

Determinants of Corporate Adoption of e-Marketplace : An Innovation Theory Perspective

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Abstract

Despite the growing interest and attention from IT researchers and practitioners, empirical research on the adoption of e-Marketplaces has been limited. This study identifies the factors influencing e-Marketplace adoption from an IT innovation perspective. Innovation, environment, and organization characteristics were tested as determinants of the adoption of an e-Marketplace based on a survey of 39 manufacturing firms. The findings indicate that external pressure and organizational size have positive relationships with organizational adoption of e-Marketplaces. Contrary to the prior innovation research, however, relative advantages did not have a significant impact on the organizational adoption of an e-Marketplace.

Key Words: B2B EC, e-Marketplace, innovation theory

Introduction

The Internet can provide the most economical business-to-business (B2B) electronic commerce platform for linking companies without additional network implementation (Turban et al. 2000). B2B electronic commerce can contribute to lower purchase costs, reduced inventory, enhanced efficiency of logistics, as well as to increased sales and lower and marketing costs (Baron et al. 2000). Since supply chain management encompasses "the coordination of order generation, order taking, and order fulfillment/distribution of products, services, or information" (Kalakota and Whinston 1997), the involved companies can be studied from both the buyers' and the sellers' points of view (Turban et al. 2000). From the purchasing company's

point of view, B2B electronic commerce facilitates procurement innovations to result in reduced purchase price, reduced cycle time, and improved supplier sourcing (Turban et al. 2000). Of the two primary forms of B2B electronic commerce (interorganizational systems based on electronic data interchange, electronic marketplace), this study explores the issues related to electronic marketplace (e-marketplace, hereafter).

So far, prior research (Gupta 1997) on B2B e-Marketplace has focused on analyzing its operating benefits, not addressing the factors that may impact the corporate purchasing department's decision to source electronically. Field applications and technical aspects of e-Marketplaces have been discussed at significant length; but limited empirical research has been conducted to understand the factors related to the e-Marketplace adoption.

The objective of this research is to identify the factors that influence corporate e-Marketplace adoption from an IT innovation perspective.

This paper is organized as follows. The next section reviews the existing literature on e-Marketplace and the theoretical framework of the research. The research model and hypotheses are proposed in section three. Section four reports on the data collection method, sample characteristics, and reliability and validity of the instruments. Section five provides analysis of the results and discussions on the research findings. In section six, we conclude with the implications and limitations of the research.

Literature Review on e-Marketplace

Purchasing vs. Procurement: Definition

A procurement department in an organization buys different

types of materials and services, and the procedures used in completing a total transaction normally vary among the different types of purchases. Cavinato (1984) defined procurement, in a narrow sense, as the act of buying goods and services for a firm or, in a broader perspective, as the activity of acquiring goods and services for the firm. The procurement process consists of all those activities necessary to acquire goods and services consistent with user requirements (Novack and Simco 1991). Koppius (1999) defined procurement as the relationship between buyers and sellers, with delivery-process as the relationship instance. The procurement process encompasses a wider range of supply activities than those included in the purchasing function (Dobler and Burt 1996).

From the buyer's perspective, several variations of the procurement process exist (Baron et al. 2000; Dobler and Burt 1996). Business procurement life cycles include a variety of phases that cover information gathering, negotiation, fulfillment, maintenance and disposal (Gebauer et al. 1998; Novack and Simco 1991). Archer and Yuan (2000) have also developed a more detailed seven-phase life cycle to match activities between supplier and customer organizations. The seven-phase life cycle consists of information gathering, supplier contact, background review, negotiation, fulfillment, consumption/ maintenance/ disposal, and renewal.

In this study, we define procurement as "the process of developing and managing qualified suppliers for effective and efficient organizational purchasing". Organizational purchasing is defined as "a series of activities pertaining to acquiring goods used in the operation of an organization".

B2B, e-Market, and e-Marketplace

The Internet and electronic commerce especially have much to offer in the way of increasing the efficiencies and competitive advantage of procurement (Carter et al. 2000). Business-to-business (B2B) electronic commerce is a fundamental shift in the manner by which firms are interacting with buyers and suppliers (Senn 2000). In this study, e-Marketplace refers to an electronic market in cyberspace with a price-making mechanism such as catalog aggregators, auction, reverse auction, or exchange. We adapt Giunipero and Sawchuk's typology for e-Marketplace; i.e. sell side e-Marketplace, buy side e-Marketplace, and 3rd party e-Marketplace. In this paper the terms "marketplace", "electronic market", "e-Market", and "e-Marketplace" all refer to the same concept. The three types of e-Marketplace are as follows.

