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# WHAT ACCOUNTS FOR ORGANIZATIONS' DIFFERENT USAGE OF B2B E-MARKETPLACES?

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## Abstract

*A business to business (B2B) e-marketplace is an Internet-based inter-organizational system that facilitates online businesses. It provides two basic functions: search and transaction. Accordingly, organizational usage of B2B e-marketplaces varies across these two functions. The previous research mainly applies the Diffusion of Innovation (DOI) theory to predict the usage of B2B e-marketplaces, but this theory is insufficient in explaining the unbalanced usage of search versus transaction. This research attempts to fill this gap. We identify a cognitive limitation associated with each usage, i.e., insufficient knowledge of B2B e-marketplaces corresponds to the usage of search and incapability of foreseeing all consequences corresponds to the usage of transaction. Then, we incorporate perceived institutional norm and organizational trust as two remedies into the DOI theory, and argue that the former will affect the use of B2B e-marketplaces for search while the latter will affect the usage of transaction. A field survey is conducted to collect the data, and structural equation modeling is employed to test the research model. The results confirm the hypotheses. Besides, relative advantage and perceived compatibility from the DOI theory also affect both types of usage. This research implies that the usage of Internet-based inter-organizational systems may encounter cognitive limitations, and highlights how the DOI theory can be extended to account for the usage of information systems that provide multiple uses at different adoption stages.*

*Keywords: B2B E-Marketplace, Usage, Organizational Trust, Institutional Norm, The DOI Theory, Cognitive Limitation*

# 1 INTRODUCTION

A business to business electronic marketplace (B2B e-marketplace) is an Internet-based inter-organizational information system, which facilitates the exchange of information relating to products/services offerings and business transactions among multiple participating organizations (Loukis et al., 2011). The global B2B e-commerce has bolstered rapidly from US\$ 2.5 trillion in 2004 to US\$ 26 trillion in 2010 (China e-Business Research Center, 2011). The B2B e-marketplace is believed to lead the development of the B2B e-commerce, since it can deliver unique benefits such as expediting discovery of targeted information, expanding trading opportunities, and electronically integrating inter-firm transactions (Galbreth et al., 2005).

However, the potential of B2B e-marketplaces has not been fully exploited in practice so far. A survey showed that among 250 investigated buying organizations, 45.3% of them only used B2B e-marketplaces to search for products/services, 17.9% of them made orders, and less than 10% of them tried deeper business requirements such as online payment and customization of products/services (eMarket Services, 2008). From the perspective of buying organizations, the usage of B2B e-marketplaces can generally be classified into the following types: search for the information about products and potential suppliers, to transact through the e-marketplace directly, or to adopt both usage (Mishra et al., 2007). Why does the usage of B2B e-marketplaces demonstrate an unbalanced pattern? This paper attempts to answer this question by investigating what factors drive different usage of B2B e-marketplaces.

The B2B e-marketplace is a novel way to conduct business, and the usage of B2B e-marketplaces is a process of diffusing an innovation within the organization. As such, much prior research applies the Diffusion of Innovation (DOI) theory to examine organizational adoption of the e-marketplace (Rask and Kragh, 2004; Truong, 2008; Yu, 2007). The DOI theory argues that the usage of an innovation depends on potential adopters' rational assessment of the innovation's attributes such as its relative advantage and compatibility with current practices (Rogers, 2003).

However, unlike privately held information systems, the B2B e-marketplace is an open platform usually provided by third parties. This characteristic leads to two cognitive limitations which constrain organizations from evaluating the usage of B2B e-marketplaces, making the DOI theory insufficient in this context. First, since the B2B e-marketplace is usually operated by third parties, no thorough training about this system will be provided to potential participants. By thus, in the early stage of usage, buying organizations may have less knowledge of B2B e-marketplaces. Second, organizations cannot exert the same level control over the exchange through B2B e-marketplaces as through privately held systems. As such, organizations cannot anticipate all the contingencies which might occur during using B2B e-marketplaces, implying a higher level of risk. For example, the transaction on the B2B e-marketplace requires the disclosure of financial information on the open platform.

This research attempts to identify the distinct remedies which facilitate organizations to overcome cognitive limitations to use B2B e-marketplaces, in addition to the factors from the DOI theory. The rest of the paper is organized as follows. Section 2 develops the theoretical background underlying this research and proposes research hypotheses. Section 3 describes the development of scales, the sample frame, and the process for data collection. Section 4 validates the scales and presents research results. Section 5 discusses theoretical and practical implications. This paper is concluded in Section 6.

