

Identification of factors affecting continuity of cooperative electronic supply chain relationships: empirical case of the Taiwanese motor industry

Ying-Pin Yeh

National Chiao-Tung University, Hsin chu, Taiwan

Abstract

Purpose – To explore the factors affecting continuity of cooperative electronic supply chain relationships in Taiwanese motor industry.

Design/methodology/approach – This study has developed a research framework that integrates the three perspectives of resource dependence, risk perception, and relationship marketing to identify the factors affecting the continuity of a cooperative electronic supply chain. After constructing a structural equation model, empirical testing on 851 raw material and spare parts suppliers for the Taiwanese motor industry was conducted.

Findings – All path coefficients in the proposed model were statistically significant, and were as hypothesized. Resource dependence, trust, and relationship commitment are positively related to the continuity of the cooperative electronic relationship. Risk perception is negatively related to the continuity of the cooperative electronic relationship.

Research limitations/implications – This paper has theoretically developed an extensive set of interrelationships among these variables (resource dependency, perceived risk, trust, relationship commitment, and continuity of cooperative electronic relationships), illustrating their comparative effects on supplier intention to use the internet for on-line transactions.

Practical implications – This empirical study provides consistent support for the proposed business-to-business (B2B) e-commerce acceptance model. Given the high explanatory power of the resulting model, it is likely to serve as the basic model for predicting supplier behavior, and the continuity of enhanced understanding of cooperative electronic relationships.

Originality/value – Previous studies did not fully address the relevant influential factors related to the continuity of cooperative electronic supply chain relationships or the causal relationships among these factors. The primary contribution of this research is the integration of constructs associated with resources, environmental uncertainty, and relationship marketing, into a coherent model that jointly predicts supplier acceptance of e-commerce.

Keywords Supply chain management, Electronic commerce, Resource management, Risk management, Relationship marketing, Taiwan

Paper type Research paper

Introduction

The rapid development of the internet and e-commerce has seen the integration of business processes, fostered across supply chains, by facilitating the information flows necessary for coordinated business activity (Sebastian and Lambert, 2003). Zhao *et al.* (2002) found that the coordination of information sharing and ordering had a significant impact on supply chain performance, in terms of both total cost and

service level. Motor companies have fully utilized electronic tools and technology to integrate supply chain information systems. The necessary documents and data interchange format of these transactions are designed to exchange information via the internet. Presently, raw material and spare parts suppliers in the motor industry can provide merchandise to different motor companies simultaneously. Motor companies do not necessarily adopt the same electronic information systems, or assume a leading position in the supply chain. To maintain their business operations, these suppliers must establish numerous electronic information systems to cope with the demands of different motor companies, clearly resulting in an increased burden in terms of investment cost and system maintenance. In this situation, suppliers are likely concerned that they may lose some manufacturing orders if they do not use these various electronic systems; alternatively they still may fail to boost their performance, regardless of which electronic systems they implement. In order to generate added value, through the

The Emerald Research Register for this journal is available at www.emeraldinsight.com/researchregister

The current issue and full text archive of this journal is available at www.emeraldinsight.com/1359-8546.htm



Supply Chain Management: An International Journal
10/4 (2005) 327–335
© Emerald Group Publishing Limited [ISSN 1359-8546]
[DOI 10.1108/13598540510612802]

electronic supply chain system, motor companies must develop sound electronic systems; they cannot ignore supplier opinions and attitudes.

Reviewing the literature on cooperative relationships among enterprises reveals the existence of approximately three approaches, which include resource dependence, risk perception and relationship marketing. To enhance supply chain competitiveness, motor companies must gain the cooperation of suppliers, in order to successfully implement an electronic supply chain system. The degree of resource dependence between two partners will increase if both can establish a good interactive relationship (Ganesan, 1994; Kumar *et al.*, 1995). Both partners would also be more willing to invest in the substantial assets and human resources required to maintain and develop a cooperative relationship, if they can establish a good interactive relationship. Buckley and Casson (1988) noted that a cooperative relationship makes coordination effective, through mutual restraint. Through the mutual distribution of resources aimed at achieving ideal improvements in this coordinated relationship, both parties may be able to achieve a win-win result based on appropriate resource distribution. The above points are the key findings in past research on resource dependence. Besides these findings, after trust has been established between buyer and seller, mutual dependence, or a situation of control by one party, occurs. At this point, risk perception also will increase (Das and Teng, 2001). The development of cooperation between the two parties is influenced if the risk perceptions exceed the limit acceptable to either partner. These are key findings in the literature from risk perception studies. Additionally, the relationship marketing orientated approach has mainly explored cooperative relationships between vehicle companies and suppliers (Morgan and Hunt, 1994). Relationship marketing can involve communication, trust and relationship commitment. Sound communication across companies also facilitates increased satisfaction with mutual cooperation (Mohr *et al.*, 1996). Simpson and Mato (1997) identified trust as the reliability of an organization's members, and belief in their willingness to perform their duties. Mohr *et al.* (1996) considered relationship commitment to be the extent to which a firm's perception contributes to maintaining their cooperative relationships.