- Sell side e-Marketplace: This is the most common B2B

model. In this model, both individual consumers and business buyers use the same supplier-provided marketplace. The architecture for this B2B model is basically the same as that for business to consumer (B2C) electronic commerce, and the purchasing process is similar. Successful examples of this business model are Dell, Intel, Cisco and IBM.

- Buy side e-Marketplace: Large-scale buyers like General Electric or General Motors, which purchases thousands of items on the Internet, would prefer to open their own marketplace. Under this model, a buyer opens an electronic market on its own server and invites potential suppliers to bid on the announced RFQs. This model offers a greater opportunity to committed suppliers (Turban et al. 2000).
- 3rd party e-Marketplace: This model enables many-to-many relationship between buyers and suppliers. Buyers and suppliers leverage economies of scale in their trading relationships and access a more "liquid" marketplace. Many-to-many liquidity allows the use of dynamic pricing models such as auctions and exchanges, further improving the economic efficiency of the market (Raisch 2001). Typical cases of this model are Boeing's PART, ProcureNet, Manufacturing.net, and Industry.net (Turban et al. 2000).

Figure 1 shows an integrated framework of the three types of e-Marketplaces, depicting how the various technologies described are interrelated and used by companies to conduct procurement (Rajkumar 2001).

Figure 1 - e-Marketplace Framework

e-Marketplace Related Research

Previous research emphasizes the effect of new technologies on organizational processes (Heide and Weiss 1995) but does not discuss the influences of electronic markets, and the

extant case-based research focusing in electronic markets limits itself to the characteristics of the market maker, the firm that manages and administer the market (e.g., Bakos and Brynjolfsson 1993).

Recently, there have been some studies related to e-marketplace (Deeter-Schmelz et al. 2001; Grewal et al. 2001). The three relevant categories (roles, issues, and adoption of e-marketplace) of such studies are summarized in Table 1.

Table 1 - e-Marketplace related research

Category	Authors Major finding/suggestions
Roles	Bailey and Bakos (1997) <ul style="list-style-type: none"> ▪ Aggregating ▪ Matching suppliers and customers ▪ Providing trust, and ▪ Providing inter-organizational market information
	Bakos (1998) <ul style="list-style-type: none"> ▪ Matching buyers and sellers ▪ Facilitation of transactions ▪ Institutional infrastructure
	Choudhury et al. (1998) <ul style="list-style-type: none"> ▪ Identifying potential trading partner ▪ Selecting a specific partner ▪ Executing the transaction
Issues	Croom (2000) <ul style="list-style-type: none"> ▪ E-Marketplace of MRO may be a so-called “killer application” on the basis of potential efficiency gains. ▪ Impact of e-Marketplace for MRO purchasing ▪ Delphi study
	Rajkumar (2001) Type of e-Marketplace <ul style="list-style-type: none"> ▪ procurement (purchasing software), e-catalog, auctions, and marketplaces
	Archer and Yuan (2000) Usage of internet-based technology through a business procurement life cycle
	Baron et al. (2000) The benefits of e-catalogs and their use in Web-based B2B procurement /purchasing systems (WBPS)
	Barratt and Rosdahl (2002) The major inhibitors and enablers of e-marketplace
Adoption	Grewal et al (2001) <ul style="list-style-type: none"> ▪ Both motivation and ability are important in determining the nature of participation in B2B e-markets. ▪ 306 from Polygon subscribers, jewelry trader conducting EC
	Deeter-Schmelz et al. (2001) <ul style="list-style-type: none"> ▪ Suppliers play a critical role in the adoption of this new innovation. ▪ 232 purchasing professional

	<p>Min and Galle (1999)</p> <ul style="list-style-type: none"> ▪ The buying firm with large purchase volume is a heavy user of EC and is likely to force its suppliers into the EC network. ▪ Empirical study of 656 US purchasing organizations.
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e-Marketplace adoption

Reviewing the innovation adoption literature suggests that the framework developed by Tornatzky and Fleischer (1990), and adopted by many researchers (Iacovou et al. 1995; Chwelos et al. 2001), may provide a useful framework for investigating e-Marketplaces. There are three elements that influence the process by which innovations are adopted (Chwelos et al. 2001). They are (1) technological, (2) environmental (or interorganizational), and (3) organizational contexts.

