Antecedents and Consequences of Smaller Suppliers' Electronic Integration with International customers: Effect of Communication Culture

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ABSTRACT:

Literature suggests that advances in information and communication technologies have been a major driver in restructuring MNEs and their cross-border supply chain management. In response to this claim, this study examines determinants and outcomes of electronic integration of small suppliers with their international customers. Drawing on an empirical base of 240 Taiwanese-based electronics equipment manufacturers, we examine the effect of culture, internal, interorganizational and environmental dimensions on electronic integration and its impact on supplier performance. Findings on the pertinence of electronic integration in international suppliers-customer relationships are presented and discussed.

1 Introduction and motivation

Changes in the landscape of international business, specifically key globalization dynamics such as growing liberalization and advances in information and communication technologies (ICT), have facilitated shifts in the strategy and structure of MNEs. There is now an increasing emphasis on specialized 'slivers' of activities, i.e. the disintegration and stretching of MNEs' value-adding activities with suppliers around the world (Buckley and Ghauri, 2004). The literature agrees that ICT advances have been a major driver in restructuring MNEs (Birkinshaw, Toulan, and Arnold, 2001; Nolan, Sutherland, and Zhang, 2002) and effective coordination and management of cross-border supply chain activities are critical elements of firm performance. However, how to effectively deploy these systems in international supplier-customer relationships and thus how to leverage internal, interorganizational and environmental dimensions to obtain higher levels of performance, is empirically underexplored.

The progressive and more prominent importance of advanced information systems in the coordination of channel partners across national boundaries is demonstrated by a variety of firms. Companies such as Dell, GM and Wal-Mart have recently committed significant resources to supply chain management systems (SCMs) in an attempt to improve coordination with their suppliers (Subramani, 2004). The literature has picked up on this trend and pointed at the increasing importance of interfirm systems integration in international buyer-supplier relationship management (Jean, Sinkovics, and Kim, 2008). Collaborative SCM systems enhance information processing capabilities and help in solving coordination problems through electronic integration across borders. Advancements of electronically integrated applications involve collaborative planning, forecasting, and replenishment (CPFR) (Andraski and Haedicke, 2003), but a crucial conceptual challenge that pertains is to identify the specific conditions under which electronic

integration can provide better support for international exchange relationships and improve expected outcomes.

The bulk of studies on the adoption of interorganizational information systems (IOS) has focused on the context of electronic data interchange (EDI) (Grover and Saeed, 2007), however, technological innovation has resulted in contemporary IOS shifting from EDI toward more Internet-based, open standard IOS which incorporate functionalities such as collaborative forecasting beyond the ones provided by traditional EDI (Zhu et al., 2006). Moreover, earlier studies have mostly examined the adoption of IOS in the context of domestic exchange relationships. Furthermore, more work is required to understand how cultural characteristics shape the implementation and deployment of IOS for firms in an international channels context (Erumban and de Jong, 2006; Jean et al., 2008). Although the increase in outsourcing and offshoring activities has driven a profusion of interfirm partnerships across national border (Hätönen and Eriksson, 2009), our understanding of determinants and outcomes of electronic integration as a coordination and integration mechanism of cross-border exchange relationships remains limited. What is more, the extant literature has documented a positive link between IOS and firm performance, however, the study of IT on firm performance is still incomplete in some aspects. First, a few scholars report either no effect or even a negative effect of IT on firm performance (Jean, 2007). Moreover, empirical evidence on the impact of SCMs on firm performance is mostly restricted to the customer's view and there has been limited research from a supplier's perspective (Sanders, 2008).

In an attempt to move beyond the state of existing knowledge, this study seeks to develop and test a model to understand how electronic integration in international supplier-customer relationships can improve performance outcomes of suppliers. Specifically, electronic integration

is conceptualized in terms of coordination and collaborative arrangements via electronic media between suppliers and their international customers. A major contribution to our understanding of electronic integration is the investigation of antecedent factors. We posit internal, interorganizational and environmental dimensions. Drawing from existing literature, innovativeness is considered a key dimension, internal to the organization. Trust, is an interorganizational relationship dimension and in terms of environmental dimensions we explicitly consider environmental volatility and culture. While the IB literature has for long been considering cultural distance as a factor relevant to international exchange relationships, we also consider the context of communication culture. This is seen as critically important to our context of electronic integration where IOS and IT research has found communication culture as antecedent of electronic integration in international supplier-customer relationships. By testing the antecedents and performance consequences of electronic integration in international supplier-customer relationships comprehensively in one model, we are able to investigate the conditions for electronic configurations that help suppliers in promoting the development of successful international arrangements.

The context of our investigation is provided by international supplier-customer relationships between Taiwanese original equipment manufacturing (OEM)/original design manufacturing (ODM) suppliers and their international customers in the electronics industry. This is an ideal context for our study, as customers of Taiwanese OEM/ODM suppliers are from different cultural contexts and exchange coordination and collaboration relationships are strongly relying on electronic media. The survey methodology was conducted and structural equation modeling was employed to analyze the data.

The reminder of this article is organized as follows. A conceptual model is developed that delineates the relationships among key constructs. The literature from transaction cost economics (TCE), relational exchange and resource based view (RBV) is reviewed to provide support for each construct. Predictions regarding the antecedents and consequences of electronic integration are offered. These hypotheses are tested empirically, and the results are presented. The paper concludes with a discussion of findings and directions for future research.

