OpenAIR@RGU

The Open Access Institutional Repository at Robert Gordon University

http://openair.rgu.ac.uk

This is an author produced version of a paper published in

Business Process Management Journal (ISSN 1463-7154)

This version may not include final proof corrections and does not include published layout or pagination.

Citation Details

Citation for the version of the work held in 'OpenAIR@RGU':

Citation for the publisher's version:

Perceived barriers towards the use of e-trade processes by Korean SMEs

Ka-Young Oh [a], Alistair R Anderson [b], Doug Cruickshank [b]

a The Department of International Trade, Konkuk University, 322 Danwol-Dong Chung-Ju SI, Chungcheongbuk-Do, 380-701, South Korea

b Aberdeen Business School, The Robert Gordon University, Aberdeen, AB10 7QY, UK

Abstract

Purpose – E-trade, electronic trading appears to offer increased efficiency in business processes, but only a limited number of small firms have adopted the new processes. The purpose of this paper is to try to establish the obstacles, the perceived barriers, to the continuing use of e-trade technologies by small Korean firms.

Design/methodology/approach – The literature was employed to develop a theoretical model that includes perceived risk and the environment. The model was operationalised in a questionnaire completed by 164 respondents. LISREL validated the instrument and the model. The data were analysed using Structural Equation Modelling.

Findings – We found that information risk and business risk negatively affect adoption and use. We also tested the relationship between the environment of the organisation and adoption of e-trade. Our results show that the maturity of information technology and the innovation characteristics of the firm have positive influences on the adoption of e-trade.

Research limitations/implications – This study uses data from existing users, so our findings extend the existing literature about decisions to adopt and use new processes. The data are, however, limited to the Korean context.

Practical implications – The study demonstrates the negative influence of perceptions about risk associated with innovative processes. Thus this awareness and understanding of how barriers are perceived should help to increase the diffusion of e-trade systems. Our findings indicate what has to be done for developing and extending the use of e-trade.

Originality/value –.The study is novel and contributes to our understanding of the adoption and use of new processes

Key words: barriers; technology adoption; e-trade; perceived risks; Korea; SME.

Perceived barriers towards the use of e-trade processes by Korean SMEs

Introduction

There is increasing evidence that the use of ICT (Information Communication Technology) can lead to more efficient transactions for smaller businesses. This is apparent for e-commerce in general (Bayo-Moriones and Lera-Lopez, 2007), but particularly true for international trade. International trade requires considerably more documentation and more detailed organisation, both of which can be usefully facilitated by e-trade. Given that international trade is increasing in the wake of globalisation, e-trade which utilises process innovations, appears as an attractive option for SMEs (Bernadas and Verville, 2005). Indeed it can be argued that the increased efficiency promised by e-trade may offer the competitive advantage so necessary in global markets (Drew, 2003; Subba Rao et al, 2003). As Li et al (2003) argue, success now seems to be measured in terms of flexibility, agility and versatility. That is, by the ability to handle continuous improvements and change. Yet it appears that take up is uneven internationally (Seyal et al, 2007; Viswanathan and Pick, 2005; Oxley and Yeung, 2001; Fillis, Johansson and Wagner, 2004) and more specifically, many SMEs seem reluctant to adopt e-commerce (Fillis, Johansson and Wagner, 2003; Matlay and Addis, 2003; Grandon and Pearson, 2004). It has been suggested that there may be something unique about small firms (Bruque and Moyano, 2007; Anderson, 2000) or about their environment (Oxley and Yeung, 2001), which deters the adoption of e-business (Drew, 2003; Daniel, Wilson and Myers, 2002).

This anomaly, the reluctance of SME's to engage in e-trade despite the promise of advantages, is the focus of this paper. We want to know what factors deter Korean small firms from the continuing use of e-trade. The paper contributes to the literature because our sampled firms already use e-commerce, thus our findings relate to continuing use rather than the more typical questions of adoption. E-trade, an electronic trading system, is similar to e-commerce, but involves international trade. It is distinguished by the additional complexities of international commerce; for example, bills of lading, customs documentation, letters of credit and certificates of origin. E-trade is thus argued to simplify and expedite a complex paper driven process. We are interested in a very specific context, SMEs in Korea. Korea is interesting because as Lee, O'Keefe and Yun (2003) note, the take up of ICT in general has been spectacular. Yet, Oh, Cruickshank and Anderson (2009) note that despite this, and active government encouragement (Joen, Han and Lee 2006), few Korean SME's have adopted e-trade. Indeed of those who have adopted, many remain in the early stages (Daniel, Wilson and Myers, 2002). Thus identifying barriers to the use of e-trade in Korea may have much wider implications.