Technological context

The technological context relates to the technologies available to an organization. Its main focus is on how technology characteristics themselves can influence the adoption process (Tornatzky and Fleisher 1990). Different organizations may face different innovation opportunities. Whether these innovation opportunities can be exploited depends on the degree of correspondence between the innovation’s characteristics and the practices and equipment currently adopted by the organization. Also not all innovations are relevant to an organization (Chau and Tam 1997). The degree of relevance depends on the relative advantage perceived and the ability to adopt.

Relative advantage has been studied in the adoption of EDI (Iacovou et al. 1995; O’Callaghan et al. 1992), adoption of web-sites (Beatty et al. 2001), adoption of web technology (Nambisan and Wang 2000), adoption of open systems (Chau and Tam 1997), and adoption of new IT (Premkumar and Roberts 1999). In most of the studies except Chau and Tam’s, relative advantage was found to be an important determinant of adoption of the ITs.

Environmental context

The environmental context is the arena in which an organization conducts its business. The environment surrounding an organization is composed of industry, customers, competitors, regulations, and relationship with government (Tornatzky and Klein 1982). Environmental factors are significant when the innovation scope is interorganizational. Many studies have found that external pressures – competitive pressure, imposition by a trading

partner- have the strongest relationship to EDI adoption in organizations (Iacovou et al. 1995; Premkumar and Ramamurthy 1995). Premkumar and Roberts (1999) found that competitive and external pressures were significant in explaining the adoption of a new IT.

Organizational context

The organizational context describes the characteristics of an organization. In Damanpour's meta-analysis of determinants of organizational innovation (Damanpour 1991), specialization, functional differentiation, professionalism, centralization, managerial attitude toward change, technical knowledge resources, administrative intensity, slack resources, and external and internal communication were found to be the significant determinants of organizational innovation.

Slack resources are considered as a necessary antecedent to innovation for an organization. Slack is defined as the pool of resources in an organization that is in excess of the minimum necessary to produce a given level of organizational output (Nohria and Gulati 1996). Rogers (1995) defined organizational slack as the "degree to which uncommitted resources are available to an organization". Slack allows an organization to afford to purchase innovation objects, absorb failure, bear the costs of instituting innovations, and explore new ideas in advance of an actual need (Damanpour 1991; Swanson 1994). Iacovou et al. (1995) found that financial resources and technological resources have significantly affected EDI adoption, while Lai and Guynes (1997) found that slack resources were one of the factors that determine ISDN adoption.

The size of an organization has consistently been found to be positively related to innovation adoption (Rogers 1995). As Schumpeter indicated, size is frequently thought to be the most important factor in technology innovation because large firms are seemingly better endowed with resources than small firms (Schumpeter 1950). Size is a variable that is easily measured, presumably with a relatively high degree of precision. And size is probably a surrogate measure of several dimensions that lead to innovation: total resources, slack resources, technical expertise of employees, organizational structure, and so on. However, there has been debate over its role as a direct contributor to successful organizational innovation processes (Kwon and Zmud 1987). Size has been studied in adoption of ISDN (Lai and Guynes 1997), adoption of new IT (Premkumar and Roberts 1999), and adoption of intranet (Eder and Igarria 2001).

Research Model and Hypotheses

Based on the literature review of the previous section, an adoption model for e-Marketplace is proposed in Figure 2. The model defines the technological context of an e-Marketplace, the external environment, and organizational characteristics as determinants of the e-Marketplace adoption. The technological context reflects relative advantages. Attributes of the environmental context are external pressure and buying power. Attributes of the organizational context include slack resources and size.

Different industries may have different contexts on the adoption of a new technology such as e-Marketplace. To eliminate the potential interfering effects of the industry differences, this study only examines the manufacturing industry where procurement is generally considered as a major function.