## 2 THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

This section will extend the DOI theory by considering organizations' cognitive limitations in assessing technological attributes of B2B e-marketplaces. Corresponding remedies that can overcome these cognitive limitations will be then proposed.

### 2.1 Technological attributes under the DOI theory

The DOI theory has been applied and tested to display great explanatory power in predicting the usage of various innovations in organizations, such as the EDI system, the ERP system, and the Human Resource information system (Yetton et al., 1999). Among others, both relative advantage and compatibility have shown consistent and significant effects on the usage of innovations (Karahanna et al., 2006). We contend that both attributes will also weigh in the usage of B2B e-marketplaces.

#### 2.1.1 *Relative advantage*

Relative advantage in the context of B2B e-marketplaces is defined as the degree to which a B2B e-marketplace is perceived to be better than the traditional inter-organizational systems (IOS) it supersedes. We contend that relative advantage will affect both organizational use of B2B e-marketplaces for search and transaction. The transactional cost theory argues that an organization views economizing cost as a core pursuing end; as a result, the organization will continuously search for the efficient means to achieve such an objective (Roberts and Royston, 1997). As has been well acknowledged, the B2B e-marketplace can reduce search cost by aggregating multiple organizations, thus attracting buying organizations to *search* for suppliers on the B2B e-marketplace (Malone et al., 1987).

With respect to transaction, the B2B e-marketplace can provide competitive product prices by making them transparent, and accelerate the transaction efficiency by electronically integrating transactional processes (Hsiao, 2003; Malone et al., 1987). As such, buying organizations would like to complete the *transaction* on the B2B e-marketplace.

*Hypothesis 1A: Relative advantage will positively affect buying organization's intention to use the B2B e-marketplace for search.*

*Hypothesis 1B: Relative advantage will positively affect buying organization's intention to use the B2B e-marketplace for transaction.*

#### 2.1.2 *Perceived compatibility*

Perceived compatibility here is defined as the consistence of B2B e-marketplaces with operational practices of an organization. We contend that perceived compatibility will affect both organizational use of B2B e-marketplaces for search and transaction. The B2B e-marketplace represents a new way of conducting business, and thereby the compatibility of the B2B e-marketplace will be an issue in forming the adoption decision. As information technologies have penetrated into business operations, the organization may have made preparation towards the electronic business, laying a foundation for the organization to judge the compatibility of the B2B e-marketplace. If the supplier selection process is perceived to be similar to the offline one, buying organizations will feel more ready to transfer to the B2B e-marketplace for *search*.

As for transaction, when the transaction process is compatible with the offline one, buying organizations will perceive fewer burdens on adaptation to the B2B e-marketplace for *transaction*, and thus will be willing to adopt this usage (Karahanna et al., 2006).

*Hypothesis 2A: Perceived compatibility will positively affect buying organization's intention to use the B2B e-marketplace for search.*

*Hypothesis 2B: Perceived compatibility will positively affect buying organization's intention to use the B2B e-marketplace for transaction.*

## 2.2 Comparison of search and transaction

We contend when the buying organization intends to use the B2B e-marketplace for search, it may encounter the insufficient knowledge of the B2B e-marketplace; while, when the buying organization intends to use the B2B e-marketplace for transaction, it may confront incapability of foreseeing consequences, as is shown in Table 1.

Cognitive limitation	Search	Transaction
Insufficient knowledge	✓	×
Incapability of foreseeing consequences	×	✓

*Table 1. The cognitive limitation associated with each usage*

Search is usually used before transaction in procurement (Mishra et al., 2007). Given this temporal sequence, the usage of search equals the early stage of innovation usage, while the usage of transaction equals the late stage. As such, a buying organization may know little about the B2B e-marketplace before using search, while it may have accumulated knowledge of the B2B e-marketplace from searching experiences when moving from search to transaction. For example, the buying organization may know the general quality of suppliers listed on the B2B e-marketplace, and whether the B2B e-marketplace has some measures to secure the information exchange on the website. By thus, the buying organization may have equipped itself with some understanding of the B2B e-marketplace prior to the usage of transaction.