As long ago as 1981, Kimberly and Evanisko (1981) identified three determinants of the adoption of technological innovations. Their categories; the characteristics of the company CEO coupled with the characteristics of the organisation and the environment in which they operate, have provided the basis for many studies. For example, Tornatzky and Fleischer (1990) listed three factors; organisational factors, technological factors and environmental factors. Thong (1999) identified four variables for information systems adoption from the technological innovation literature: CEO characteristics, the characteristics of the information systems, organisational characteristics and environmental characteristics. Accordingly, we see that the attitudes towards innovation by senior members of the organisation combines with the internal characteristics of the firm and the external environment of

that firm. As we discuss later, the literature thus suggests that barriers to adoption appear to fall into two distinct categories; the perception of risks and the perception of the firm's internal and external environment, albeit that in practice these factors work in combination. These categories thus form the variables that we investigate.

Barriers

The concept of barriers is useful in understanding why some firms adopt and others do not, (Irvine and Anderson, 2008; Walczuch, Van Braven and Lundgren, 2000) or in helping to explain why some adopt early and others lag behind (Fillis, Johansson and Wagner, 2003), perhaps using only some aspects of the system (Bouwman et al., 2007). In essence, barriers have a negative effect on the acceptance of e-commerce (Lawson et al., 2003; MacGregor and Vrazalic, 2005). For small business, which may lack the resources of larger firms (Jack, Dodd and Anderson, 2004), these barriers may be seen as substantial. MacGregor and Vrazalic's (2005) study of small businesses' e-commerce adoption barriers in Sweden and Australia noted that for some respondents, e-commerce was either "too difficult" or "unsuitable" for the business. Similarly, Heung (2003) identified five categories of barriers to the implementation of e-commerce in Hong Kong: inadequate financial resources, technical issues, inadequate knowledge of e-commerce, partner's participation and security.

Thus, in many ways the literature proposes a trade off between the perceived advantages and the perceived disadvantages. Gunasekaran and Nagi (2005) explored the application and implementation of e-commerce in Hong-Kong. They found that the factors influencing acceptance of e-commerce could be divided into perceived benefits, application of e-commerce, usage of the Internet and perceived barriers. Perceived benefits include quick response and access to global information, customer service, advertising and low cost whilst the perceived barriers consist of a limited legal framework, the lack of technical skills and security and problems with cost justification. Taking a broad view, Kshetri (2007) distinguished 3 types of barriers to e-commerce; economic, socio-political and cognitive. He argues the first two, economic and socio-political are primarily organisational. However, he notes that cognition affects behaviour and argues that the cognitive component plays a prominent role. Eastin (2002) considers risk in conducting online business is about the perception of security and this plays a significant role in the adoption processes. Similarly UNCTAD (2000) reported that cognitive barriers are more serious than other categories of barriers. It seems that a cognitive barrier may be manifest as a lack of trust in the systems (Anderson, Steinerte and Russell, 2010). Certainly, Lawson et al.'s (2003) results showed that major barriers are perceived security and privacy of transactions and lack of IT expertise of staff. Reliability or riskiness can thus be conceptualised as the amount of uncertainty surrounding the outcome of an innovation (Dearing, Meyer, and Kazmierczak, 1994; Johnson et al.,1998).

There is an interesting paradox in that ICT systems are meant to reduce risk by making more complete information readily available. But the systems themselves, the solutions, carry their own risks, the most catastrophic being systems failure (Hanseth and Ciborra, 2007). So the very reliance on a system can be perceived as a risk in itself. Moreover, Hanseth and Ciborra (2007) point out that as ICT systems become more complex, our own knowledge of how the system works is always incomplete. However we might expect that familiarity will reduce this perception of risk; alternatively a bad experience may increase the perceived risk. Hence looking at continuing use will add to what we already know about adoption.