Figure 2 - A Model for e-Marketplaces Adoption

Technological Context

Relative advantage

Relative advantage refers to the degree to which a new technology is perceived as being better than the current method (Rogers and Shoemaker 1971). The most basic considerations in new technology adoption are costs to transition to new technology and advantages (or benefits) materialization from the new technology introduction; the greater advantage is perceived compared to the current method, the more probable an organization will adopt the new technology. This perception, in the context of e-Marketplace adoption, can be operationalized as a "relative advantage" factor. Relative advantage is not the same as awareness. While awareness is mainly concerned with the reception of information about e-Marketplaces, relative advantage captures the extent of agreement with the claimed benefits relative to the adopter's local conditions. While

awareness is a precondition of forming a belief, it is the latter that drives an adoption decision. Thus we may suggest the following hypothesis.

H1: Relative advantage will be positively related to e-Marketplace adoption.

Environmental Context

External pressure

External pressure refers to influences from the organizational environment. The two main sources of external pressure to e-Marketplace adoption are (1) competitive pressure, and (2) imposition by others, including organizations such as parent company, industry associations, and governmental units (Hart and Saunders, 1998). Competitive pressure refers to the level of e-Marketplace capability of the firm's industry and, most importantly, capability of its competitors. Kimberly and Evanisko (1981) have found positive associations between competition and innovation adoption. As more competitors become e-Marketplace-capable, firms are more inclined to adopt an e-Marketplace in order to maintain their own competitive position.

Imposition from others is expected to be a critical factor for e-Marketplace adoption by firms; as weaker parts in relationships with organizations such as governmental units or parent companies, which evaluate company achievements annually, companies are extremely susceptible to impositions by their stronger parts (Hart and Saunders, 1998). Such impositions are especially prevalent in the case of e-Marketplace because of its role as a hub of business transactions.

Thus it is hypothesized that companies facing a higher level of external pressure are more likely to adopt the e-Marketplace. Therefore,

H2: External pressure will be positively related to e-Marketplace adoption.

Buying power

Buying power refers to the degree to which a buying firm's influence is perceived in the market. Suppliers are typically dependent upon customers that provide them with a large proportion of their sales revenue. Power is "the firm's capacity to influence change in another firm that is dependent on the resources of that firm" (Cartwright 1965). In general, the greater the percentage of revenue from a particular customer, or the larger the supplier pool from which a customer can select a product or service, the greater is the supplier's dependency on the customer. In these situations, a buying firm (customer) may exert power over

the dependent supplier to follow a particular course of action it dictates (Hart and Saunders 1998). According to the literature on EDI adoption, use of coercive power to influence a firm to use EDI has been employed by a number of large companies where supplier reselection was a viable possibility (Mukhopadhyay et al. 1995). Since information and communication links via electronic commerce require bilateral commitment, it is necessary for both trading partners to participate in electronic commerce trading. A firm with buying power is more likely to expect its trading partners to participate in e-Marketplace, because perception of buying power is an important determinant of decisions for terms and conditions of business. Based on these viewpoints, the following hypothesis is proposed:

H3: Buying power in a market will be positively related to e-Marketplace adoption.

Organizational Context

Slack resources

Slack resources refer to the degree to which a pool of resources is perceived to be in excess. A financial measure of slack is typically used, such as changes in an organization's budget and sources of finance or changes in expenditures for the organization's main activity. Miller and Friesen's (1982) measure includes both financial and human resource slack. In general, greater absolute income and surplus would boost commitment to the investment of resources required for the innovation implementation and accompanied organizational change. As Kwon and Zmud (1987) have asserted, successful innovation, occurs when sufficient organizational resources (sufficient developer and user time, sufficient funding, sufficient technical skills, etc.) are directed, first toward motivation, then toward sustaining the implementation effort.

It is expected that slack resources are positively related to organizational innovation because they allow an organization to purchase innovation objects, absorb failure, bear the costs of instituting innovations, and explore new ideas in advance of an actual need (Damanpour 1991). Hence:

H4: Slack resources will be positively related to e-Marketplace adoption.

Size

Resource availabilities and relative insulation to risk which come from market power and a diversified portfolio of investment opportunities should induce larger firms in a competitive market to be more likely (or less hesitant) to engage in innovation activities (Schumpeter 1950). As

Schumpeter indicated, size is frequently thought to be the most important factor in technology innovation because large firms are seemingly better endowed with resources than smaller firms. In addition, it would appear reasonable to suppose that large organizations have more potential to adopt an e-Marketplace than smaller organizations simply because of their larger scale of procurement volume and operations. Also, since high costs may be incurred in implementing an efficient and effective e-Marketplace, a large firm is in a better position to engage in an e-Marketplace than a small firm. Bakos (1991) indicated that the cost and expertise required to build and manage electronic market systems might favor big firms, since smaller firms might individually lack the resources for a system large enough to achieve the economies of scale necessary to establish EC information links. Thus, we expect that;

H5: Size of organization will be positively related to e-Marketplace adoption.

