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Suppliers' Internal Capabilities and Participation in the Electronic Market

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ABSTRACT

Business to business (B2B) is the fastest growing segment of the explosive growth of e-commerce. The purpose of this study is to identify internal factors which influence the supplier's adoption of private exchange (PE), a single buyer side electronic market (EM). This study identified cost, flexibility, delivery, and quality as internal capabilities and investigated how these four factors influence suppliers' participation in PE. The results of the study indicate the following: (1) suppliers do not believe that their capability to produce customized products for customers plays an important role in PE; (2) they still believe that standardized rather than engineered products would dominate the marketplace; and (3) a contractible factor like lower price, rather than non-contractible factors including superior flexibility of production capability, fast and reliable delivery, and quality, plays an important role in the market.

Keywords

Private Exchange, Internal Capabilities, Adoption of Electronic Market

INTRODUCTION

An explosive growth in business to business (B2B) electronic market (EM) has become a global trend. However, many B2B EMs are struggling to survive because they have failed to attract enough participants. Thus, it would be very meaningful to identify factors which influence suppliers' participation in EM.

Among many B2B EMs, this study focuses on private exchange (PE) since it is currently the fastest-growing type and also is expected to be a major segment of B2B EM (Laudon and Laudon, 2005; Whitaker et al., 2001). PE is a privately built EM by a single buyer who attracts many suppliers into the buyer's market. The main benefit of this model is that, if successfully implemented, the market helps both the buyer and sellers. This is because PE not only keeps the advantage of close off-line relationships but also gives the benefit of on-line transactions. Since PE is one of the web-driven exchange models based on collaboration among partner firms, in addition to commercial transactions, participating firms can conduct business in the most effective way.

While it is important to understand what makes potential participants join EM, most studies have focused on the inter-organizational factors such as trust, dependency, subsidy expected from a partner, and the number of suppliers as factors influencing suppliers' adoption of electronic data interchange (EDI), the domain which is different from major B2B EMs like PE.

In the B2B PE environment, suppliers' primary concern has changed from inter-organizational factors to their internal capability since they do not expect their off-line relationships with the buyer to be transferred to on-line relationships. Although previous studies on EDI adoption introduced perceived benefits as factor similar to internal capability, these studies focused not on suppliers' internal capability before EDI adoption but rather on their internal capabilities which are expected to improve after adopting EDI (Cragg and King, 1993; Iacovou; 1995). Thus, this study intends to identify internal factors which influence the supplier's adoption of PE. For the purpose of this research, we identified cost, flexibility, delivery, and quality as internal capabilities which influence suppliers' decision to participate in PE since; (1) they have played very important roles as order-winning criteria or order qualifying criteria; (2) inter-organizational factors, such as trust, depend heavily on the web in EM; and most importantly (3) the advanced IT also shifted the focus of buyer-supplier relationships from contractible aspects like price and product specifications to non-contractible factors including quality, speed, and

flexibility. Thus, this study investigates how these four factors are influencing suppliers' participation in PE, which supports horizontal collaboration between partners. In summary, the research question can be stated as follows: What are the internal capabilities that influence suppliers' adoption of PE?

PE FOR PRIVATE COLLABORATION

PE is a new type of B2B EM that is emerging, and it is expected to eventually be the main B2B EM (Whitaker et al., 2001). According to Jupiter Research (Jupiter Research Center, 2001), spending on PE infrastructure was expected to reach \$37 billion by 2005. According to different perspectives of scholars or practitioners, PE can be defined differently. However, there are common characteristics which differentiate PE from other kinds of public EMs as follows (Cap Gemini Ernst & Young, 2001):

- (1) PE is privately built by a single buyer or a consortium of buyers who attract many suppliers into the buyer's market.
- (2) PE is designed to accept only a closed group of the most trusted and valuable partners.
- (3) As a closed market, PE provides more secure information and knowledge flows, thus resulting in an increased level of knowledge sharing among partners.
- (4) PE focuses on value creation among partners whereas other EMs emphasize market liquidity and standardization of processes to increase the transaction-based revenue

In sum, PE is significantly different from other kinds of EM as its focus is on buyer-supplier relationships rather than on contractible aspects, thus shifting from price and product specifications to quality, speed, and flexibility. Kirchsteiger et al. (2002) supported this idea by stating that most public EMs have failed since they made sellers compete on price only, whereas most business contracts involve differentiated goods and services focusing on quality, convenience, and reliability, as well as a price. Sairamesh et al. (2002) also introduced the conflict of interest between suppliers and buyers as a reason for most EM failures. They stated, "suppliers may want to differentiate their products, whereas market makers want to describe products across suppliers in a common fashion to enable better search and comparison."