2 Conceptual framework and hypotheses

Prior research in interorganizational information systems (IOS) adoption has extensively drawn on organizational, relational technological and environmental variables to examine the determinants of IOS adoption. Merging this stream of research with international business and culture literature, the proposed conceptualization of antecedents and consequences of electronic integration in international supplier-customer relationship is proposed in Figure 1. As shown in Figure 1, drawing from TCE, resource-based view, and relational exchange theory, environmental turbulence (based on TCE), innovativeness (based on RBV) and trust (based on relational exchange) are incorporated as key determinants of electronic integration for supplier with their international customers. Further, drawing from theoretical development of international business and culture theories by Hofstede (1984) and Hall (1987), two cultural factors that are unique to the international B2B context- cultural distance and the context of communication culture- are also included into the conceptual framework. Cultural distance underscores the interaction between partners from different cultural environments. Cultural distance has been linked to the implementation and utilization of electronic integration in international context. Contexts of communication culture highlight the communication cultural which could also affect the configuration of electron integration for suppliers in relationships with their international

customers. These antecedents are thought to affect the degree to which the supplier would like to employ electronic integration with the international customer. Further, the framework aims to determine under what condition electronic integration can be in the best configuration which can be a source of competitive advantage for smaller suppliers in international exchange relationships. Thus, the relationships between electronic integration, innovativeness, trust, environmental volatility and their impacts on supplier's relationship performance will be discussed. The proposed conceptualization provides a general model that can serve as the theoretical and empirical foundations for future research on other forms of IOS such as online reverse auction in the international market.

Insert Figure 1 about here

2.1 Role of electronic integration in inter-organizational relationships

Electronic integration, in this study, refers to the extent to which firms use supply chain communication systems (SCCS) to conduct specific supply chain activities ranging from operational levels such as tracking order, dealing invoice to strategic levels such as collaborative demand planning and forecasting (Wang, Tai, and Wei, 2006). TCE (Williamson, 1975) contends that vertical integration is preferred over market exchange when the sum of transaction and production cost of market exchange exceed those of hierarchy. According to TCE, electronic integration is seen as an alternative form of governance and coordination mechanisms which provide benefits such as reduction of coordination cost and transaction risk which vertical integration can provide (Kim and Mahoney, 2006b; Wang et al., 2006). Thus, it has been argued that IT-enabled integration could be seen as effective governance mechanism without involving common ownership for exchange parties (Zaheer and Venkatraman, 1994). Moreover, electronic

integration constitutes a mechanism which relational governance could provide because electronic integration requires both exchange parties invest in relationship-specific investments and mutual commitment (Kim and Mahoney, 2006b). Thus, it has been argued that electronic integration can facilitate joint decision making and collaborations in exchange relationships and thus give firms better capability in managing their channel relationships (Kim, Cavusgil, and Calantone, 2006).

In order to opertationalize electronic integration, researchers have proposed different approaches. Earlier research only focuses on EDI use and integration as the proxy of electronic integration. Recently, some studies have tried to extend the conceptualization of electronic integration and operationalize it as a multidimensional constructs. Subramani (2004) identify electronic integration as two patterns of IT use which including IT use for exploitation and IT use for exportation. Kim et al. (2005) refers to specific domains: electronic integration for monitoring and electronic integration for coordination. Integrating both Subramani (2004) and Kim et al.'s (2005) work, this study employ two independent dimension to conceptualize electronic integration- electronic integration for coordination and electronic integration for collaboration according to the intentionality of use for electronic integration.

Electronic integration for coordination includes conducting coordination and control channel activities such as checking inventory and product quality information through SCCS (Kim et al., 2005; Wang et al., 2006). Electronic integration thorough specific IOS such as EDI has been conducted by channel partners to support common operation execution and control which help firms reduce their coordination cost. Electronic integration for collaboration refers to conducting collaborative planning, forecasting and product design for partners via SCCS (Subramani, 2004). The internet-based open standard IOS such as Extensible Markup Language

(XML) facilitates higher level of electronic integration which helps firms conduct more collaborative activities with their channel partners (Kim et al., 2006).

2.2 The influence of cultural distance on electronic integration

The present study adopts Hofstede (1984)'s conceptualization of cultural distance. Previous studies have shown that cultural distance has a unique influence on the way a company govern their international partners (Zhang, Cavusgil, and Roath, 2003). Further, some earlier work has also discussed culture's impact on the adoption of IT, both at firm (van Everdingen and Waarts, 2003) and country level (Erumban and de Jong, 2006). The suppliers and their international customers in this study are assumed to belong to diverse culture, as they are from different countries. Thus, these cultural differences may result in different attitudes toward the use of electronic integration in governing their exchange relationships.

It is logical to argue that the more distant the cultures, the greater the uncertainty and asymmetric information the two organizations must experience, and the greater the reliance on electronic integration for exchange parties to enhance coordination and information process capabilities in international channel relationships. For example, as the Chinese and North American cultures are considered distant, it should be more common to exercise electronic integration to support transactions between the partners.

On the other hand, some may argue that difference in national culture may lead managers to more rely on relational, trust based governance mechanism to coordinate their transactions due potential loss and misuse of proprietary information through IT-based coordination mechanisms.

According to relational exchange theory, relational norms such as bilateral information exchange and harmonious conflict resolution, can serve as better governance mechanisms in international channel relationships. Higher levels of electronic integration could allow partners to

exchange bilateral information for forecasting, planning and joint product development. Thus, it has been argued electronic integration in collaboration can serve as a relational contract. In dealing with partners from higher distant culture, firms may prefer to more electronically integrate with their international partners to coordinate their business processes in order to mitigate transaction risk. Consequently, it is suggested that electronic integration will more likely to be observed when supplier in relationships with international customers from higher distant culture.

H1: The greater the cultural distance between the supplier and the international customer, the greater will be the extent to which the supplier is electronically integrated with its international customer.

2.3 The influence of the context of communication cultures on electronic integration

The second dominant culture theory included in our conceptual framework is the context of communication culture proposed by Hall (1976). Hall focuses on the characteristics of communication and classified culture in different countries into high versus low context culture. According to Hall (1976), people in a high-context culture (e.g. Japan, China) rely on the communication context more than low culture context (e.g. US, Germany). That is, people from high culture context try to obtain information mainly from their personal information network. On the other hand, people from low cultures context seek information from a research base or use information sources such as databases and the Internet. Given the main power of electronic integration is to facilitate communication between exchanges partners, the context of communication culture may be a critical determinant of electronic integration in international channel relationships. However, only limited research has applied Hall's classification into the investigation of B2B innovation adoption such as electronic integration in international channel relationships.