Research Method

Data Collection

Data collection was carried out in the form of a field survey. The survey was performed between September and October, 2001. Pilot testing was done by administering the questionnaire to two senior procurement professionals working for manufacturing firms and academicians with experience in this area. Feedback from the pilot testing was used in refining the questionnaire.

Sample targets were selected with systematic sampling. In systematic sampling, every k th sampling unit of the population is selected after the first sampling unit is selected at random from the total sampling units (Frankfort-Nachmias and Nachmias 1996). 89 firms were selected from the 390 manufacturing firms listed on the Korea Stock Exchange.

Out of the eight-nine questionnaires mailed, forty-two responses were received representing a response rate of 47.19 percent. Since three responses were unusable, thirty-nine cases were analyzed for this study.

The respondents and non-respondents were compared with regard to firm size. Results of t-tests show there are no significant differences between non-respondents and respondents at the $\alpha = 0.05$ significance level.

Sample Characteristics

Among the thirty-nine organizations, twenty three (59 percent) of them had below 1,000 employees. Annual procurement volume of most of the sample firms (82 percent) ranged from \$1 million to below \$1 billion. Seventeen firms adopted e-Marketplaces. Almost all the adopters have used traditional methods and EDI for procurement at the same time. For the questions allowing multiple answers, respondents indicated that they have procured through the categories of buy-side, sell-side, and 3rd party marketplaces almost equally.

Operationalization of Variables

Operational definitions of the study instruments are shown in Appendix I. For each variable, a multiple-item scale was developed where each item was measured based on a 7 Likert scale from 'strongly disagree' to 'strongly agree', except for the measure for organizational size.

Where possible, constructs that have already been developed, and validated by other researchers were adopted. If the constructs had not been operationalized previously, they were developed from the relevant literature and validated through pilot testing.

The dependent variable, e-Marketplace adoption was determined by a binary measure: adopters or non-adopters. Organizations were classified as adopters if they decided to adopt e-Marketplaces; or have been procuring through e-Marketplaces.

Organizational size was measured using the number of employees. Because the size distribution of the sample was highly skewed, we adopted a logarithmic transformation to reduce the variance (Kimberly and Evanisko 1981).

Validity and Reliability of Measurement Instrument

Content validity

Content validity defines how representative and comprehensive the items were in representing the hypothesis. This is assessed by examining the process that was used in generating the scale items (Straub 1989). In this research, definitions of relative advantage, external pressure, and slack resources were developed based on the review of innovation theory and research in information systems. Six items were selected for relative advantage, four items for external pressure, and four items for slack resources. For developing scales for buying power, we used the power-political theory and Porter's research (Porter and Millar 1985).

Construct validity and Reliability

In this study, we follow Straub's (1989) processes of validating instruments to test construct validity in terms of convergent and discriminant validity. For testing convergent validity, we evaluated the item-to-total correlation that is the correlation of each item to the sum of the remaining items. All items' item-to-total correlation score was larger than 0.4. The discriminant validity of each construct was assessed by principal component factor analysis with VARIMAX rotation. As shown in Appendix II, the confirmatory factor analysis for four independent variables yields four distinct factors: relative advantage, external pressure, buying power, and slack resources. Factor loadings for all variables were greater than 0.44 with no cross-construct loadings, indicating acceptable discriminant validity. Together, the four observed factors accounted for 74.8% of the total variance. To validate the appropriateness of the factor analysis, we applied several measures to the entire correlation matrix. Here, Bartlett's test of sphericity ($p=0.000$) indicates the statistical probability that the correlation matrix has significant correlations among at least some of the variables, and the Kaiser-Meyer-Olkin measure of sampling adequacy (0.638) showed acceptable sampling adequacy (Hair, Jr. et al. 1998).

The Cronbach Alpha coefficient was used to assess reliability of the measures (Straub, 1989). As shown in Appendix II, reliability coefficients were acceptable for all constructs, ranging from 0.847 for relative advantage to 0.947 for slack resources.