The risk is an issue that has to be considered when intending to use the B2B e-marketplace for transaction, but it is insignificant when intending to use search. First, compared with the information disclosed in the search process, the information published on the B2B e-marketplace during the transaction process is more confidential, such as the order and payment information, which may be leaked and manipulated by competitors. Second, the search results are usually immediate, while the transaction results often span relatively a long time interval. The longer delay between the initial action and the outcome, the more likely unexpected contingencies might occur (Sterman, 1989). Therefore, the buying organization may perceive less control over the transaction on the B2B e-marketplace, i.e., incapable of foreseeing the consequences of the transaction.

## 2.3 Remedies to overcome cognitive limitation

To overcome cognitive limitations, a buying organization has to utilize some heuristics to simplify the usage decision (Simon, 1976). These heuristics in this research are coined as remedies. We identify two such remedies, perceived institutional norm and organizational trust.

### 2.3.1 Perceived institutional norm

Perceived institutional norm is specified as the usage of the B2B e-marketplace perceived by the focal organization as generally agreed business practice. Perceived institutional norm has been shown to repair the insufficient knowledge when the innovation is unfamiliar with (Rogers, 2003). Since it is agreed upon by the majority in the business environment and applied across organizations, perceived institutional norm can in a certain degree solve organizations' doubt about the innovation (Rogers,

2003). Because the usage of search will encounter insufficient knowledge, buying organizations will rely on institutional norms when they intend to adopt this usage of the B2B e-marketplace.

First, perceived institutional norm inflicts effects through organization's horizontal relationship formed by competitors. This path creates the bandwagon effect, which describes the phenomenon that an organization is likely to imitate the actions taken by competitors in the business environment (J. G. March, 1981). Once one action is taken by the majority of the competitors, this action will be accepted as the standard business practice in the industry (Deephouse, 1996). Second, perceived institutional norm takes effects through organization's vertical relationship formed by trading partners. The more participants on the B2B e-marketplace, the more likely the B2B e-marketplace will become the important way of doing business. The fact that enough trading partners have used the B2B e-marketplace will make a buying organization consider the B2B e-marketplace to be a preferred way of doing business in the industry (Son and Benbasat, 2007).

However, the effects of perceived institutional norm decrease as organizations' knowledge of the innovation improves. The more knowledge of the B2B e-marketplace implies that the buying organization knows what kind of organizations is listed on the B2B e-marketplace, what facilitators and policies are provided by the B2B e-marketplace for the business, and so on. In a word, the rationality of the buying organization has been raised to a certain level when using transaction. This knowledge endows the buying organization with the capability of making its own judgment of the innovation, while unnecessarily relying on external clues.

*Hypothesis 3: Perceived institutional norm will positively affect buying organization's intention to use the B2B e-marketplace for search.*

### 2.3.2 Organizational trust

The trust in the B2B e-marketplace is defined as the willingness of one organization to be vulnerable to the actions of the B2B e-marketplace based on the expectation that the latter will perform a transaction intermediary important to the former, irrespective of the former's ability to monitor or control the latter. Organizational trust is usually viewed as a mechanism for risk reduction (Mayer et al., 1995). The usage of transaction implies high risk, and thus we contend that organizational trust will overcome this cognitive limitation

First, organizational trust can reduce uncertainties, and therefore it can help trading partners to well cope with unanticipated events. The great uncertainties of the transaction make the organization unable to foresee all the possible contingencies (Hart and Moore, 1988). In this situation, a belief that all the contingencies can be well dealt with even if they are not formally drafted on the contract requires buying organizations' trust in the B2B e-marketplace. Second, organizational trust can reduce informational and financial risk on the B2B e-marketplace. The transaction requires publishing confidential information such as financial information. The trust in the B2B e-marketplace will assure the organization of the B2B e-marketplace's insistence on making good effort in safeguarding its clients' private information. As such, the organization will have less concern over the information leakage on an open platform.

However, in the case of search, neither is disclosed the confidential information nor is there the delay between typing keywords and obtaining searching results. Accordingly, the organization is not exposed to the high risk when using search, and does not consign its stakes to the B2B e-marketplace. Therefore, organizational trust is not a key issue in this situation.

*Hypothesis 4: The trust in the B2B e-marketplace will positively affect buying organization's intention to use the B2B e-marketplace for transaction.*

## 2.4 Control variables

The previous research has shown that the usage of the B2B e-marketplace is possibly affected by product complexity and organizational size. This research restrains the effects of these two factors by treating them as control variables. Product characteristics refer to how difficult to describe a product online and what degree the production of the product requires asset specificity. Organizational size refers to the number of employees or revenues of an organization. High complexity and/or asset specificity of a product and large organizational size will deter the organization from using the B2B e-marketplace (Son and Benbasat, 2007).