Prior literature has investigated the relationship between communication and trust (Anderson and Narus, 1990; Kumar, 1996; Sanzo *et al.*, 2003); the relationship between trust and cooperation (Ganesan, 1994; Carter and Jennings, 2002); the relationship between resource dependence and cooperation (Ganesan, 1994; Zaheer and Venkatraman, 1995); and the relationships among trust, relationship commitment and cooperation (Moore, 1998; Jonsson and Zineldin, 2003). These previous studies did not fully address the relevant influential factors related to the continuity of cooperative electronic supply chain relationships or the causal relationships among these factors. Suppliers would be willing to cooperate, by investing in the resource facilities and procedural reform involved in an electronic supply chain system, in hope of enhancing their competitive edge. Risk perception and relationship marketing affects cooperative electronic relationships. Integrating these related approaches can clarify the previously unexplainable parts.

This study has developed a research framework that integrates the three perspectives of resource dependence, risk perception and relationship marketing, in order to identify factors affecting the continuity of cooperative electronic supply chains. After constructing a structural equation model, we conducted empirical testing on the raw material and spare parts suppliers for the Taiwanese motor industry. All path coefficients in the proposed model were statistically significant and were as hypothesized. Finally, we present a discussion of the theoretical and managerial implications of these research findings.

The Taiwanese motor industry and electronic supply chain

In Taiwan the factories that manufacture cars and motorcycles have technical and capital partnerships with overseas companies. The technologies are mainly from Japan, because that's where most of the prototypes of the cars and motorcycle that are produced locally originate. Cars and motorcycles manufactured locally are sold under the brand name of the technical parent company, and Taiwan is the primary sales market. From the point of view of the technical parent company, in Taiwan their motors are exclusively manufactured by the Taiwanese motor manufacturing industry. Thousands of parts are needed to make a car or a motorcycle, and an automaker or a motorcycle-maker alone cannot produce all needed parts. Therefore, the motor industry adopts the business model of vertical division of labor by outsourcing first-tier spare parts manufacturing. In fact, with the mutual formation of a network involving several independent motor companies and hundreds of raw material and spare parts suppliers, each member of the network focuses on a particular activity. This system of intense industrial cooperation of the vertical division of labor is the driving force, and part of the production in each division of the motor industry. Whether the local parts sector will be locked into the production of standardized, low value-added parts, or will move up the value-added ladder, depends on its level of integration into the supply chain (Abrenica, 1998). Taiwanese motor companies coordinate production capacity with their distributors and dealers before they make up their yearly, seasonally, or monthly production plan. Moreover, these firms will notify their parts suppliers regarding the totals required, and some even establish delivery times for their daily production needs.

Since 1985, Taiwan had been striving to become a components center for the region. Taiwan's motor industry emphasizes export assistance, subsidies for R&D, and the establishment of national standards for automotive components to support parts producers, as well as the use of local content requirements and tariffs (Kajiwara, 1993; Economist Intelligence Unit (EIU), 1995). Rationalizing the industry, by reducing the number of makes and models, and by standardizing certain components, is crucial for gaining economies of scale (Abrenica, 1998). Given today's global competition, Taiwan's Ford Lio Ho distributes locally assembled Mazda and Kia vehicles, as well as Ford vehicles manufactured in Europe and North America. Moreover, Isuzu and Mitsubishi produce common parts in Taiwan specifically for Asian commercial vehicles (Munkirs, 1993). Previously, the motor industry always attempted to maintain competitiveness based on quality. Nevertheless, the

fact that future competition will intensify has forced the industry to respond more swiftly to market needs. Given the recent explosive development of the internet and e-commerce, motor companies have taken full advantage of the electronic technology and tools to integrate their supply chain information systems. The motor industry in Taiwan has been vigorously pursuing electronic data exchange in order to improve information transmission rates and accuracy. Looking at it from how orders are sent, most make use of the electronic data form to send their orders. The major operating system of electronic information transmission in the previous electronic data interchange (EDI) application environment was a closed value-added network. With the advances in information technology, the present network is primarily designed for an open internet application environment. Accordingly, the traditional EDI information exchange standard has been shifted toward EOI (EDI over internet) in response to the changes in the operating environment. Moreover, the development of traditional EDI information exchange standard will continue to evolve until XML becomes the standard. The necessary documents and the data exchange format of the transaction will be designed for exchanging information via the internet.

Research model and hypotheses

This study explores the issue of the continuity of cooperative electronic supply chain relationships, set up as an endogenous variable. Moreover, adopting an electronic supply chain system is a new plan and action. Thus, cooperating firms must be provided advance knowledge of the plan and course of action, as well as resources required, adjustment procedures, personnel training and achievable benefits and risks which may occur. Communication and coordination were, therefore, set up as exogenous variables. Coordination between the motor companies and the suppliers can produce resource dependence, and the perception of risk, for cooperative suppliers. Finally, communication between the motor companies and the suppliers tends to produce trust between the cooperative suppliers, followed by commitment to the relationship; only after this has been achieved, are suppliers willing to maintain mutual cooperation. Therefore, resource dependence, risk perception, trust, and relationship commitment, were mediating variables. In other words, this study has attempted to integrate resource dependence, risk perception, and relationship marketing to deduce the framework and hypotheses of the research. Figure 1 illustrates the research framework.

Resource dependence perspective

Pfeffer and Salancik (1978) viewed an organization as an open system. Based on this concept, an organization must interact with the external environment to obtain the resources necessary to maintain organizational survival. Hall (1987) considered a major influence on dependence level to be the significance of resources to organizational operations, the distribution of resources and use rights, and the concentration of resources in the environment.