Based on Hall's theory, it is logical to argue that businesses in high-context culture are likely to prefer in-person contacts to carry out everyday B2B activities and such preference will reduce the need for IT-supported coordination. In contrast, businesses in low-context culture may prefer to use codified information source gaining from electronic coordination and collaboration in international channel relationships. Consequently, we follow Hall's classification of communication culture contexts and hypothesize the following effect of communication culture on electronic integration:

H1: With customers from low-cultural contexts, the extent to which the supplier is electronically integrated with its international customer will be greater.

2.4 The impact of innovativeness on electronic integration

Prior researchers have tried to link some organizational factors as determinants of IOS adoption. According to a recent review by Grover and Saeed (2007), organizational factors such as top management support, organizational slack, organizational readiness to accept new technology and IT capability are considered as import determinants of EDI use. It is logical to argue that organizational with more innovative orientation, it is more likely will be ready to accept new technology. Consequently, this research focuses on innovativeness as a key determinant of supplier's electronic integration with the international customer. According to Hult et al. (2004), innovativeness refers to a firm's capability to engage in innovation; that is, the introduction of new process, products, or ideas in the organization. Innovativeness is among the most important organizational capability which links to firm success.

Innovativeness constitutes the key impetus for supplier's electronic integration for the following reasons: First, innovative suppliers are more likely develop better product and service for their customer in exchange relationships. Innovative suppliers would perceive greater benefits

provided by IT-enabled coordination and collaborations in international channel relationships. For example, in the context global electronics supply chain, branded MNEs such as Dell and HP are collaborating with Original Design Manufacturing (ODM) suppliers through B2B IT applications to develop advanced electronics products. Moreover, innovative suppliers are porn to adopt advanced technology solution in order to enhance their business process. Therefore, innovative firms are more likely to possess greater IT capability. The compatibility and readiness of IT capability between exchange parties has been considered by prior researchers for the success of IOS integration (Chwelos, Benbasat, and Dexter, 2001). Recently, Kim et al (2006) highlighted empirical work that shows that firm's IT capability contributes to electronic integration in supply chain relationships. Accordingly, we hypothesize,

H3: The greater the supplier's innovativeness, the greater will be the extent to which the supplier is electronically integrated with its international customer.

2.5 The impact of trust on electronic integration

In this study, trust is defined as the confidence that exchange parties have for each other's reliability and integrity (Zhang et al., 2003). According to the relational exchange theory, a significant level of trust can be viewed as a relational governance mechanism which helps deter opportunistic behavior because it lessens the perceived vulnerability between partners (Cavusgil, Deligonul, and Zhang, 2004). Prior studies have identified trust as one of the most important interorganizational factors for the adoption of IOS such as EDI (e.g. Hart and Saunders, 1997; Lee and Lim, 2005; Zaheer and Venkatraman, 1994). Electronic integration involves sharing of confidential information for coordination and collaboration between exchanges parties. Therefore, it has been argued that electronic integration has potential risk of the misuse of proprietary information for the partners. For example, as Andraski and Haedicke (2003) noted, the main concerns of many suppliers with different buyers is that if they share too much information

then, when there are meeting unexpectedly high demand, those with the greater bargaining power and information will demand preferential treatment at the expense of others. Moreover, electronic integration may create a lock in effect for the transaction party and lose an investing party's flexibility in exchange relationships. Given that international exchange relationships are more cultural diverse than domestic ones, exchange parties may be more skeptical and unwilling to use electronic integration as a coordination and collaboration mechanism to share confidential information. Further, there is a significant bargaining power imbalance for suppliers with their international customers. Thus, trust is particularly important for suppliers to be electronically integrated with their international customers. A significant level of trust may be able to deter the risk of opportunistic behaviors by transact partners in international exchange relationships. Accordingly, we hypothesize,

H4: The greater trust in international supplier-customer relationships, the greater will be the extent the supplier is electronically integrated with its international customer.

2.6 The impact of environmental volatility on electronic integration

Environmental volatility is defined as the extent to which environment changes quickly (Klein, Frazier, and Roth, 1990; Skarmeas, Katsikeas, and Schlegelmilch, 2002). In a competitive environment such as the global electronics industry, rapid fluctuations in demand and supply conditions aggregate a level of uncertainty because of difficulties associated with making accurate predictions. According to TCE, prior research suggested that one way to deal with environmental uncertainty is vertical integration with channel partners in order to reduce transaction cost (Klein et al., 1990). However, vertical integration incurs coordination cost and loses firm's flexibility in channel structures.

Electronic integration provides an alternative form of vertical integration without ownership. IT-enabled coordination and collaboration enhances information processing capabilities of the transaction parties and has been regarded as a more efficient vertical coordination mechanism in coping with environmental uncertainty (Wang et al., 2006). Thus, prior researchers argued that firms are more willing to electronically integrated with their partners in order to reduce transaction cost under environmental uncertainty (Wang et al., 2006).

On the other hand, a volatile physical and economic environment may present a barrier to the supplier to rely on electronic coordination and collaboration with the international customer. The reasons are related to the difficulty associated with obtaining necessary and accurate information in order to effectively electronic coordinate and monitor the other partner's activities. Under a volatile environment, product and market information changes quickly and thus makes it more difficult to exchange timely information. Moreover, an uncertain environment is likely to undermine a firm's intention to conduct information-based collaboration such as CPFR due to the concerns of' inaccurate forecast and planning. Researchers suggested that greater environmental volatility is associated with looser electronic organizational form like electronic brokerage in order to permit ongoing adaptations to changing market conditions (Grover and Saeed, 2007). In an international exchange relationship where environmental uncertainty is exacerbated due to geographical and cultural distance between exchange partners (Skarmeas et al., 2002), the supplier may not be willing to closely electronically integrate with the international customer in order to maintain its adaptation and flexibility capability under the volatile environment. Thus, we predict:

H5: The greater environmental volatility faced by a supplier, the less will be the extent to which the supplier is electronically integrated with the international customer.