## 3 RESEARCH METHOD

### 3.1 Instrument development

This research employed a field survey to examine the research model. The measurements for each construct were selected from the literature (Chwelos et al., 2001; Doney and Cannon, 1997; Pavlou, 2002; Son and Benbasat, 2007; Teo et al., 2003), which were adapted to the B2B e-marketplace context. Appendix shows the indicators for each construct. The 7-point Likert scale was used to measure each indicator, with 1 representing “totally disagree” and 7 representing “totally agree”.

### 3.2 Data collection

To guarantee the qualification of the sample, we chose the participants of the ECVV, a leading B2B e-marketplace based in China, and EMBA students who have the authority over procurement selection as the sample frame. Both the electronic version and the hard copy of the questionnaire were developed. We sent out 500 hard copies of the questionnaire, and kept the online version active on ECVV’s website for three consecutive months. At last, 160 questionnaires were collected. The quality of the responses to the questionnaires were examined by eliminating those questionnaires which have the same score for ten consecutive items or have empty answers for five consecutive items. In the end, 140 questionnaires survived filtering.

## 4 RESULTS

### 4.1 Sample characteristics

We examine the sample characteristics, including the distributions of the industry and the organizational size. It is shown that the sample covers major industries, and contains large-, medium-, and small-sized organizations, ensuring the representativeness of the sample.

### 4.2 Measurement model

SmartPLS (2.0.M3) was used to analyze the data. The measurement model was examined by testing the reliability and the validity of the instrument. Cronbach’s  $\alpha$  is the mostly used indicator to measure the reliability. Table 2 shows that Cronbach’s  $\alpha$ ’s of all the reflective variables (product complexity is modeled as a constructive variable) are well above the critical value 0.707 (Nunnally and Bernste, 1994).

Construct	No. of indicators	Cronbach’s $\alpha$	Range of loadings
Relative advantage (RA)	4	0.883	0.824–0.909

Perceived compatibility (CP)	3	0.734	0.696~0.877
Perceived institutional norm (PN)	3	0.724	0.753~0.827
Trust in the e-marketplace (TM)	4	0.817	0.766~0.831
Intention to adopt search (IS)	3	0.790	0.823~0.854
Intention to adopt transaction (IT)	4	0.852	0.795~0.866
Product characteristics (PC)	2	/	0.541~0.945
Organizational size (OZ)	2	0.724	0.874~0.896

Table 2. Reliabilities and loadings

The validity of a scale contains the convergent validity and the discriminant validity. The convergent validity is tested by examining the loading of each indicator on its corresponding latent construct. Table 2 shows that the loadings of indicators on their corresponding constructs are beyond the critical value 0.6 (Chin, 1998). The discriminant validity is tested by comparing the square root of the Average Variance Extracted (AVE) of one latent construct with its correlations with any other construct. Table 3 displays that the AVE of each latent construct is well above the threshold value 0.5 (Chin, 1998), and the square root of each construct's AVE is larger than the correlation of this construct with any other construct.

Constructs	PN	TM	RA	CP	SI	TI	PC	OZ
Perceived norm (PN)	0.803							
Trust in EMP (TM)	0.496	0.803						
Relative advantage (RA)	0.789	0.489	0.861					
Perceived compatibility (CP)	0.577	0.353	0.662	0.81				
Search intention (SI)	0.645	0.312	0.668	0.62	0.839			
Transaction intention (TI)	0.576	0.532	0.641	0.57	0.596	0.833		
Product characteristics (PC)	0.537	0.428	0.415	0.373	0.369	0.396	/	
Organizational size (OZ)	-0.110	-0.081	-0.243	-0.158	-0.236	-0.193	-0.044	0.885