Results and Discussion

Results

The choice of data analytic technique for testing the research hypotheses was restricted to three options: individual *t*-tests of differences between adopters and non-adopters of e-Marketplaces for each research variable, a multivariate discriminant analysis that identifies the important research variables that best discriminate between adopters and non-adopters of e-Marketplaces, or Logistic regression that is an alternative to discriminant analysis whenever the dependent variable has only two categories.

Since the multivariate analysis option is a more powerful and accurate statistical procedure than either the individual *t*-tests or logistic regression (Hair, Jr. et al. 1998), we decided to use the multivariate discriminant analysis as the data analytic technique. For the purpose of comparative analysis,

the group-wise means for all the variables have also been computed. Results of the discriminant analysis are shown in Table 2.

The principal assumptions underlying discriminant analysis involve the formation of the variate of discriminant function (normality, linearity and multicollinearity and the estimation of the discriminant function (equal variance and covariance matrices)). The most common test for the assumptions is Box's M (Hair, Jr. et al. 1998). As the test by SPSS 10.0 for Windows shows non-significance (Box's M = 17.5, Approximate F = .985, Degree of freedom = 15, 4746.725, Significance = .468), the groups are deemed not different and the assumption is not violated.

Step-wise variable selection, with the selection criteria of minimizing Wilks Lambda and a tolerance level of 0.001, was used to generate the discriminant function. The value of Wilks lambda, the Chi-square value, and the level of significance are shown in Table 2. It is significant at $p < 0.1$. The standardized discriminant coefficients and discriminant loadings for the variables are given in Table 2. Discriminant loadings (also known as structural correlations), measuring the simple linear correlation between each predictor variable and the extracted discriminant function, are increasingly being used to determine the significance of the variables (Hair, Jr. et al. 1998). While there are no rigid rules about the validity of these values, the general guidelines are that values above 0.3 are satisfactory and acceptable (Premkumar and Ramamurthy 1995).

Two variables: external pressure and size were found to have discriminant loadings above the cut-off value. These variables also had high discriminant coefficients, thereby indicating that they are important discriminators by both criteria. Mean, standard deviation, and univariate *F*-statistics, testing for equality of group means for the variables in the adopter and non-adopter groups are also given in Table 2 for better understanding of the discriminant analysis results.

Another important test is to examine the ability of these functions for accurate classification. The classification results are also shown in Table 2. While the overall classificatory ability is reasonably high (76.9 percent), it has to be compared with classificatory ability of a chance model to establish its superiority. Chance accuracy is determined by the formula: $p^2 + (1 - p)^2$, where *p* is the proportion of the sample in the first group. In our case, *p* was 0.564, and therefore the accuracy of the chance model was 50.8 percent, which was much lower than our discriminant model's (76.9 percent).

Table 3 shows the results of the hypotheses tests. As indicated in Table 3, two hypotheses (H2 and H5) were supported.

Table 2 - Results of discriminant analysis

Wilks' lambda	Chi-square	Degrees of freedom	Significance
.737	10.555	5	.061

Variables	Discriminant coefficient	Discriminant loading	Group mean(S. D.)	
			Non-adopter	Adopter
Relative advantage	.083	-.026	5.41 (.95)	5.43 (.87)
External pressure	.706	.738	2.05 (1.17)	3.17 (1.42)
Buying power	-.143	-.161	4.23 (1.27)	4.00 (1.11)
Slack resources	-.262	.104	4.48 (1.80)	4.68 (1.38)
Size	.707	.681	5.92 (1.41)	7.16 (1.71)

Classification accuracy			
	Total	Non-adopter	Adopter
Non-adopter	22	18 (81.8%)	4 (18.2%)
Adopter	17	5 (29.4%)	12 (70.6%)
Overall Accuracy	76.9%		
Chance Accuracy	50.8%		

Table 3 - Results of hypothesis tests

Hypotheses	Independent variables	F-Statistic	Results
H1	Relative advantage	.006	Reject
H2	External pressure	7.218**	Support
H3	Buying power	.341	Reject
H4	Slack resources	.143	Reject
H5	Size	6.131**	Support

*: $p < 0.1$, **: $p < 0.05$, ***: $p < 0.01$

Discussion of the Results

The goal of this study was to extend understanding of e-Marketplace adoption in manufacturing firms by identifying factors that distinguish adopter firms from non-adopter firms. To measure the facilitators of e-Marketplace adoption, we

introduced five variables, relative advantage, external pressure, buying power, slack resources, and size. External pressure and size were found to be the facilitators of e-Marketplace adoption, while relative advantage, buying power, and slack resources were found to be insignificant. In the following section, we discuss the result on each of the five factors in more detail.