While exploring cooperative relationships among industrial firms, Heide and John (1988) indicated that increased investment in transaction-specific assets of suppliers enhanced cooperative relationships and the expectation of continued cooperation. Zaheer and

Venkatraman (1995) noted that the effort made by firms in building stable and long-term relationships increased with their investment in transaction-specific assets. Consequently, firms are more willing to maintain the continuity of such cooperative relationships. In this respect, supplier investment in transaction-specific assets helps reduce production costs and simultaneously increases production efficiency, helping build a closer cooperative relationship between suppliers and buyers. Meanwhile, the buyer has the increased cost of switching exchange partners. Accordingly, suppliers that are willing to establish a cooperative electronic supply chain relationship with a motor company will invest in transaction-specific assets, in compliance with the substantial assets, human resources and production procedures of the buyer. The above reasoning demonstrates that supplier investment in relevant assets, human resources or adjustment of production procedures, in line with demand for electronic supply chain systems, will help suppliers establish a long-term and stable relationship; this can help meet expectations, to maintain a lasting and cooperative relationship, with the buyer. The following hypothesis is based on the above reasoning:

H1. Resource dependence is positively related to the continuity of the cooperative electronic relationship.

Frazier *et al.* (1988) suggested in their study of just-in-time relationships, that high levels of coordination are associated with mutually fulfilled expectations. Mohr *et al.* (1996) provided a somewhat different perspective on how communication resources and efforts should be allocated. Specifically, combining collaborative communication with low levels of governance may be a viable strategy to enhance outcomes. Garcia-Dastugue and Lambert (2003) indicated that lack of coordination will result in inefficiencies in the supply chain, in the form of inventory buffers, underutilized capacity, obsolete products or lost sales. The following hypothesis is based on the above reasoning:

H2. Coordination is positively related to resource dependence.

Risk perception perspective

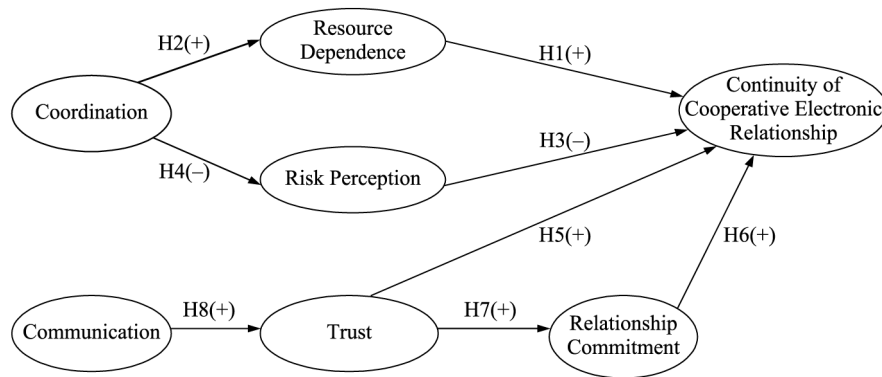
Cunningham (1967) named risk perception, previously defined by Cox and Rick (1967), as “uncertainty” and “unfavorable results.” Douglas and Wildavsky (1982) considered that general risk perception was not based on an inherent understanding of technology, but rather that risk perception was influenced by individual psychological awareness and social culture.

Mayer *et al.* (1995) stated that the perception of risk involved the trustor’s beliefs, about the likelihood of gains or losses, outside of considerations that involve the relationship with the particular trustee. Moreover, the feeling resulting from risk perception can influence generated differences in cooperation. From the above analysis, the desire to be involved in continuous electronic cooperation with the motor company declines as the level of risk perception faced by the suppliers increases. Accordingly, the following hypothesis was developed:

H3. Risk perception is negatively related to the continuity of the cooperative electronic relationship.

Madhok (1995) suggested that a lack of trust and a perception of a high-risk prompt alliance influenced

Figure 1 Research model and hypotheses



partners to choose a governance structure with tighter control mechanisms. This essentially supports the idea, that when it is difficult to rely on trust, more control is the answer for lowering risk. Parkhe (1993) found that a perception of opportunistic behavior (high relational risk) leads to the deployment of contractual safeguards, or control in alliance. Kumar and Seth (1998) indicated that control has been found to facilitate coordination. The following hypothesis is based on the above reasoning:

H4. Coordination is negatively related to Risk perception.

Relationship marketing perspective

Relationship marketing stresses continuous and long-term interchange (Dwyer *et al.*, 1987). Shani and Chalasani (1992) viewed relationship marketing as an integrated force, which not only confirms, maintains and establishes network relationships among individual customers, but also sustains these network relationships through interaction, individualization and extended contact, in order to increase profits. Morgan and Hunt (1994) considered relationship marketing to include marketing activities implemented to establish, maintain and develop a successful exchange model. Morgan and Hunt considered the two key concepts in relationship marketing to be “trust” and “relationship commitment”. Gundlach *et al.* (1995) noted that the commitment of both exchange partners represented a strong signal of anticipated relationship quality, which could be used to develop trust in a relationship, and influence the regulations in the sharing society regarding the development of future exchange management. Gruen (2000) considered the main goal of relationship marketing to be the creation of a more effective method of interacting with the customer, thus developing a continuous and long-term relationship.

