
Provide training	.767			
Provide support personnel	.805			
Provide equipment or tools	.770			
Provide capital for new investments	.690			
Joint action				
Eliminate non-value activities		.790		
Supplier participates in buyer product design		.622		
Performance expectation				
Increase supplier performance goals			.489	
Recognize supplier progress			.631	
Trust				
Believe the information provided by the supplier				.820
The supplier is concerned that our business succeeds				.816
The supplier keeps our interests in mind				.689

Table 5. The reliability values for the measurement model of endogenous constructs

Indicator	Loading	Loading
Market responsiveness		
The products can be produced faster	.907	
Responsiveness in the market has been improved.	.740	
Operational effectiveness		
Have helped to reduce product cost		.909
Have helped to improve product quality		.796

Table 6. The reliability values for the measurement model of endogenous constructs

Construct	1	2	3	4	5	6
1. Asset specificity	1.000					
2. Joint action	.589	1.000				
3. Performance expectation	.517	.671	1.000			
4. Trust	-.026	.117	.239	1.000		
5. Market responsiveness	.177	.390	.453	.318	1.000	
6. Operational effectiveness	.123	.284	.328	.352	.563	1.000

Table 7. Correlations between constructs as output from CFA

Goodness of fit measure	Criterion	Model A	Model B	Model C	Model D
Absolute fit measurements					
Chi-square (χ^2)		91.508	92.608	93.751	143.153
Degrees of freedom (*df*)		77	78	79	80
Level of significance of Chi-square	P ≥ .05	.124	.124	.123	.001
Chi-square/degree of freedom (χ^2/df)	≤ 3.0	1.188	1.187	1.187	1.789
Goodness of fit Index (GFI)	≥ .90	.921	.920	.920	.881
Root Mean Square Residual (RMSR)	≤ .10	.011	.012	.013	.031
Absolute fit measure					
Normed Fit Index (NFI)	≥ .90	.906	.905	.903	.853
Comparative Fit Index (CFI)	≥ .90	.983	.983	.983	.928
Adjusted Goodness of fit Index (AGFI)	≥ .80	.877	.878	.879	.823
Parsimonious fit measure					
Parsimony Normed Fit Index (PNFI)		.664	.672	.680	.658
Parsimony Goodness of Fit Index (PGFI)		.591	.598	.606	.595

Table 7. The goodness of fit measures of competing structural models

Dependent variable	Independent variable	Standardized regression weight	t-value
Market responsiveness	Asset specificity	.201	2.362
	Operational effectiveness	.620	6.471
Operational effectiveness	Joint action	.477	3.498
	Performance expectation	-.187	-2.069
	Trust	.463	3.486

Table 8. The regression weights and t-values of the final structural model