2.7 The impact of electronic integration on relationship performance

Viewed as an effective form of governance, electronic integration provides better information processing capabilities in helping operation and coordination processes for suppliers with their international customers. Therefore, it is expected that electronic integration enhances suppliers' performance through reducing transaction cost. Moreover, higher levels of electronic integration in IT-enabled collaborative activities like CPFR can serve the role of a relational contract which helps suppliers to minimize transactional cost and create governance value through self enforcing agreements (Kim and Mahoney, 2006a). In a similar way, Kim and Mahoney (2006b) also argued that electronic integration as a relationships specific investment which enhances mutual commitment to support exchange. According to Dyer and Singh (1998), effective governance and relationships specific investment are valuable resources and could be sources of firm's competitive advantage in interorganizational relationships. Further, in the case of OEM suppliers-international customer relationships, supplier's use of electronic integration can enhance their own reputations and IT capabilities and thus help ensure existing and attract more international procurement arrangements (Kang, Mahoney, and Tan, 2009). Therefore, electronic integration can enhance a firm's relationship performance in international market.

Drawing from RBV, some prior studies investigated different attributes of IT resources and their contributions to firm performance (e.g.Wade and Hulland, 2004). Electronic integration is regarded as a more valuable outside-in IT source which can generate higher firm performance (Jean et al., 2008). Kim et al. (2006) empirically show that electronic integration is positively related to market performance in supply chain relationships. Therefore, despite of the mixed results on IT-business value in the extant literature, we argue that electronic integration is expected to reap benefits for suppliers in relationships with their international customers.

H6: The greater the extent to which suppliers are electronically integrated with international customers, the greater supplier's relationship performance.

2.8 The impact of innovativeness, trust and environmental volatility on relationship performance

An innovative supplier firms is expected to perform well in its relationship with the international customer. Innovative firms are able to adopt innovative ideas and provide better solutions to their customers and thus allow them to achieve competitive advantage, thereby contributing to their performance (Hult et al., 2004). For example, in the context of OEM/ODM suppliers and their international customer relationships, a Taiwanese electronics, HTC, worked as an ODM supplier with the international telecom customer like O2 and Orange to design innovative mobile phones. HTC's innovative capabilities put them in a niche position in the globalizing industry and constituted great competitive advantage in the international market. Thus, we argue:

H7a: The greater the supplier's innovativeness, the greater the supplier's relationship performance.

Regarding the relationship between trust and supplier performance, trust has been considered to be critical to enhancing firm's performance in interorganizational relationships. Trust may be particularly important in cross-border relationships because vertical integration and market incentives are not always viable alternatives (Zhang et al., 2003), specifically for suppliers which are in a weaker bargaining position against international customers. A significant level of trust may serve a self-enforcement contract to deter opportunistic behaviors between exchange partners (Cavusgil et al., 2004). In a trustworthy business relationship, the supplier will put more resource and concrete effort on the existing collaborative relationships. Moreover, suppliers can be motivated to improve current operation processes which could

provide better product and service for the international customers, which ultimately enhance suppliers' market performance. Therefore the following hypothesis is postulated:

H7b: The greater trust in the international supplier-customer relationship, the greater the supplier's relationship performance.

With respect to the relationship between environmental volatility and relationships performance, we argued that environmental volatility may be detrimental to supplier's performance. The major challenge that environmental volatility imposed on interfirm relationships is the increased coordination cost (Skarmeas et al., 2002). In a volatile and unpredictable market, everything changes quickly and it is difficult for suppliers to capture accurately customer's demand forecast and build up collaborative interfirm relationships (Skarmeas et al., 2002). This results in increasing supplier's inventory and coordination cost with their customers. Further, suppliers also need to cope with rising distributions cost, on-time delivery, or delays in getting new products to market for their customers. Therefore the following hypothesis is postulated:

H7c: The greater the environmental volatility in the international supplier-customer relationship, the less the supplier's relationship performance.

3 Methodology

3.1 Research context and sample

The unit of analysis in this study is the specific subcontracting relationship between Taiwanese suppliers and their international MNE customers. The focus on Taiwanese suppliers as unit of analysis is deliberate as their cultural context is significantly different from the majority of their international customers, there is cultural distance and the industry context is signified by environmental volatility which makes id difficult to make accurate sales forecasts, monitor trends in the industry or predict accurately business trends. Furthermore, the Taiwanese electronics

industry pioneers in terms of the development of information technology and industry contributes significantly to the global industry structure and world economy (Dedrick and Kraemer, 2007). To this end the examination of the Taiwanese electronics industry captures industry leaders from the suppliers' perspective as well as the contributing MNE partners which include Intel, IBM, HP, and Dell which dominate this market. Most of the branded electronic companies outsource their product development as well as manufacturing to so-called original design manufacturers or ODMs, thus disintegrating their supply chain.

Key informants in this study are senior OEM/ODM account managers who are directly involved in international subcontracting relationship with branded firms and have knowledge about IT.

The study uses survey methodology to collect the data. The sampling frame for the survey comprises of all electronic companies from the year 2007 directory of the *Top 5000 Largest Firms in Taiwan*, published by China Credit Information Service Ltd (a total of 1069 companies). All firms in the database were contacted to assess their eligibility and locate appropriate informants for the study.