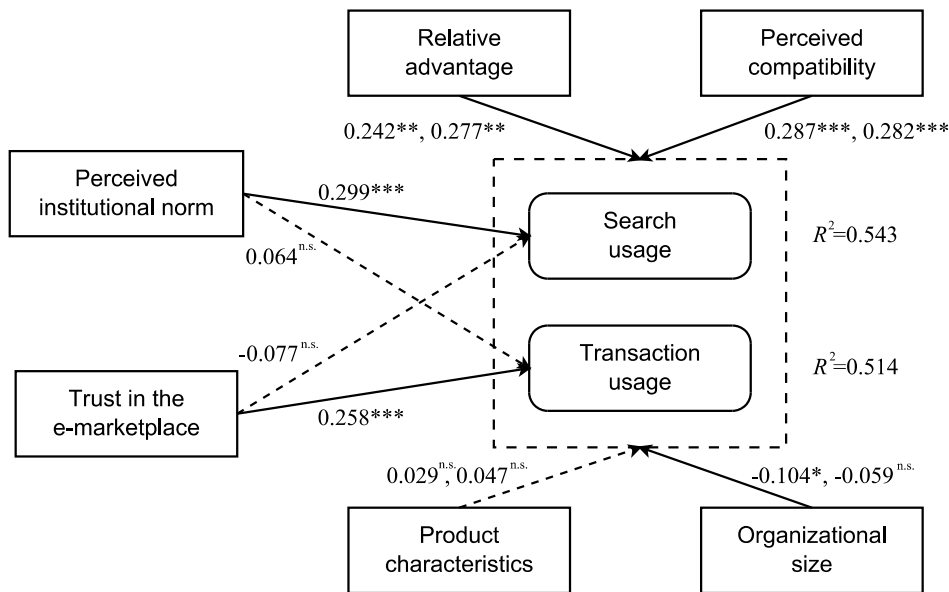
Table 3. Correlations and square roots of AVE's

### 4.3 Causal model

Figure 1 illustrates that perceived institutional norm can significantly promote the buying organization's intention to use the B2B e-marketplace for search ( $\beta=0.299$ ,  $t=2.895$ ), but does not have significant effects on the intention to use the B2B e-marketplace for transaction ( $\beta=0.064$ ,  $t=0.792$ ). While the trust in the B2B e-marketplace has significant effects on the usage of transaction ( $\beta=0.258$ ,  $t=3.111$ ), but it does not contribute to the usage of search ( $\beta=-0.077$ ,  $t=1.305$ ). The results also show that relative advantage significantly promotes the buying organization's usage of both search ( $\beta=0.242$ ,  $t=2.217$ ) and transaction ( $\beta=0.277$ ,  $t=2.252$ ); perceived compatibility also has significant effects on the usage of search ( $\beta=0.287$ ,  $t=3.435$ ) and transaction ( $\beta=0.282$ ,  $t=2.826$ ).

Proposed factors can explain a total of 54.3% of the variance of the intention to use the B2B e-marketplace for search, and they can explain a total of 51.4% of the variance of the intention to use the B2B e-marketplace for transaction. Therefore, all hypotheses are supported.





\*\*\*:  $p < 0.01$ , \*\*:  $p < 0.05$ , \*:  $p < 0.1$ , n.s.: not significant

Figure 1. Research results

## 5 DISCUSSION

### 5.1 Theoretical implications

This research extends the DOI theory by considering cognitive limitations of decision makers and incorporating the corresponding cognitive remedies. The original DOI theory assumes that the potential adopters are rational, so that they can evaluate the technological attributes of the innovation. Since the B2B e-marketplace is an Internet-based open platform operated by third parties, organizations may have cognitive limitations which prevent them from assessing the B2B e-marketplace. This research identifies perceived institutional norm and organizational trust can help organizations to overcome such cognitive limitations, thus improving the explanatory power of the DOI theory.

These results shed lights on the research on the usage of information systems which simultaneously offer multiple uses. The traditional information systems such as the CRM system and the EDI system are designed to satisfy a specific use. However, the B2B e-marketplace can usually provide different uses. Our results show that the cognitive remedy needed for the usage of such an information system may be changed as the depth of usage increases. The organizations may be influenced by perceived institutional norm to begin the initial usage when they have insufficient knowledge of the system. As they are interwoven with the system, the effects of perceived institutional norm decrease; however, the trust may show its importance for the sake of risk.

This research justifies the time point at which perceived institutional norm could have effects on the usage. When organizations intend to begin the initial usage of an innovation, it is the general case that the organizations lack the knowledge of the innovation. By obeying norms or following the pervasive behaviors adopted by the others, the focal organizations can simplify the decision. As such, perceived institutional norm is able to promote the initial usage of the innovation. However, as the focal organizations move from the initial usage to the routinized use of the innovation, the positive effects of perceived institutional norm deteriorate.