RESEARCH DESIGN AND METHODOLOGY

Research Frame and Variables

The purpose of this study is to identify suppliers' internal capabilities which influence suppliers' adoption of PE. Figure 1 presents the research framework.

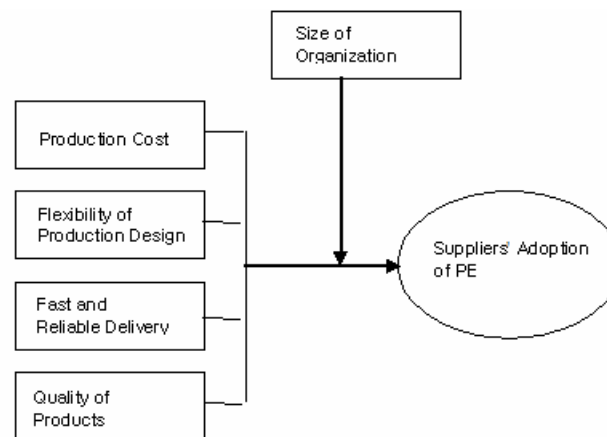


Figure 1. Research Framework

This study measured suppliers' intention of adopting PE by using a single item and used it as the dependent variable. To control the influence of the size of organization, this study adopted organization size which is measured by the number of

employees as a control variable. Independent variables consist of four types of capabilities which are measured in terms of (1) production cost, (2) flexibility of products, (3) fast and reliable delivery, and (4) quality of products as follows:

Step 1: Calculate the difference between the current level of each supplier's capabilities in terms of production cost and its expected importance as an order-winning criterion in PE. The negative numbers represent under capability, while the positive numbers represent over capability.

Step 2: Do the same for flexibility of production capacity, fast and reliable delivery, and quality of products.

As explained above, this study measured the gap between suppliers' source of core competence and expected order winning criteria in PE and used the value as the suppliers' internal capabilities.

Hypothesis

To investigate the influence of suppliers' internal capabilities on their adoption of PE, this study developed a set of hypotheses by focusing on four kinds of capabilities introduced above. The hypotheses focus on the perceived strengths or weaknesses that suppliers expect when they join PE. For this purpose, the hypotheses will test the relationship between "suppliers' internal capabilities" and their intention of joining PE.

As explained in the previous section, this study focuses on suppliers' internal capabilities in terms of four factors including cost, flexibility, delivery, and quality since they have been known as order winning criteria or order qualifiers (Miller and Roth, 1994; Vastag and Narasiman, 1998), and their importance has been changed significantly since the advent of the Internet era. Moreover, development of information technology (IT) has moved the focus of the buyer-supplier relationship from a contractible aspect to non-contractible aspects. Thus, it will be very meaningful to identify what kinds of capabilities really influence a supplier's intention of joining PE.

Since the sample firms of this study are small and medium sized manufacturing organizations that supply electronic parts for a global manufacturing firm, which produces electronic products, this study adopted the issue of congruence from the domain of manufacturing to measure capabilities. Vastag and Narasimhan (1998) insisted that the focus of firms' manufacturing practice should be strongly related to performance measures including cost, flexibility, delivery, and quality. Challis et al.'s (2002) study also proved a positive relationship between the focus of manufacturing practice and firms' measurable performance. Thus, this study assumes that a supplier's area of core competence reflects the current focus of its manufacturing practice. This study also assumes that the expected order winning criteria in PE should indicate the focus of the manufacturing strategy, which will lead the focus to future manufacturing practice.

Miller and Roth (1994) argued that core competencies such as cost, flexibility, delivery, and quality should be related to corporate strategy, which includes manufacturing strategy as a subordinate function. Vastag and Narasimhan (1998) emphasized the importance of the congruence between manufacturing practices and manufacturing strategy. Skinner (1978) also maintained that organizations that have congruence are superior to those without in terms of firm performance.