The data collection followed a two-step approach. Initially, qualitative interviews were conducted with 15 senior OEM/DOM account managers or directors to frame the context of the study and obtain conceptual input necessary to solidify construct development and contextualization of the survey instrument. Although not designed as a dyadic study, care was taken to counter-balance perspectives provided with MNE partners. Hence, two interviews were recorded with branded electronics MNE buyers. In a second step, a large-scale survey was undertaken. To maximize response from Taiwanese-based electronics companies who have been 'over-used' as information providers for management studies in recent years, we followed Yu and

Cooper's (1983) suggestion to combine telephone and personal contact survey. Moreover, we also sent questionnaires through e-mail for respondents who preferred to answer questionnaires in this way. For the telephone and e-mail surveys, each informant who agreed to participate in this study was faxed or emailed a questionnaire packet. 240 useable questionnaires were returned, resulting in an effective response rate of 22.72% (240/1056). Respondent characteristics are presented in Table 1.

Non-response bias was assessed by classifying responses into two groups, early responses and late responses (Armstrong and Overton, 1977). Furthermore, independent t-tests on demographic variables such as revenue and employee number were performed. No significant difference was identified. We also ran other t-tests on key variables such as IT advancements in the proposed conceptual model between these two groups. Again, no significant difference emerged, hence non-response bias did not present a problem in our database (Armstrong and Overton, 1977).

Insert Table 1 about here

3.2 Measurement

Multi-item scales and seven-point response formats were used to operationalize all variables. The measurement approach for each theoretical construct in our model is described briefly below.

3.2.1 Electronic integration

Electron integration of the supplier with the international customer was viewed as a higerh-order construct and operationalized on the basis of Kim et al. (2005) and Kim et al. (2006)'s work, tapping electronic integration for coordination and electronic integration for collaboration. The electronic integration for coordination was assessed employing a four -item scale, which gauges the coordination and control aspects of electronic integration. The collaboration facet of electronic integration was measured using three items that captures the degree to which collaborative channel activities were conducted through SCMs.

3.2.2 Cultural distance

We operationalized cultural distance as a composite score based on the commonly used procedure in international business literature developed by Kogut and Singh (1988), where distance score is calculated for each international customer country based on a variance-weighted average of Hofstede's four dimensions includes individualism, uncertainty avoidance, masculinity and tolerance of power distance (Hofstede, 1984). High and low cultural distance groups are formed by median split of cultural distance scores.

3.2.3 Communication culture context

According to Hall's (1976) approach, countries can be classified into high and low-context culture based on the way messages are communicated within a society. We form high and low-context culture groups of the supplier's international customer in our study based on Hall's classification.

3.2.4 Innovativeness

OEM/ODM supplier' innovativeness was based on Hurley and Hult (1998), and modified to the customer-supplier context. It is operationalized as a construct comprising five measures. These address the suppliers' abilities to introduce technology new to the industry as well as to the company and the service's uniqueness and innovativeness.

3.2.5 Trust

A four-item scale was used to measure trust. It was taken from Doney and Cannon (1997) and adapted to our context. These items measure the supplier's perception of the credibility and benevolence of international customers in the partnerships.

3.2.6 Environmental volatility

The four-item construct taps the variety of the market for the focal supplier's product, in comparison with other products in general. The items capture the changeabilty of market shares, difficulty in monitoring trends, stability of industry volume, and accuracy of sales forecasts, and are borrowed from Skarmeas et al. (2002).

3.2.7 Relationship performance

Relationship performance is defined as the extent to which the suppliers consider their relationships with international customers worthwhile, equitable, productive and satisfying. We developed a scale consisting of eight items on the basis of previous work by Selnes and Sallis (2003) and Kim et al (2006).

4 Analysis and results

4.1 Common method bias

All measures in this study were collected via a single questionnaire, which opens up the threat of common method bias. Survey data is always potentially threatened by common method bias, as such data rely on respondents' perception using a single source of information. We used a two step approach to elucidate this issue. Firstly, Harman's one-factor test was used (Podsakoff and Organ, 1986; Wu et al., 2006). A principal component analysis of all the items included in this study was performed. No dominant factor emerged (the first factor explains only 13% of the total variance), which indicated that there is no evidence suggesting the presence of common method bias in this study. Secondly, we pursued a more rigorous approach to assess the extent to which common method bias is affecting the data analysis by conducting a test for potential common method bias using hierarchically nested covariance structure model offered in the literature (e,g., Cote and Buckley, 1987). The literature suggests that we estimate three models: trait only model (M2), method only model (M3), and trait and method model (M4). Table 2 reports the results of our estimations along with the results of testing for the presence of trait factors and testing for the presence of a method factor (Lee et al., 2004). According to the results, variances from construct items (or traits) are significant. However, variances from the method are present at 1% construct items are considered as in M2 and M4. This suggests that only an insignificant portion of the covariance originates from the method used in data collection. To further assess the extent to which such method variances are presence in our data, we calculated the mean percentages of variance explained by the construct items and by the common method factor. The results show that the mean percentage of variance explained by the construct items is 67.1% while that of the common method factor is only 3.5%, indicating that common method bias is minor (Lee

et al., 2004). Therefore, we conclude that common method bias is not posing a major threat to the study.

Insert Table 2 here

4.1.1 Measurement Model and Construct Validity

We carried out confirmatory factor analysis (CFA) using EQS for Windows 6.1 to evaluate the measurement model. The CFA model includes all five study constructs. To purify the measures, items with a loading less than .5 were eliminated in an effort to increase convergent validity. Furthermore, item scales linked to more than one construct were removed to improve discriminant validity. The purification process yielded at least three items for each construct. As Table 3 shows, the CFA model revealed an excellent fit with the covariances provided by the dataset with χ^2 = 390.05 on 194 d.f., NNFI = .935, CFI = .946, SRMR = .049, and RMSEA = .064 (Bentler and Chou, 1987).