Anderson and Narus (1990) defined trust as a firm’s degree of belief that their cooperative partners will not act speculatively. Anderson and Narus further believed that the actions of cooperative partners would always have positive results and have no unexpected negative consequences. Similarly, Anderson and Weitz (1992) viewed trust as the goodwill and trust that firms hold towards their partners; they further believed that cooperative partners would actively try to satisfy the needs of the firms they were in partnership with. Moorman *et al.* (1992) described trust as the volition of firms in trusting and relying on trading partners. Ganesan (1994)

indicated that a supplier’s trust in a buyer and their willingness to be involved in maintaining a long-term relationship are positively correlated. Wilson (1995) noted that trust is a firm’s belief in an exchange relationship, namely that the other partner will act to benefit the cooperative partner. The following hypothesis was developed, following the above analysis:

H5. Trust is positively related to the continuity of the cooperative electronic relationship.

Dwyer *et al.* (1987) defined relationship commitment as a firm’s willingness to contribute to the cooperative relationship, which implies willingness to sacrifice short-term benefits to achieve long-term gains. Anderson and Weitz (1992) considered that relationship commitment may represent the attitude of partners to the development and maintenance of a stable and lasting relationship. Moore (1998) found that a firm’s relationship commitment influenced the willingness to maintain a cooperative relationship. Additionally, the characteristics of long-term perspectives in the alliance are displayed in relationship commitment, stressing desire for continuing trade in the future. The above analysis produced the following hypothesis:

H6. Relationship commitment is positively related to the continuity of the cooperative electronic relationship.

Dwyer *et al.* (1987) considered trust to be the extent of the belief of one partner, in the willingness of the other partner, to fulfill the contractual obligations associated with their trade relationship. Achrol (1991) indicated that the stronger the firm’s trust in its cooperative partner, the stronger the relationship commitment of that firm to the cooperative partner. Morgan and Hunt (1994) found that mutual trust between two firms correlates positively with relationship commitment:

H7. Trust is positively related to relationship commitment.

Presenting a partner relationship model, Anderson and Narus (1990) further tested and verified the cooperative relationship between the reseller and the supplier. Furthermore, from the supplier perspective, Anderson and Narus demonstrated that communication clearly and positively influences trust. Anderson and Weitz (1992) indicated that communication may increase the consistency of the expectations and perceptions between partners, reducing role ambiguity and mutual misunderstanding, and thus, possibly, enhancing trust. Additionally, Bruce *et al.*

(1995) considered routine communication to be conducive to establishing trust among alliance members. Moreover, Kumar (1996) remarked that excellent communication quality and frequent communication help improve mutual understanding, and also increase trust. Simpson and Mato (1997) indicated that exchanges of opinions and agreement, established through communication, help improve trust in, and appraisal of, the partner. Thus, this study concludes that communication among partners helps boost mutual understanding and trust. Accordingly, the following hypothesis was presented:

H8. Communication is positively related to trust.

Methods

Measurement

The latent variables involved in the different aspects of this research, (communication, coordination, relationship commitment) which are classified under perceptions or feelings of the testee, cannot be directly observed or obtained. Instead, these latent variables must be generated from inferences drawn from manifest variables. Accordingly, this study cites related literature or scales, and adopts manifest variables, that have been demonstrated to be effective. The measurements of the related variables mainly refer to appropriately revised evidence-based literature. This study further developed the required research variables and measurements, employing 22 manifest variables as multiple indicators for seven constructs (or latent variables) of the research model (see Table I). A Likert five-point scale was used to measure the 22 items, and the range of answers was divided into strongly agree, agree, neutral, disagree, and strongly disagree.

Data

The data collected for this study was based on the membership list of the Taiwan Transportation Vehicle Manufacturers Association and the list of motor raw material and spare parts suppliers, provided by motor companies in Taiwan; this amounted to 851 firms. To simplify questionnaire completion and return, this study sent e-questionnaires to raw material and spare parts suppliers via e-mail, requesting them to assign a staff member to fill out the necessary information and answers, based on the questionnaire contents.

Analysis

The analysis followed a two-step procedure, based partly on an approach recommended by Anderson and Gerbing (1988). The first step employed confirmatory factor analysis to design a measurement model that achieved an acceptable fit with the data. The second step then tested the theoretical model (or structural model) using path analysis to demonstrate a meaningful and statistically acceptable structural model. The research model in Figure 1 was path analyzed using the Maximum Likelihood estimator of LISREL, which used the correlation coefficient matrix of the measured variables as an input (Joreskog and Sorbom, 1993). This study applied the CALIS procedure of the SAS system to perform LISREL.

Results

Reliability analysis and sample structure

A total of 851 questionnaires were sent out, one to every listed raw material and spare parts supplier in the Taiwanese motor industry. This process yielded 262 returned questionnaires. The returned questionnaires were encoded and filed. After removing incomplete responses, the actual number of valid questionnaires was 241. The rate of return was 28.3 percent.