Iacovou et al. (1995) suggested that the supplier's adoption of EDI is influenced by opportunities for increased ability to compete by providing better service at a lower price. Those which have competed on quality and long-term relationships hesitated to adopt EDI since they believed that their source of strength might be lost in the new environment. As shown in Figure 2, the result of their study implies that a supplier's current source of core competence can also be a source of order winning criteria in PE and thus a major adoption factor for PE.

This study posits that the relationship between suppliers' capability and their intention of adopting PE varies according to different kinds of internal capabilities. For example, suppliers with high internal capability in terms of production cost tend to have the intention of joining PE since they still believe they need to compete mainly on the price. On the other hand, suppliers with high capability in terms of flexibility, delivery, and quality will show a low level of intention of joining PE since they do not believe their capability in these areas will play an important role as order winning criteria in PE. Thus, the following hypotheses are developed (See Figure 2).

- H1. The greater the level of capabilities in terms of production cost, the higher the intention of suppliers to join PE.
- H2. The greater the level of capability in terms of flexibility of production capability, the lower the intention of suppliers to join PE.
- H3. The greater the level of capabilities in terms of reliable and fast delivery, the lower the intention of suppliers to join PE.
- H4. The greater the level of capabilities in terms of the quality of products, the lower the intention of suppliers to join PE.

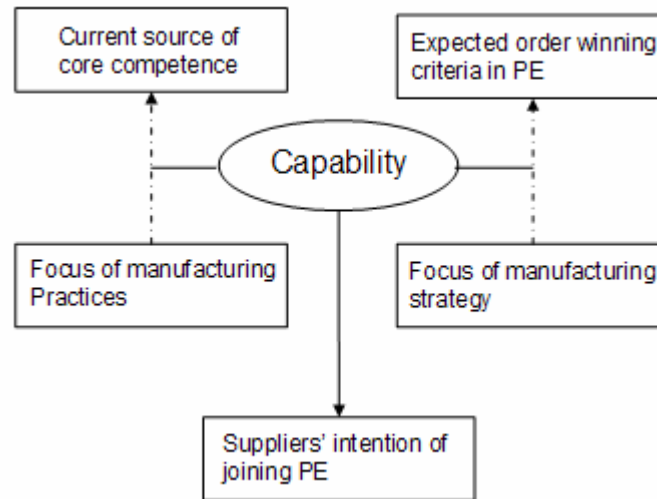


Figure 2. Research Model

Research Methodology

Sample and Data Collection

This study is intended to investigate the relationships between the suppliers' intention of joining PE and the internal capabilities that are expected to influence suppliers' intention. This study addressed the dynamic aspect of suppliers' internal capabilities which are assumed to be significantly influenced by advanced IT. A total of 400 suppliers of a single buyer, a major IT firm which was recently ranked as one of the top five IT firms in the world (Business Week, 2004) and one of the top 25 global brands (Business Week, 2005), were selected as a sample group. Thus, the unit of analysis of this study is the organization.

The questionnaires were sent to the marketing manager or the highest-ranking officer in charge of the marketing function who has the overall understanding of and responsibility for the organization's relationship with the buyer and the firm's internal capability.

Instrument Design

To develop the questionnaire, interviews with practitioners were conducted to identify potential factors influencing suppliers' participation in PE. Also, a thorough review of previous literature on the related areas including (1) EDI adoption, (2) electronic markets, (3) IT and inter-organizational relationships, and (4) changes incurred by the Internet technology, was conducted to identify factors.

By aggregating the results from both interviews and literature reviews, the first draft of the questionnaire measuring (1) the characteristics of the suppliers, (2) suppliers' perception of PE, and (3) suppliers' market position were developed. Then, the questionnaire was significantly revised through three pilot tests using the suppliers in the same industry. The final version of the questionnaires were distributed to the sample group.

Statistical Tools

To investigate the relationships between suppliers' intention of joining PE and their internal capabilities, various statistical tools are employed for this study. First, multiple regression analyses were employed to identify which capabilities actually influence suppliers' intention to adopt PE. Second, suppliers were separated into two groups, according to their level of four kinds of capabilities and that of the overall capability. Then, five independent sample t-tests were conducted to differentiate the two groups by comparing the mean scores of their intention to adopt PE. SPSS 12.0 was used for analyses.