Relative advantage

In our study, relative advantage was not found to be significant in distinguishing adopter firms from non-adopter firms. One explanation for the insignificance of relative advantage in manufacturing firms might be the equally high awareness of e-Marketplace benefits by both the adopter firms and non-adopter firms (cf. See the group mean values: non-adopter = 5.41, adopter = 5.43) due to drastic proliferation of the Internet and promotional efforts by the B2B related firms and organizations.

That is, non-adoption may not be due to lack of perceived relative advantage, but due to perceived barriers such as security risk, resistance to change, and lack of implementation experience.

External pressure

External pressure was found to have significantly high values in discriminant coefficients and discriminant loadings. Examination of the mean value of the variables in the two groups reveals that adopters of e-Marketplace seem to have had significant pressure from external sources to adopt e-Marketplaces compared to non-adopters. External pressure can therefore be considered as important facilitators to differentiate adopters from non-adopters from the buyer perspective.

In our study, external pressure consists of three subconstructs in the literature: competitive pressure, enacted trading partner power, and industry (including government) pressure. Among them, competitive pressure seems to be the key in determining the overall level of external pressure to adopt e-Marketplaces because firms are more inclined to adopt e-marketplaces in order to maintain their own competitive position, as more competitors become e-Marketplace-capable.

Furthermore, external pressure espoused by government, government-related, and/or collective associations may act more strongly when the focus is on a specific application, such as electronic bidding for transparent trades, rather than on the more dispersed range of applications sampled in this study.

Buying power

Contrary to our expectations, buying power was found to have an insignificant relationship with the adoption of e-Marketplace. We may interpret that buying power involves two aspects: First, it encourages buying firms to adopt e-Marketplaces because they have a strong belief in trading partners' participating in the same e-Marketplaces. Secondly, it may discourage buying firms from adopting e-Marketplaces because it breeds complacency and hinders a generation of motivation to innovation. That is, the result seems to reflect the mixed effects of the buying power: both increasing and decreasing adoption of e-Marketplaces.

Another reason might be because, in manufacturing firms, most of the procured products are raw materials, not MRO. For such firms, private networks (e.g. EDI) are often implemented with the most important existing trading partners. In fact, on the upstream side, a typical goal for such applications as EDI has been to reduce the total number of suppliers and enhance the quality and efficiency of the overall procurement function (Croom 2000). For a strategic product, they may not want to shift from hierarchical to market relationships with suppliers.

Slack resources

Slack resources were found to have an insignificant relationship with the adoption of e-Marketplaces. The question about slack resources in this research was about the extra resources including financial capability, human resources and information technology support capability. Both groups answered that they have a slightly high level of slack resources.

One possible explanation for the lack of difference between adopters and non-adopters is that the introduction of e-Marketplace does not require as much financial and technological investment or human resources from the buying firms as adoption of many other ITs (e.g. ERP, EDI etc.) would require. Another reason could be an inverse U-shaped relationship between slack and innovation in organizations (Nohria and Gulati 1996). They argued that too little slack is detrimental to innovation because it discourages any kind of experimentation whose success is uncertain. Equally, too much slack is detrimental to innovation because it breeds complacency and a lack of discipline that makes it possible that more bad projects will be pursued than good. If it is assumed that both too much and too little slack may be detrimental to innovation, the proper amount of slack would need to be determined in the future studies.

Finally, Singh (1986) stated that absorbed slack which corresponds to excess costs in organizations is related to risk taking and unabsorbed slack which corresponds to excess,

uncommitted liquid resources is not. According to Singh, the relationship between innovation and slack would depend on the type of slack measured, and the two types of slack would need to be separated.

Size

Firm size was found to have a significant relationship with the adoption of e-Marketplace. This result is consistent with prior findings in the literature. For example, many studies (Rogers 1995; Min and Galle 1999) have examined the factors leading to organizational innovativeness, which include, among others, organizational size. Organizational size is also a possible explanation for the greater rate of EDI adoption among very large firms (Chwelos et al. 2001), as organization size has consistently been recognized as a driver of organizational innovation (Damanpour 1991). Larger organizations tend to adopt IT easily due to greater economies of scale. For instance, they are better positioned to reap greater procurement cost savings from e-Marketplace due to its high volume of procurement than the small firms.