This research identifies when organizational trust matters during the adoption process. As the understanding of the trust deepens, the trust has been recognized not to be omnipotent. The deep research on the trust has been called for to identify the contexts in which trust takes effects (Gefen et al., 2008). This research makes contribution to this end by finding that the characteristics of a task can differentiate the effects of trust. This result implies the substitutability between trust and control (Das and Teng, 1998). When the results of the task are predictable, the organizations perceived good control of the task, and therefore trust is unnecessary; however, when the results of the task are hard to predict because of the risk, the trust will show its importance, since the trust is the important source of the informal control, and its objective is to promote cooperation and reduce risks (Gallivan and Depledge, 2003).

## **5.2 Practical implications**

The B2B e-marketplace has to constantly attract new organizations to participate, to sustain the critical mass of the organizations active on the B2B e-marketplace. This research points out that perceived institutional norm can promote the organization's initial usage of the B2B e-marketplace, and thereby the market-maker should pay attention to establishing this norm. For example, the market-maker can publish the number of organizations on the B2B e-marketplace and the transactional volume through the B2B e-marketplace on the website; the market-maker can also make advertisement on various types of media. By thus, a favorable atmosphere can be established helpful to shape the views about the B2B e-marketplace.

The market-maker had better invest efforts in improving the trustworthiness of online transaction. Since transaction is at the higher position on the value chain than search, the B2B e-marketplace cannot realize its major value unless organizations are converted from the initial usage of search to the more advanced usage of transaction. This research indicates that organizational trust is the key to this conversion. Accordingly, the market-maker should pay more attention to improving the online transaction mechanism, and set up a system of rules which deal with the issues related to transaction.

## **6 CONCLUSION**

The B2B e-marketplace is a novel way to conduct business, and the DOI theory was relied on to explain the usage of the B2B e-marketplace. However, most of this stream of research ignores organizations' cognitive limitations, which might prevent from accurately accessing the technological attributes of the B2B e-marketplace, and thus might inflict effects on different usage of the B2B e-marketplace. By extending DOI theory with perceived institutional norm and organizational trust as two remedies to cognitive limitations, this research finds different effects of both factors on the usage of search and transaction. Future research can further characterize the usage of the B2B e-marketplace, and then studies interactive effects of cognitive remedies with technological attributes of the DOI theory.

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## Appendix

Constructs	Indicators
Relative advantage	Using B2B e-marketplaces reduces procurement costs. Using B2B e-marketplaces improved access to suppliers' prices and product descriptions. Using B2B e-marketplaces widened our company's purchasing scope. Using B2B e-marketplaces enhanced our company's ability to compete.
Perceived compatibility	We have sufficient experience with network-based applications. Our company has made significant investments in resources dedicated to participating in B2B e-marketplaces. Our procurement process has been tailored to meet the requirements of doing business through B2B e-marketplaces.
Perceived institutional norm	Our main competitors that have adopted B2B e-marketplaces have benefited greatly. A lot of suppliers from which we'd like to procure are participants of Alibaba. There are quite a lot of suppliers selling the product that we want to procure in Alibaba.
Trust in the e-marketplace (Doney and Cannon, 1997)	This B2B e-marketplace is generally trustworthy. This B2B e-marketplace seems to have much knowledge about what needs to be done to facilitate online transactions. This B2B e-marketplace seems to have much knowledge about what needs to be done to facilitate buyers' search for suppliers. This B2B e-marketplace tries its best to be fair when dealing with its participants.
Intention to adopt the e-marketplace for search	How often have you searched for suppliers in alibaba.com? For each product, we have searched for suppliers from alibaba.com. The ratio of procurement amount from the suppliers that we've found in alibaba.com to our total procurement amount is
Intention to adopt the e-marketplace for transaction	If there are other procurement opportunities, I predict that we would consider using this B2B e-marketplace to find suppliers. If there are other procurement opportunities, I predict that we would consider transacting with suppliers through this B2B e-marketplace. It is likely that we will actually purchase through this B2B e-marketplace in the near future. It is likely that we will transact for a long time with suppliers through this B2B e-marketplace.
Organizational size	How many employees does your company have? What's the average revenue of your company each year?
Product characteristics	Our company usually purchases products from B2B e-marketplaces that can easily be described online. Our company usually purchases products from B2B e-marketplaces that require asset specificity.