To investigate the possibility of non-response bias in the data, a test for statistically significant difference in the response of early and late waves of returned surveys was performed (Armstrong and Overton, 1977; Lambert and Harrington, 1990; Lessler and Kalsbeek, 1992). For each phase, the last wave of surveys received was considered to be representative of non-respondents. Each survey sample was split into two groups on the basis of early and late survey return times; *t*-tests were performed on the responses of the two groups. The *t*-tests yielded no statistically significant differences among the survey items tested. These results suggest that non-response bias did not significantly impact the study.

Table II illustrates data reliability using Cronbach's α . All constructs (latent variables), for the continuity of cooperative electronic supply chain relationships, had a high reliability, with a Cronbach's α exceeding 0.8. The data reliability, in general, was acceptable.

Analyzing the number of employees and annual turnover of the sample companies revealed that the respondents were mostly from small- and medium-sized enterprises, although a few large enterprises were also included. Thus, the samples were highly representative of the industry in Taiwan. Additionally, 50 percent of the largest buyers from these sample firms were automobile companies, while the remaining 50 percent were motorcycle companies. These sample firms mostly placed orders electronically. The most common method for placing orders was e-mail, accounting for 37.3 percent of all orders, followed by other forms of EDI, such as XML, which accounted for 27.4 percent.

Confirmatory factor analysis

In the measurement model, each indicator variable is predicted to load just one factor; that is, none of the indicators are complex variables (measuring multiple latent variables) (Hatcher, 1998). The psychometric properties of the measures used in this research were assessed through confirmatory factor analysis, and two complex variables were removed, namely Items 19 and 13. The model fit also used the estimates of CFI, GFI, AGFI, NFI, NNFI, and RMR listed in Table III. The results in Table III indicated a good fit to the data; as the fit indices exceeded or approached 0.9, estimated RMR was 0.0292, and AGFI approached 0.8.

The reliability of the measures was assessed using composite reliability and variable extracted estimates, as listed in Table IV. The composite reliability of each construct exceeded 0.7 in this study, satisfying a minimally acceptable level (Hatcher, 1998). However, Fornell and Larcker (1981) suggested that variance extracted estimates should exceed 0.5. All indices in Table IV exceed 0.5. Therefore, overall, the constructs in this model performed fairly well. Table IV assesses validity using the *t* values of the factor loadings. All

Table I Measurement of the manifest variables of each latent variable

Latent variables	Manifest variables
1. Continuity of cooperative electronic relationship	V1. Satisfied with the establishment of cooperative electronic supply chain relationship with the largest buyer
	V2. Continuing relevant cooperative electronic supply chain relationship with the largest buyer corresponds with the long-term benefit to your firm
	V3. Continued investment in electronic facility helps the cooperative relationship with the largest buyer
2. Resource dependence	V4. When the electronic supply chain system with the largest buyer is switched to the new system with the new buyers, it will take long time
	V5. When the electronic supply chain system with the largest buyer is switched to the new system with the new buyers, it will require increased lots of educational training of the personnel
	V6. When the electronic supply chain system with the largest buyer is switched to the new system with the new buyers, it will increase much procedural adjustments
	V7. When the electronic supply chain system with the largest buyer is switched to the new system with the new buyers, it will necessitate much facility adjustments
3. Coordination	V8. After the electronic supply chain system has been set up, the largest buyer will treat our firm and others fairly
	V9. When there are differences in opinion regarding the electronic supply chain system, the largest buyer will be willing to cooperate to solve the problem together
	V10. Our firm would be willing to set up a specialized unit (personnel) or coordinating mechanism to solve conflicts related to the electronic supply chain system with the largest buyer
4. Risk perception	V11. When the largest buyer is involved in the electronic supply chain system, it is helpful in forecasting the volume of market demand for motor spare parts (reverse)
	V12. When the largest buyer is engaged in the electronic supply chain system, it is helpful in forecasting technology changes in motor spare parts (reverse)
	V13. During interaction with the largest buyer, through the electronic supply chain system, our firm has often changed production plans (reverse)
5. Trust	V14. The largest buyer possesses the expertise to participate in electronic supply chain system work
	V15. The electronic supply chain system is valuable when implemented with the cooperation of the largest buyer
	V16. The electronic supply chain system, in which the largest buyer is involved, helps increase the efficiency of the bilateral interface
6. Relationship commitment	V17. Our firm is willing to make a strong effort to cooperate with the largest buyer to achieve an electronic connection
	V18. Top managers fully support the electronic supply chain system used by the largest buyer, and thus will work to achieve the various commitments of that system, including quality, delivery date, specifications, and so on
	V19. A contract must be established with the largest buyer to manage the cooperative electronic supply chain relationship
7. Communication	V20. The largest buyer fully exchanges opinions with our firm concerning the objectives and methods related to the electronic supply chain system
	V21. Product/service related information should be shared with the largest buyer, using electronic technology such as the internet, extranet, and EDI
	V22. A specialized unit (personnel) is in charge of communicating with the largest buyer, via electronic technology

Table II Results of reliability analysis

Latent variables	Cronbach's α
1. Continuity of cooperative electronic relationship	0.8946
2. Resource dependence	0.9505
3. Coordination	0.8003
4. Risk perception	0.8728
5. Trust	0.8751
6. Relationship commitment	0.8659
7. Communication	0.8056

indicator t values ranged from 12.9898 through 18.9066, indicating that all factor loadings were significant ($p < 0.001$). This fact supported the convergent validity of all indicators that effectively measured the same construct (Anderson and Gerbing, 1988).