RESULTS AND DISCUSSION

Analysis of Data

Of the 400 questionnaires distributed, 113 usable responses were received. Twenty-one questionnaires were returned to the researchers due to one of the following postal service explanations: (1) The address was wrong, (2) the firm was no longer in

existence, or (3) the firm had moved. Excluding the returned questionnaires due to wrong addresses, the response rate was 28.25%.

Tables 1 and 2 show the demographic characteristics of responding organizations. The size of the organization is illustrated by the number of employees. The average number of employees of responding organization was 198. Table 1 summarizes the distribution of the responding organization size represented by specific ranges. The result indicates that most of the responding organizations are small- and medium-sized enterprises (SMEs).

Number of employees	Frequency	Percent	Cumulative Percent
9 or less	13	11.7	11.7
49 or less	17	15.3	27.0
99 or less	19	17.1	44.1
499 or less	53	47.7	91.9
999 or less	5	4.5	96.4
1000 or more	4	3.6	100.0
Total*	111	100.0	

* Two organizations did not indicate the number of employees.

Table 1. Number of Employees

When it comes to the relationship with buyers, the average length of the relationship between the responding organization and the buyer is 12.49 years, and the average number of main buyers of responding organizations is 13.94. Table 2 represents the business type of the responding organizations. Since the sample group consists of suppliers of a global IT firm, 69.6% of respondents are classified as manufacturers of electric or electronic products.

Type	Frequency	Valid Percent	Cumulative Percent
Electric, Electronics	78	69.6	69.6
Metal, Machine	11	9.9	79.5
Other	23	20.5	100
Total*	112	100.0	

* One organization did not respond to this question.

Table 2. Type of Business

Hypotheses Test

Multiple regression analysis was conducted to test hypotheses developed for this study. Then, the suppliers were separated into two groups: (1) those with higher levels of intention to join PE, and (2) those with lower levels of intention. Next, independent sample t-Tests were conducted to identify which factors really differentiate these two groups.

Multiple regression analysis was conducted to identify the suppliers' internal capabilities that influence their intention of joining PE. As shown in Table 5, four factors including (1) production cost, (2) flexibility of production capability, (3) reliable and fast delivery, and (4) quality of product were used as independent variables. The size of the organization was used as a control variable. The dependent variable is the suppliers' intention of adopting PE.

Table 3 shows the extracted model, which explains about 10% of total variance.

Model	R	R Square	Adjusted R Square	Std. Error
1	.312	.098	.052	.801

Table 3. Model Summary

P value (.064) in ANOVA statistics in Table 4 shows the model is significant at the α -level of 0.1.

Model		Sum of Squares	df	Mean Square	F	P
1	Regression	6.935	5	1.387	3.065	.064
	Residual	64.169	100	.642		
	Total	71.104	105			

Table 4. ANOVA Statistics

Tolerance scores in Table 5 show that a multi-collinearity problem can be ignored since all the tolerance scores are greater than .01 (Pedhazur, 1997). The Durbin Watson coefficient for the auto-correlation problem was not checked since the data is not a time series one. The coefficient scores in the table show the flexibility of production capability was identified as a major factor influencing suppliers' intention of joining PE. The result indicates that there is a negative relationship between the suppliers' intention and capability in terms of production flexibility. This means that the higher the capability in terms of flexibility, the lower the suppliers' intention to join PE.

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics
Model		B	Std. Error	Beta			Tolerance
1	Constant	3.382	.105		32.300	.000	
	Cost	.047	.061	.079	.781	.437	.837
	Flexibility	-.156	.070	-.251	-2.236	.028	.896
	Delivery	-.094	.080	-.139	-1.178	.242	.711
	Quality	.020	.092	.028	.219	.827	.554
	Size	-9.486E-0.5	.000	-.033	-.339	.735	.806

Table 5. Regression Model Results

The result of the hypotheses tests is summarized as seen in Table 6.