Importantly many of these concerns are the perceptions of barriers, rather than de facto obstacles. Nonetheless, perception is what influences decisions, especially in small firms where the owner manager plays a decisive role in decision making (Harbi, Amamou and Anderson, 2009). Grandon and Pearson (2004) examined the determinant factors in the adoption of electronic commerce as perceived by top managers in SME. They argue that those who perceive e-commerce as adding strategic value to the firm have a positive attitude toward its adoption. Perceptions about a new technology (Chorev and

Anderson, 2006) often relate to the perceptions of risk. Indeed, Lawson et al. (2003) identified the major barriers to electronic commerce for SMEs as security and privacy of transaction. Hence trust and security appear to be most important among the challenges to be overcome if e-commerce is to be facilitated. The literature indicates that risk is cognitively understood. That is to say, it is about perception rather the reality. The literature describes two forms of cognitive risk, information risk and business risk.

Liu and Wei's (2003) study showed that e-commerce adoption decisions are strongly influenced by their perception of risk. Salo and Karjaluoto (2007) noted the major barrier for most end-users related to revealing personal information. This was manifest as a lack of trust in the other party's ability to keep the information safely. Presented more generally, this suggests that because e-commerce is virtual, and hence lacking personal contact, a lack of trust could operate as a barrier for adopting e-commerce. Udo (2001) also investigated the privacy and security concerns of online IT users. He found that the majority of users have serious concerns about their privacy and security while shopping on the Internet together with concerns about the confidentiality of their e-mails. Turning to the object of our study, e-trade, it is clear that previous research has found similar effects about perceptions of risk. Several studies about adopting e-trade systems have described barriers as cognitive or distrust (Kshetri, 2007; MacGregor and Vrazalic, 2005; Lawson et al., 2003; Salo and Karjaluoto, 2007). These barriers could delay the adoption of a system or lead to the abandonment of the attempt to adopt innovation. However if use of the e-trade system had proved satisfactory, perceptions of risk would be reduced and hence encourage continuing use.

Based on previous research, we define cognitive barriers as the lack of trust in the technology of a system. We propose two elements of trust, perceived information risk and perceived business risk, Perceived information risk is defined as the degree of distrust about the product which is offered by an e-trade system; perceived business risk is defined as apprehension about an organisation's business security when using an e-trade system.

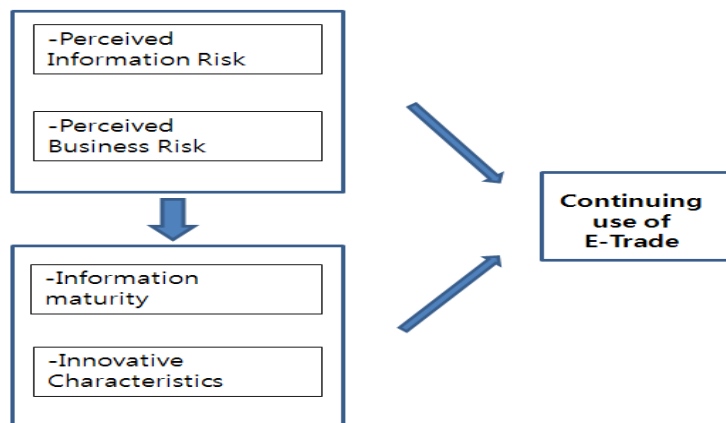**The organisational environment**

Clearly perceptions and decisions do not operate independently or in isolation. Rather they are formed in the context of the organisation in which the view is fashioned and action is taken (Anderson, Dodd and Jack, 2010). Thus, as we noted earlier, the organisational context is important. Previous research about the diffusion of IT has argued that the organisational environment has a strong influence on decisions about IT (Premkumar and Ramamurthy, 1995; Thong, 1999; Zhu, Kraemer and Xu, 2003). The factors which constitute the environment of an organisation comprise two categories; internal and external. Generally, the internal environment, the organisational characteristics, can be described as the infrastructure, top management support and IT employees. Fathian, Akhavan and Hoorali's (2008) study identified critical internal factors, described as resource barriers, such as ICT infrastructures and staff knowledge. The presence of these factors in the internal environment of organisation is often usefully described as "e-readiness" (Grandon and Pearson, 2004; Molla and Licker, 2001; Tan, Tyler and Manica, 2007; Bayo-Moriones and Lera-Lopez, 2007). Molla and Licker (2001) argued that such organisational factors affect e-commerce adoption. Interestingly, they synthesise these as perceived organisational e-readiness and perceived external e-readiness. Thus factors in the external environment mirror the concept of e-readiness. Fathian, Akhavan and Hoorali (2008) discuss external issues as ICT availability, security and the legal environment. Tan, Tyler and Manica (2007) describe external e-readiness as market forces and supporting industries. Their study finds that the external environment plays a major positive role in e-commerce adoption whilst internal organisational factors inhibit e-commerce adoption and diffusion.