Summary and Conclusion

This study, based on prior research in innovation adoption, has identified five variables under three broad categories (technological, environmental, and organizational contexts) and evaluated their influence on the manufacturing firm's decision to adopt e-Marketplaces. A survey instrument was developed to measure these variables and data were collected from 39 organizations using a mail survey. Discriminant analysis was used to identify the determinants for e-Marketplace adoption. We conclude that, in case of manufacturing firms, external pressure and firm size seem to be the important determinants of the decision to adopt an e-Marketplace. Firms that perceive more external pressure and firms that are large in size are more likely to adopt e-Marketplaces. This study has also provided evidence that innovation theories can be successfully applied to the study of corporate adoption of e-Marketplaces, particularly in the context of the manufacturing industry.

Implications for Future Research

We developed and tested a simple model that categorized factors affecting e-Marketplace adoption. Strengths of this model may be its parsimony and derivation of most factors (except buying power) from previous conceptual and empirical research. Although our exploratory investigation of the model has provided preliminary findings on the

adoption of e-Marketplace, further research is needed to enhance our understanding of this subject. Future research can proceed in several directions. Since we have empirically validated the model in the context of the buyer side, future studies can examine the adoption of e-Marketplace from the seller's side. Future studies can also target the industries, other than manufacturing.

Another topic of interest would be to examine the phases of adoption/diffusion, and identify the factors and their influence on the diffusion of e-Marketplaces. As with any research model, there is a danger that other important factors may have been ignored. It will be worth studying models including additional variables such as obstacles, adopting firm's capabilities, etc.

Limitations

The study has several limitations that need to be recognized. First, the cross-sectional nature of the study limits our ability to imply causality in the relationships among the variables. Thus, the results of the survey may have been affected by the fact that perception of technology changes as the organization uses the technology.

Second, since the sample population for this study was restricted to manufacturing firms, the results can only be generalized for the manufacturing firms.

Third, the small sample size limits the power of our statistical analysis. A large-scale field survey could be used to collect data that can validate the model on a larger scale and provide greater generalizability of the results.

Fourth, this research used the key informant method for data collection. Acknowledging its limitations, future research on this topic should attempt to obtain multiple sources within the organizations.

Finally, this study used a survey sample limited to Korean organizations. Between countries, maturity of a certain technology and the decision process for adopting a technology can be different. These differences may affect the assumptions in this research.

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External pressure	The extent of pressure exerted by the competitive environment and the imposition by trading partners, parent company, or regulations	Chwelos et al. (2001); Iacovou et al. (1995); Premkumar and Ramamurthy (1995)
Buying power	The degree to which buying firm's influence is perceived in the market	Porter and Millar (1985); Rogers and Shoemaker (1971);
Slack resources	The degree to which the pool of resources is perceived in excess	Iacovou et al. (1995); Swanson (1994); Damanpour (1991)
Size	The size of the organization	Damonpour (1991)

Appendix II. Construct validity and reliability of measures

Construct	Item label	Factor loading	Item to total correlation	Cronbach alpha
Relative advantage	ADV1	0.444	0.435	0.847
	ADV2	0.567	0.577	
	ADV3	0.708	0.522	
	ADV4	0.856	0.741	
	ADV5	0.875	0.769	
	ADV6	0.895	0.804	
External pressure	PRE1	0.725	0.668	0.925
	PRE2	0.857	0.842	
	PRE3	0.894	0.834	
	PRE4	0.909	0.843	
	PRE5	0.854	0.799	
	PRE6	0.837	0.745	
Buying power	PWR1	0.856	0.771	0.874
	PWR2	0.871	0.841	
	PWR3	0.724	0.589	
	PWR4	0.854	0.730	
Slack resources	SLK1	0.884	0.839	0.947
	SLK2	0.921	0.887	
	SLK3	0.937	0.879	
	SLK4	0.929	0.898	

Appendix I. Operational definition of key constructs

Variables	Operational definition	Related literature
Relative advantage	The degree to which an e-marketplace is perceived as being better than current method	Rogers (1995); Iacovou et al. (1995)