Hypotheses	Factors	Results
H1	Production cost	Not supported
H2	Flexibility of production capability	Supported
H3	Fast and reliable delivery	Not supported
H4	Quality of products	Not supported

Table 6. Result of Hypotheses Test

To check the individual effect of each type of capability, five t-Tests on four kinds of capabilities and an overall capability were conducted. First, the group was separated into two groups for each t-Test by using the mean score of each capability as a cut-off point between the two groups. Thus, group one consisted of suppliers with the lower 50 percent of capability and group two, those with the higher 50 percent of capability. As seen in Table 7, there are significant differences between the two groups in terms of flexibility, delivery, and overall capability. These results imply that: (1) the greater the flexibility of production capability, the lower the intention of suppliers to join PE; and (2) the greater the delivery capability, the lower the suppliers' intention to join PE. Although the results were not statistically significant, t-Test on the two groups separated by quality also showed the same trend as flexibility. The results from the additional t-Test analyses also strongly support the result of the hypotheses test.

Factor	Group by Capability	N	Mean	Std. Deviation	P value
Cost	Low	40	3.1500	1.02657	.374
	High	70	3.3143	.71308	
Flexibility	Low	56	3.4643	.68661	.002
	High	52	2.9808	.89641	
Delivery	Low	56	3.3929	.73059	.080
	High	54	2.1111	.92485	
Quality	Low	51	3.3529	.74360	.248
	High	59	3.1695	.91260	

Table 7. Result of the t-Test

Discussion

The results of this study imply that suppliers with competitive advantage in terms of non-contractible aspects like flexibility and delivery hesitate to join PE since they believe their source of strengths would not play important roles in the new market.

Among the four factors analyzed, the flexibility of production capability plays a very important role. The negative coefficient in the multiple regression analysis supports the second hypothesis of this study that "The greater the level of capability in terms of flexibility of production capability, the lower the intention of suppliers to join PE." The result implies: (1) suppliers do not believe that their capability to produce customized products for customers will play an important role in PE; and (2) they still believe that standardized rather than engineered products still dominate the marketplace. Another negative relationship was identified between suppliers' capability in terms of a reliable and fast delivery and their intention to join PE, although the P-value is a bit higher ($p > 0.1$) than a statistically significant value. This result means that suppliers do not believe that their capability in terms of reliable and fast delivery will play an important role in PE.

On the other hand, a positive relationship was identified between suppliers' capability in terms of production cost and their intention to join PE as this study hypothesized. Even though this result was not statistically significant, it deserves our attention since it supports that suppliers still regards PE as a marketplace where many suppliers have to compete based on the price. Suppliers' capability in terms of quality of products showed neither positive nor negative relationship with their intention to join PE. This result implies that some suppliers believe that the focus of EM will shift from a contractable aspect like the price of products to non-contractable factors like quality of products, by virtue of advanced information systems, while other suppliers still believe that only price of products will play an important role in the EM. Also, size of the organization had no impact on suppliers' intention to join PE.

CONCLUSION

The purpose of this study is to identify internal capability factors which influence the supplier's decision to join PE. For this purpose, this study identified price, flexibility, delivery, and quality as internal capabilities. The results of this study showed that suppliers still believe that contractable aspects rather than non-contractable areas play important roles even in the new type of EM. Especially, the result indicated that the flexibility of production capability plays a very important role in suppliers' decision to join PE and suppliers still believe that standardized rather than engineered products will dominate the PE marketplace. In sum, the result of statistical analyses suggest that suppliers still believe that PE is a price based marketplace where lower price rather than non-contractable areas such as superior flexibility of production capability, fast and reliable delivery, and quality play important roles as order winning criteria. Thus, buyers need to convince their suppliers that PEM is a new marketplace where not only price but also other non-contractable factors play important roles as order winning criteria.

Because this study is based on a survey method to test a set of developed hypotheses, it has some limitations related to research processes. First, it was not easy for the respondents to clearly understand what the fundamental difference is between PE and other kinds of electronic markets, even though the characteristics of PE are clearly described in the questionnaire. Thus, it would have been meaningful if the data were collected through direct interviews with each supplier. However, it was not possible as the unit of analysis is the organization (the supplier) and the required sample size is simply too large in terms of cost, time, and available human resource to conduct the study. Second, all the respondents are suppliers of a single global IT firm. Thus, the result of this study has a limitation in terms of external validity. This means that the result of this study might not be applied to other industries since each industry has its own unique context and business environment. Third, the result of this study could vary according to different cultural and economic environments. For example, different sets of factors might be identified according to geographical locations of each sample group, even if the sample groups are from the same industry.

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