Drawing from this literature, we define e-readiness as the ability of an organisation to successfully adopt, use, and benefit from information technologies. We look at two aspects of e-readiness; the maturity of information technology and the innovation characteristic of the organisation. The maturity of information technology and the innovation characteristics of an organisation are defined as follows; the maturity of information technology is the degree to which an organisation has information technology relating to e-trade and the innovation characteristic is the degree that e-trade systems are supported by the CEO. This study thus explores the relationship between environment variables and the continuous use of e-trade and the relationship between barriers and environment. We present these variables in the model below.

The model derived from the literature and hypotheses

Our model is designed to identify whether the perceived risk and environment influence the continuous use of e-trade. It has three categories, perceived risk, the information technology environment of an organisation and the future adoption and continuing use of e-trade. The model is illustrated in Fig. 1. It describes the impact of two sets of independent factors, perceived risk and the environment of an organisation, on the 'continuous use'' of e-trade by firms. The dependent variable is continuous use which means the degree of willingness of firms to continue to use e-trade. This is estimated on a five point Likert scale. We explore the direct, indirect and total effect amongst perceived risk, environment and continuous use of e-trade by using this model.

Figure. 1. The Model

Hypotheses- Perceived Risk

As discussed earlier, in the many studies relating to perceived risks, there has been shown to be a negative relationship between e-commerce adoption and perceived risk. We test two categories of risk; cognitive risk and trust, which we term Perceived Risk. Perceived risk consists of two sectors, perceived information risk and perceived business risk. Perceived information risk is defined as the extent of distrust about information which is offered by the e-trade system. Perceived business risk is defined as anxiety relating to an organisation's business security. Thus perceived business risk represents trust in the counterparty when companies do business with others. If companies do business using the internet, they do not meet each other and a lack of face-to-face or verbal contact may engender a sense of insecurity. Such perceived risks will have a negative influence on the environment related to information technology and on the future adoption of e-trade. Thus, we propose the following hypotheses:

H 1-1: Perceived information risk negatively affects the maturity of information technology related to e-trade.

H 1-2: Perceived information risk negatively affects the innovation characteristics of an organisation related to e-trade.

H 1-3: Perceived information risk negatively affect the future adoption of e-trade.

H 2-1: Perceived business risk negatively affects the maturity of information technology related to e-trade.

H 2-2: Perceived business risk negatively affects the innovation characteristic of an organisation related to e-trade.

H2-3: Perceived business risk negatively affects the future adoption of e-trade.

The organisation's environment

As demonstrated in our review, e-readiness is expected to have a positive effect on the use of e-trade. In this study, organisational environment is treated as the maturity of information technology and the degree of support within an organisation. The degree of organisation support is referred to as the "innovation characteristic". We explore the relationship between maturity of information technology and innovation characteristics in the following hypotheses:

H3-1: The maturity of information technology positively affects the innovation characteristics of an organisation.

H3-2: The maturity of information technology positively affects the future adoption of e-trade.

H4: The innovation characteristics of an organisation positively affect the future adoption of e-trade.

Methodology

The sample

Our initial sample universe was drawn from some 500 companies registered with the Korea International Trade Association (KITA). This list provided details of trade type, company name, phone numbers and e-mail address of various small-medium sized enterprises. From the initial list we received a total of 193 completed questionnaires. Of these, 29 had missing responses in the questionnaire and these were excluded from our analysis. Our usable final number of completed responses was 164, a satisfactory response rate of some 33%. The details and characteristics of the sample are shown in Table 1. The entire sample was comprised of SMEs according to the Korean official definition of less than 300 employees. All the responses were from companies operating e-trade.

Respondent sample profile, Table 1.