Subsequently, the unidimensionality of constructs was assessed by assessing convergent validity, discriminant validity, and construct reliability. According to the results, all items are significantly loaded on their corresponding factor ($p < .01$) and their loadings are greater than .5 as shown in Table 3, suggesting that all study constructs have an adequate level of convergent validity (Nunnally and Bernstein, 1994). For discriminant validity, average variance extracted (AVE) of each construct should be greater than its shared variances (Fornell and Larcker, 1981). As reported in Table 4, the average variance extracted (AVE) for each construct ranged from .55 to .71 while the shared variances among constructs ranged from .02 to .66, as reported in the upper triangle of Table 4. However, no shared variances were greater than AVE of the respective construct. These results demonstrate a good level of discriminant validity between our study

constructs (Fornell and Larcker, 1981). Finally, the composite reliability of each construct and standardized parameters of measurement items are reported in Table 3. All composite reliabilities are greater than .86, far above the acceptable level of .7 suggested in the literature (Nunnally and Bernstein, 1994).

Insert Tables 3 & 4 here

4.1.2 EIC as a second order construct

Before estimating the structural model with EIC as a second order construct, we estimated another CFA with EIC specified as a second-order construct to assess its validity as a second-order construct. All other constructs remained the same as in the previous CFA. The results were χ^2 = 390.62 with 196 d.f., NNFI = .936, CFI = .946, SRMR = .049, and RMSEA = .064. While NNFI shows a minor fit improvement, most other fit indexes remained pretty much the same. Furthermore, the chi-square difference confirms the two CFA models are not statistically different. To assess the model fit improvement between these non-nested models, we examined CAIC index reported. In order for a non-nested model fit to be improved, CAIC index should be decreased. According to the results, there was a slight fit improvement from the first order model (CAIC = -871.987) to the second order model (CAIC = -884.429).

Subsequently, the validity of the second-order construct was assessed by examining the loadings of the two dimensions of EIC first for convergent validity. As shown in Table 5, the loadings were .70 for electronic coordination and .90 for electronic collaboration indicating a good level of convergent validity. For discriminant validity, we examined the AVEs and shared variances. The shared variances ranged from .02 to .30, which is much less than the AVE of .65 for EIC. It shows a good level of discriminant validity for EIC as a second order construct. The

composite reliability of EIC, the second order construct, was .79, which is greater than .70, suggested in the literature (Nunnally and Bernstein, 1994). These results suggest good construct validity for EIC as a second-order construct.

Insert Table 5 here

4.2 Structural model

To test our hypotheses, the proposed model with all measurement items from the CFA model with EIC as a second order construct is estimated using EQS for Windows 6.1. The results reveal an excellent fit of the model with the empirical covariances provided by the data with χ^2 = 463.60.975 on 240 d.f., NNFI = .927, CFI = .937, SRMR = .052, RMSEA = .062. Based on the excellent fit of the structural model, the proposed hypotheses are tested.

In Hypothesis 1, we claimed that the difference in the communication cultures (e.g., high vs. low context of cultures) would affect EIC positively. That is, if the buyer is from a high context culture, EIC will be lower. According to the result, it is supported (b = -.120, p < .05). We also maintained in Hypothesis 2 that a greater level of cultural distance between the international buyer and supplier will result in a higher level of EIC. However, it is not supported by the result (b=.-.032, p > .05). In Hypothesis 3, we claimed that a supplier's innovativeness will affect EIC positively, which is supported by the result (b=.302, p < .01). It is further argued in Hypothesis 4 that a supplier's trust in the international buyer will result in a high level of EIC. The results also support this hypothesis (b=.181, p < .01). The results further lend support for Hypothesis 5 that argues a negative impact of environmental turbulence on EIC (b= -.152, p <.05).

In regard to the impact of EIC on relational performance, we expected in Hypothesis 6 that EIC influences relational performance positively. The results provide support for this

hypothesis (b = .143, p < .05). In Hypothesis 7a, we contend that innovativeness of the spplier will have a direct impact on relational performance, which is supported by the result (b = .312, p < .01). It is also expected in Hypothesis 7b that trust leads to relational performance directly, which is supported by the result (b = .393, p < .01). Finally, environmental turbulence was expected to have a negative impact on relational performance directly. We did not find support for the hypothesis (b = -.029, p > .05). We summarize these results in Figure 2.

Insert Figure 2 here

5 Discussion

With the growing of international outsourcing activities, managing interorganizational relationships becomes critically important. Electronic integration via advanced IT has been increasingly adopted in interfirm relationships as an effective coordination mechanism. This study seeks to understand the antecedents and consequences of electronic integration in international customer-supplier relationships. Drawing from TCE, RBV and relational exchange perspectives, we investigate environmental volatility, innovativeness and trust as key drivers of electronic integration. More specifically, based on Hall (1976) and Hofstede's (1984) conceptualization, we examine the impact of communication culture and culture distance on the degree of electronic integration in international exchange relationships. Moreover, we examine the performance outcome of electronic integration in international exchange relationships. The results of this study have some implications for both theoretical development and managerial practice.

Conceptualizing electronic integration as a second order construct including electronic coordination and electronic collaboration, electronic integration in international customer-supplier relationships in this study has a positive and significant impact on relationship

performance for suppliers. The results demonstrate that electronic integration in terms of effective use IT in coordination and collaboration channel activities can work as an effective governance mechanism. Supplying firms with greater extent of electronic integration with international customers can enhance information processing capabilities and reduce coordination costs cross-border which ultimately improve performance outcome. This is consistent with TCE which argues that effective governance mechanism can enhance firm value in exchange relationships. This is also consistent with the RBV perspective which argues that IT alone is not sufficient for enhancing firm's performance. Only by integrating with specific firm activities such as coordination and collaboration in international exchange relationships, IT can be a source of firm's competitive advantage. Therefore, electronic integration in international exchange relationships can be seen as both effective governance mechanism and a contribution to the enhancement of firm capabilities. This is in line with an emerging view that argues that firm resources and capabilities can span across firm boundaries and be embedded in interfirm relationships. Electronic integration in international exchange relationships can thus be viewed as an effective governance mechanism which also serves as firm capability and creates value for suppliers in international exchange relationships.