Path analysis

From the above, the theoretical model testing was conducted with path analysis, using LISREL. The CFI, GFI, NFI, NNFI exceeded or were close to 0.9, estimated RMR was 0.0408, and AGFI was close to 0.8. The research model achieved quite a good fit (Joreskog and Sorbom, 1993). Figure 2 and Table V summarizes the results of the path

Table III Summary of measurement statistics

Chi-square	413.31
df	149
GFI	0.8522
AGFI	0.7916
RMR	0.0292
NFI	0.9068
NNFI	0.9206
CFI	0.9377

Notes: $n = 241$; GFI = goodness of fit index; AGFI = GFI adjusted for degrees of freedom; RMR = root mean square residual; NFI = normed-fit index; NNFI = non-normed-fit index; CFI = Bentler's comparative fit index

analysis. All path coefficients in the current model were statistically significant and as hypothesized ($H1-H8$ were supported).

Implications for theory and research

Implications for theory and research are as follows:

- The primary contribution of this research is the integration of constructs associated with resources and environmental uncertainty (resource dependency and perceived risk), with relationship marketing constructs (trust and relationship commitment), into a coherent model that jointly predicts

supplier acceptance of e-commerce. Drawing upon relationship marketing, this paper has theoretically developed an extensive set of interrelationships among these variables, illustrating their comparative effects on supplier intention, to use the internet for on-line transactions.

- This empirical study jointly provides consistent empirical support for the proposed business-to-business (B2B) e-commerce acceptance model. Given the high explanatory power of the resulting model, it is likely to serve as the basic model for predicting supplier behavior and the continuity of enhanced understanding of cooperative electronic relationships.
- In terms of theory building, this study has attempted to develop a new theory by grounding new variables in a well-accepted general model (relationship marketing) and applying them in a new context. It is important to note that the two new constructs – resource dependence and risk perception – are placed within the nomological structure of the original model and are compatible with relationship marketing variables.

Practical implications

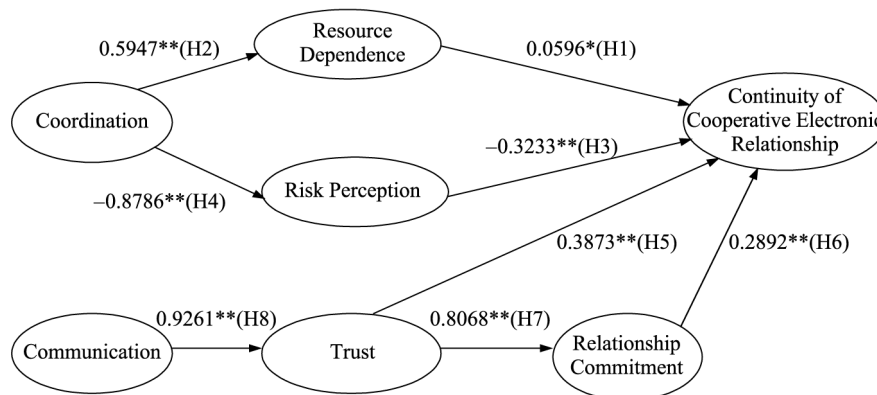
Practical implications are as follows:

- Motor companies can encourage suppliers to increase their transaction-specific investments, possibly through a reward system, and thus, can enhance supplier

Table IV Results of reliability analysis and factor loading analysis

Latent variable and measurement variable	Standardized factor loadings	t-value	Composite reliability	Variance extracted estimates
Continuity of cooperative electronic relationship			0.8956 ^a	0.7377
V1	0.8602	16.4701 *	0.7399 ^b	
V2	0.8941	17.5403 *	0.7994	
V3	0.8270	15.4814 *	0.6839	
Resource dependence			0.9508	0.8287
V4	0.9171	18.4628 *	0.8411	
V5	0.9272	18.9066 *	0.8597	
V6	0.9158	18.4152 *	0.8387	
V7	0.8804	17.2217 *	0.7751	
Coordination			0.8084	0.5848
V8	0.8050	14.7037 *	0.6480	
V9	0.7509	13.3369 *	0.5639	
V10	0.7365	12.9898 *	0.5424	
Risk perception			0.8752	0.7781
V11	0.8776	16.5384 *	0.7702	
V12	0.8865	16.7870 *	0.7859	
Trust			0.8741	0.6998
V14	0.7362	13.6623 *	0.5420	
V15	0.8973	17.5229 *	0.8051	
V16	0.8673	16.5876 *	0.7522	
Relationship commitment			0.8648	0.7640
V17	0.8715	16.2062 *	0.7595	
V18	0.8766	16.3434 *	0.7684	
Communication			0.8153	0.5959
V20	0.7487	13.0753 *	0.5606	
V21	0.8194	14.8587 *	0.6714	
V22	0.7454	12.9954 *	0.5706	

Notes: * Denotes a significant value ($p < 0.001$). ^a indicates the composite reliability; ^b indicates the square of factor loadings

Figure 2 Testing results of the theoretical model

Note: Path coefficients are statistically significant ** denotes a significant value $p < 0.01$, and * denotes a significant value $p < 0.05$

Table V Summary of causal model statistics

Chi-square	473.3
df	161
GFI	0.837
AGFI	0.7874
RMR	0.0408
NFI	0.8933
NNFI	0.9132
CFI	0.9264

Notes: $N = 241$; GFI = goodness of fit index; AGFI = GFI adjusted for degrees of freedom; RMR = root mean square residual; NFI = normed-fit index; NNFI = non-normed-fit index; CFI = Bentler's comparative fit index

dependence on electronic supply chain systems. Moreover, the high switching cost may also increase supplier willingness to maintain the cooperative relationship. Nonetheless, suppliers must understand the benefits of an electronic supply chain system in eliminating doubts and preventing speculation, which may possibly further reduce the perception of risk.

- Given the special features of an electronic supply chain system, both personnel education and adjustments to procedures or facilities will require assistance from the motor company. Accordingly, the motor company should reinforce the forecasting capabilities of the electronic supply chain system for technological changes in relevant vehicle spare parts and also for market demand. Such a cooperative electronic supply chain relationship with the motor company is analogous with long-term supplier benefits and increased supplier satisfaction. Additionally, suppliers will continue to invest in electronic facilities, thus helping in the continuity of cooperative supply chain relationships.
- The motor company must fully coordinate with suppliers regarding the setup process of the electronic supply chain system; the suppliers must be made aware that the motor company is committed to treating all suppliers fairly. When differences of opinion exist regarding the electronic supply chain system, the motor company must be willing

to solve the problem through cooperation. The setting up of a specialized unit (personnel), or coordinating mechanism, can effectively reduce both partner conflict and perceptible disparity.

References

- Abrenica, J.V. (1998), "The Asian automotive industry: assessing the roles of state and market in the age of global competition", *Asian-Pacific Economic Literature*, Vol. 12 No. 1, pp. 12-26.
- Achrol, R.S. (1991), "Evolution of the marketing organization: new forms for turbulent environments", *Journal of Marketing*, Vol. 55 No. 4, pp. 77-93.
- Anderson, E. and Weitz, B. (1992), "The use of pledge to build and sustain commitment in distribution channel", *Journal of Marketing Research*, Vol. 29 No. 1, pp. 18-34.
- Anderson, J.C. and Gerbing, D.W. (1988), "Structural equation modeling in practice: a review and recommended two-step approach", *Psychological Bulletin*, Vol. 103 No. 3, pp. 411-23.
- Anderson, J.C. and Narus, J.A. (1990), "A model of distributor firm and manufacturer firm working partnerships", *Journal of Marketing*, Vol. 54 No. 1, pp. 42-58.
- Armstrong, J.S. and Overton, T. (1977), "Estimating nonresponse bias in mail surveys", *Journal of Marketing Research*, Vol. 15 No. 8, pp. 396-402.
- Bruce, M.L., Leverick, F. and Wilson, D. (1995), "Success of factor collaboration produce development: a study of supplier of information communication technology", *R&D Management*, Vol. 25 No. 1, pp. 33-44.
- Buckley, P.J. and Casson, M. (1988), "A theory of cooperation in international business", *Management International Review*, Vol. 40 No. 1, special issue, pp. 19-38.
- Carter, C.R. and Jennings, M.M. (2002), "Social responsibility and supply chain relationships", *Transportation Research Part E*, Vol. 38 No. 3, pp. 37-52.
- Cox, D.F. and Rick, S. (Eds) (1967), *Risk-Taking and Information Handling in Consumer Behavior*, Harvard University Press, Boston, MA.
- Cunningham, S.M. (1967), "The major dimensions of perceived risk", in Cox, D.F. (Ed.), *Risk-Taking and*