In terms of the antecedents of electronic integration in international customer-supplier relationships, the results show that communication culture has a significant impact on the degree of electronic integration. When a high context culture supplier is in relationships with an international customer from high context culture, this supplier will tend to be more reluctant to use interorganizational information systems for coordination and collaboration activities. This finding verifies communication culture between exchange parties in international exchange relationships plays a crucial role in determining the degree of electronic integration in international customer-supplier relationships. Communication culture, which emphasized the

context in which exchange parties communicate each other, has a significant impact on electronic IT integration. Some earlier studies have argued the potential impact of culture on IT adoption. However, limited empirical work has focused on communication culture and in fact empirically establishes its impact on the degree of electronic integration in international exchange relationships.

On the contrary, in our study, cultural distance, which is conceptualized based on Hostede's (1984) culture dimensions, does not link to electronic integration. This finding is interesting and consistent with recent arguments on the misleading role of cultural distance in international business. That is, recent studies have criticized on using Kogut and Singh (1988)'s composite scores of cultural distance as a proxy of national cultural difference. For example, driven by globalization and a significant cross-pollination effect of culture (Ralston et al., 2008), more and more global managers have a global mind-set and similar culture value. Therefore, using a composite score of cultural distance in examining cross-border activities has become more challenging for international business studies (Tung, 2008). This study finds that using communication culture in measuring national cultural difference seems more appropriate in examining the adoption electronic integration in international exchange relationships.

The results also show that innovative culture of suppliers can facilitate the development of electronic integration in international exchange relationships. This finding demonstrates that innovativeness orientation plays a crucial role in developing a supplier's IT capability that is conducive to higher firm performance. Innovativeness orientation serves a signaling function in that it shows the ability and strategic orientation of the supplier to engage in cross-border e-commerce activities. This is consistent with prior literature which proposed the crucial role of innovativeness culture in the diffusion of innovation. Moreover, the finding demonstrates that

innovativeness has strong direct impact on relationship performance. The results highlight the importance of supplier innovativeness in developing more productive international exchange relationships with the customers.

The strength of the impact of trust on electronic integration is consistent with prior findings and thus reinforces the importance of developing healthy, trust-based relationships as key antecedents of electronic integration in interfirm relationships. For electronic integration to pan out successfully between exchange partners, trust serves as a key foundation function. It is an inter-organizational tool that facilitates effective coordination and collaboration between exchange partners. This is specifically pertinent in the context of international supplier-customer relationships, where customers enjoy largely a powerful role, due to the smaller suppliers' dependency on their business partners. Customers are usually more reluctant to share critical knowledge, specifically if trust has not yet been developed between exchange partners. Furthermore, trust also serves as an effective mechanism in terms of improving outcomes of the relationship.

The findings also show that environmental volatility presents a barrier and hinders the willingness to utilize electronic integration as a relational exchange and coordination mechanism between international suppliers and customers. The specific international context which exacerbates the geographical and cultural distance of exchange partners obviously implicates a reduced willingness to integrate closely via electronic forms. While this could potentially allow exchange partners to maintain adaptive responsiveness and flexibility capability, it seems environmental volatility reduces this exchange option.

In line with our expectations our findings support the direct and positive relationship between electronic integration and relationship performance. Electronic integration serves as a

governance enabler in that it provides better information processing capabilities and in helping operation and coordination process for international suppliers with their customers. It reduces transaction costs and helps suppliers to reap tangible rewards in terms of increased sales growth, increased market share and profitability as well as contributes to the creation of new products and learning about customers and markets for products.

From a managerial perspective, the findings suggest that small electronic suppliers are well advised to invest in electronic integration, i.e. coordination and collaboration processes with their customers. Electronic integration offers a good route for channeling internal mechanisms such as innovativeness and it also leverages trust, an interorganizational mechanism. A major contribution of this study is the explicit consideration of electronic integration in terms of coordination and collaboration and its impact in relationship performance of suppliers. Electronic integration features positive impacts on performance. By incorporating context of culture in our study which shows significant negative impact on electronic integration, it is also highlighted that culture play an important role in the relationship exchange via electronic means. While cultural distance does not show any significant results, the context of culture is a very important consideration for electronic integration in international supplier-customer relationships.

6 Limitations

The findings need to be seen against a set of limitations. Firstly, when examining electronic integration and its associated antecedents and performance outcomes, this study considered the perspective of suppliers. While there is a paucity of studies taking the supplier perspective and thus this viewpoint is an important contribution, it may be valuable to compare whether the findings are equally applicable from the perspective of the international customer. Dyadic perspectives in this context pose the specific challenge of asking respondents about the

identity and contact details of their counterpart. We have been unsuccessful in eliciting appropriate response from our research partners, but future avenues are wide open for this challenge. Secondly, the specific context was a supplier sample in Taiwan, suggesting that an extension of the study to other countries is desirable. We hope that this study will inspire further research to address issues pertaining to the critical role electronic integration plays in international supplier- customer relationships.

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8 Appendix – Figures and tables

Figure 1: Proposed conceptualization of electronic integration in international supplier-customer relationships.