- Information Handling in Consumer Behavior*, Harvard University Press, Boston, MA, pp. 82-108.
- Das, T.S. and Teng, B.S. (2001), "A risk perception model of alliance structuring", *Journal of International Management*, Vol. 7 No. 1, pp. 1-29.
- Douglas, M. and Wildavsky, A. (1982), *Risk and Culture: An Essay on the Selection of Technological and Environmental Dangers*, University of California Press, Berkeley, CA.
- Dwyer, F.R., Schurr, P.H. and Oh, S. (1987), "Developing buyer-seller relationship", *Journal of Marketing*, Vol. 51 No. 2, pp. 11-27.
- Economist Intelligence Unit (EIU) (1995), "Taiwan: regional components centre for south-east asia?", *Motor Business International*, 4th quarter, Economist Intelligence Unit, London.
- Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.
- Frazier, G., Spekman, R. and O'Neal, C. (1988), "Just-in-time exchange relationships in industrial markets", *Journal of Marketing*, Vol. 52 No. 4, pp. 52-67.
- Ganesan, S. (1994), "Determinants of long-term orientation in buyer-seller relationships", *Journal of Marketing*, Vol. 58 No. 2, pp. 1-19.
- Garcia-Dastugue, S.J. and Lambert, D. (2003), "Internet-enabled coordination in the supply chain", *Industrial Marketing Management*, Vol. 32 No. 5, pp. 251-63.
- Gruen, T.W. (2000), "Relationship marketing activities, commitment, and membership behaviors in professional associations", *Journal of Marketing*, Vol. 64 No. 3, pp. 34-50.
- Gundlach, G.T., Achrol, R.S. and Mentzer, J.T. (1995), "The structure of commitment in exchange", *Journal of Marketing*, Vol. 59 No. 1, pp. 78-92.
- Hall, R.H. (1987), *Organizations: Structure, Process, and Outcomes*, 4th ed., Prentice-Hall, Englewood Cliffs, NJ.
- Hatcher, L. (Ed.) (1998), *A Step-by-step Approach to Using the SAS System for Factor Analysis and Structural Equation Modeling*, 3rd ed., SAS Institute, Inc., Cary, NC.
- Heide, J.B. and John, G. (1988), "The role of dependence balancing in safeguarding transaction-specific assets in conventional channel", *Journal of Marketing*, Vol. 52 No. 1, pp. 20-35.
- Jonsson, P. and Zineldin, M. (2003), "Achieving high satisfaction in supplier dealer working relationships", *Supply Chain Management: An International Journal*, Vol. 8 No. 3, pp. 224-40.
- Joreskog, K.G. and Sorbom, D. (Eds) (1993), *LISREL 8: User's Reference Guide*, Scientific Software International, Chicago, IL.
- Kajiwarra, H. (1993), "Taiwan: policy shift regarding the automotive industry", in Inoue, R., Kohama, H. and Urate, S. (Eds), *Industrial Policy in East Asia*, JETRO, Tokyo.
- Kumar, N. (1996), "The power of trust in manufacturer-retailer relationships", *Harvard Business Review*, Vol. 74 No. 6, pp. 92-106.
- Kumar, N., Scheer, L.K. and Steenkamp, J.B.E.M. (1995), "The effects of perceived interdependence on dealer attitudes", *Journal of Marketing Research*, Vol. 32 No. 3, pp. 348-56.
- Kumar, S. and Seth, A. (1998), "The design of coordination and control mechanisms for managing joint venture-parent relationships", *Strategic Management Journal*, Vol. 19 No. 2, pp. 579-99.
- Lambert, D. and Harrington, T. (1990), "Measuring nonresponse bias in mail surveys", *Journal of Business Logistics*, Vol. 11 No. 2, pp. 5-25.
- Lessler, J.T. and Kalsbeek, W.D. (1992), *Nonsampling Error in Surveys*, Wiley, New York, NY.
- Madhok, A. (1995), "Revisiting multinational firms' tolerance for joint ventures: a trust-based approach", *Journal of International Business Studies*, Vol. 26 No. 1, pp. 117-37.
- Mayer, R.C., Davis, H. and Schoorman, F.D. (1995), "An integrated model of organizational trust", *Academy of Management Review*, Vol. 20 No. 3, pp. 709-34.
- Mohr, J.J., Fisher, R.J. and Nevin, J.R. (1996), "Collaborative communication in interfirm relationships: moderating effects of integration and control", *Journal of Marketing*, Vol. 60 No. 1, pp. 103-15.
- Moore, K.R. (1998), "Trust and relationship commitment in logistics alliances: a buyer perspective", *International Journal of Purchasing and Materials Management*, Vol. 34 No. 2, pp. 24-37.
- Morgan, R.M. and Hunt, S. (1994), "The commitment-trust theory of relationship marketing", *Journal of Marketing*, Vol. 58 No. 3, pp. 20-38.
- Moorman, C., Zaltman, G. and Deshpande, R. (1992), "Relationships between providers and users of marketing research: the dynamics of trust within and between organizations", *Journal of Marketing Research*, Vol. 29 No. 1, pp. 314-29.
- Munkirs, J.R. (1993), "The automobile industry, political economy, and a new world order", *Journal of Economic Issues*, Vol. 27 No. 2, pp. 627-38.
- Parkhe, A. (1993), "Messy research, methodological predispositions, and theory development in international joint ventures", *Academy of Management Review*, Vol. 18 No. 2, pp. 227-68.
- Pfeffer, J. and Salancik, G.R. (Eds) (1978), *The External Control of Organizations: A Resource Dependency Perspective*, Harper & Row, New York, NY.
- Sanzo, M.J., Santos, M.L., Vazquez, R. and Alvarez, L.I. (2003), "The effect of market orientation on buyer-seller relationship satisfaction", *Industrial Marketing Management*, Vol. 32 No. 5, pp. 327-45.
- Sebastian, J.G.D. and Lambert, D.M. (2003), "Internet-enabled coordination in the supply chain", *Industrial Marketing Management*, Vol. 32 No. 2, pp. 251-63.
- Shani, D. and Chalasani, S. (1992), "Exploiting niches using relationship marketing", *The Journal of Consumer Marketing*, Vol. 9 No. 3, pp. 33-43.
- Simpson, J.T. and Mato, D.T. (1997), "Relationship management: a call for fewer influence attempts?", *Journal of Business Research*, Vol. 39 No. 7, pp. 209-18.
- Wilson, D.T. (1995), "An integrated model of buyer-seller relationship", *Journal of Academy of Marketing Science*, Vol. 23, pp. 335-45.
- Zaheer, A. and Venkatraman, N. (1995), "Relational governance as interorganizational strategy: an empirical test of the role of trust in economic exchange", *Strategic Management Journal*, Vol. 16 No. 4, pp. 373-92.
- Zhao, X., Xie, J. and Zhang, W.J. (2002), "The impact of information sharing and ordering co-ordination on supply chain performance", *Supply Chain Management: An International Journal*, Vol. 7 No. 1, pp. 24-40.