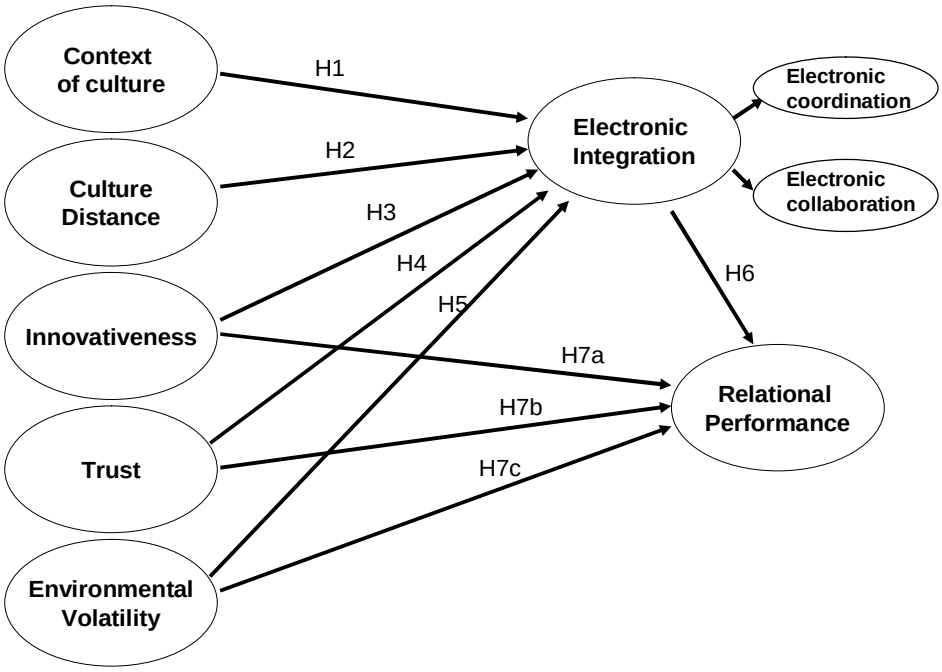

Table 1: Demographic characteristics of the respondents firms (n=240)

Product Distribution	Percentage
Communication Products	12.1%
Systems	6.3%
Computer Peripherals	14.2%
Optoelectronics	14.6%
Semiconductors	15.8%
Computer Components	37.1%

Employee Numbers	Percentage
Less than 100	20.0%
100-199	21.7%
200-499	26.7%
500-999	13.3%
1000-4999	14.6%
5000-9999	1.7%
10000 and above	2.1%

Sales Revenue	Percentage
NT100M-NT500M (US $3M)	19.6%
NT501-NT1B	15.8%
NT1B-NT5B	39.2%
NT5B-NT10B	7.5%
More than NT10B (US $300M)	17.9%

Table 2: Assessment of Common Method Bias

Model	χ^2	df	p	CFI	NNFI	SRMR
M1: Null model	3841.14	231	.000	n/a	n/a	n/a
M2: Trait only model	390.05	194	.000	.935	.946	.049
M3: Method only model	2352.41	209	.000	.344	.406	.169
M4: Trait and method model	257.14	172	.000	.968	.976	.036

Model Comparison	$\Delta\chi^2$	Δdf	p	Conclusion
Testing for the presence of trait factors				
M1-M2	3451.09	37	<.01	M1>M2
M3-M4	2095.27	37	<.01	M3>M4
Testing for the presence of a method factor				
M1-M3	1488.73	22	<.01	M1>M3
M2-M4	132.91	22	>.01	M2>M4

Table 3: Measures and composite reliabilities

Constructs and Measures		Composite Reliability
Innovativeness		**.87**
Our firm's management actively seeks innovative ideas.	.87	
Innovation is readily accepted in program/ project management.	.91	
Technical innovation is readily accepted in our firm.	.69	
Trust		**.88**
We believe the information that our international customer provides us.	.78	
Our international customer is genuinely concerned that our business succeeds.	.89	
When making important decisions, our international customer considers our welfare as well as his own.	.74	
Our international customer is trustworthy.	.80	
Environmental Volatility		**.92**
Sale forecasts in your business are quite inaccurate.	.91	
It is very difficult to monitor the trends in our industry	.99	
Sales volume in our industry is very volatile	.75	
Electronic Integration-Coordination		**.89**
Our international customer monitors our quality of product electronically.	.70	
We exchange product price and market information with our international customer electronically.	.73	
We and our international customer coordinate production plans with each other electronically.	.91	
We and our international customer coordinate inventory levels with each other electronically.	.93	
Electronic Integration-Collaboration		**.88**
Relying on our information system we collaborate on forecasting and planning with our international customer.	.93	
Collaboration in demand forecasting and planning with our international customer is always possible through our information system.	.89	
We collaborate with our international customer on new product design and development through our information system.	.69	
Relationship Performance		**.86**
Increased sales growth.	.73	
Increased market share.	.66	
Enhance product quality.	.75	
Improvements to current processes or creation of new processes	.72	
Learning about customers and markets for our products	.84	

CFA Model Goodness of Fit Indexes:

Chi-square: 390.05 on 194 d.f., NNFI: .935, CFI: .946, SRMR: .049, RMSEA: .064

[a] All items were measured using a 7-point Likert scale ranging from 1=strongly disagree to 7=strongly agree

Table 4: Intercorrelations and Shared Variances of Measures (n=246)

	F1	F2	F3	F4	F5	F6
Innovativeness (F1)	**.69**	.13	.02	.09	.16	.25
Trust (F2)	.36	**.65**	.07	.07	.12	.44
Environmental Turbulence (F3)	-.14	-.26	**.79**	.04	.06	.05
Electronic Integration (F4)	.30	.26	-.20	**.68**	.66	.11
Electronic Integration-Coll (F5)	.40	.34	-.25	.81	**.71**	.15
Relationship Performance (F6)	.50	.66	-.22	.33	.39	**.55**

Note: The correlations are in the lower triangle of the matrix. Shared variances are in the upper triangle of the matrix. The average variance extracted is in the diagonals.

Table 5: Electronic Integration - Second Order Construct

First-Order Construct	Loadings
Electronic Coordination	.70
Electronic Collaboration	.90

Note: Average Variance Extracted = .65; composite reliability = .79.

Figure 2: Role of electronic integration in international buyer-seller relationships