Respondent profile	Number	Percentage (%)
Respondents' business type		
Trading only firm	21	12.8

Trading/manufacturing firm	143	87.2		

e-trade age, i.e. extent of time having e-traded

Less than 6 months	6-12 months	12-24 months	24-36months	Over36 months
38	17	37	33	39

Company size

Less than 10 employees	11-50 employees	51-100 employees	101-300 employees
41 (25.0%)	33 (20.1%)	42 (25.6%)	48 (29.3%)

Annual sales revenue

Less than US $1 million	US$1 to $1million	Over US$10 to $ 20 million	Over US$20 to US $50 million	More than US$50 million
56 (34.1%)	26 (15.9%)	23 (14.0%)	35 (21.3%)	24 (14.6%)

Survey instrument

Based on our research model presented earlier, a questionnaire was developed. To ensure the content validity of the scales, the measurement items were based on prior relevant studies and used a 5 point Likert scale. The questionnaire was presented in four parts. The first part describes the concept of e-trade and assesses the level of future adoption of e-trade. The continuous use of e-trade measured the extent of willingness to increase the use of e-trade system in international trade processes. Barriers consist of two content areas; perceived information risk- the perception of business risk associated with e-trade.

The items of perceived information risk constitute- insufficient information about business partners or correspondents, goods and credit. Perceived business risk examined items about business confidentiality, or the preservation of, and abuse of information. In the third section, we asked about the industry environment and the innovation characteristics of the respondents' firms. The final part consisted of questions about the respondent's demographics.

Results

Measure development and scale properties

Before testing the hypotheses, we first discuss the confirmatory analysis, scale reliability and validity of all the measurements in this study. A first-order confirmatory factor analysis using LISREL 8.3 (Jöreskog and Sörbom, 1989) was conducted to test the measurement model. We used a covariance matrix which referred to the relationship of each variable for the confirmatory analysis.

Table 2. Fit indices for measurement and the structural model

Fit indices	Recommend Value	Measurement Model	Structural Model
$X^2(d.f)$	Non-Sign	118.87(67)	235.098(10)
AGFI	>0.80	0.87	0.821
NFI	>0.90	0.91	0.977
GFI	>0.90	0.92	0.988
CFI	>0.90	0.96	0.981
IFI	>0.90	0.96	0.981
RMSEA	<0.08	0.05	0.057

In the confirmatory analysis, seven common model-fit measures were used to assess the model's overall goodness of fit: the ratio of X^2(d.f), adjusted goodness of fit index (AGFI), normed fit index (NFI), Goodness of fit (GFI), comparative fit index (CFI), incremental fit index (IFI), and root mean square error of approximation (RMSEA).

As shown in Table 2, all the model-fit indices exceeded their respective common acceptance levels suggested by previous research, thus demonstrating that the measurement model exhibited a fairly good fit with the data (x2=118.87 with df=10, NNFI=0.91, CFI=0.96, IFI=0.96, GFI=0.92, AGFI=0.87, RMR (root mean square residual)=0.03, RMSEA=0.05). Therefore, the study could proceed to evaluate the psychometric properties of the measurement model in terms of reliability, convergent validity and discriminant validity. Reliability and convergent validity of the factors were estimated by construct reliability and average variance extracted (Table 3). The construct reliability for all the factors in the measurement model was above 0.80.

Table 3. Convergent Validity.

Latent Variables	Item	Factor loading	t-value	R2	Error terms
CAE	CAE1	.72	3.77	0.44	0.66
	CAE2	.69	3.93	0.81	0.11
PIR	PIR1	.50	9.26	.35	.35
	PIR2	.64	13.07	.15	.15
	PIR3	.61	13.32	.12	.12
PBR	PBR1	.71	13.20	.69	.23
	PBR2	.76	15.26	.85	.10
	PBR3	.62	11.35	.55	.32
ICO	ICO1	.53	8.57	.37	.47
	ICO2	.57	10.77	.53	.28
	ICO3	.60	12.43	.66	.19
	ICO4	.64	11.11	.56	.33
MIT	MIT1	.58	7.52	.41	.49
	MIT2	.91	9.89	.96	.03

CAE: Continuous adoption of e-trade
PIR: Perceived Information Risk
PBR: Perceived Business Risk

MIT: Maturity of Information Technology
ICO: Innovation Characteristic of the Organisation

Convergent validity can also be evaluated by testing factor loading. Hair et al. (1998) suggest that a factor loading should be greater than 0.5; the factor loadings of all items in the model were greater than 0.5. Our model examined discriminant validity which compared the shared variance between factors with the average variance extracted of the individual factors (Fornell and Larcker, 1981). The results show that the average variance extracted (AVE) of all factors are greater than 0.50 (see Table 4).

The squares of correlation coefficient value do not exceed the AVE of each factor in the correlation relationship. If the square value of correlation coefficient exceeds AVE, this model would have no discriminant validity. We employed a composite reliability score to measure the reliability. This relies on the actual loading to construct the factor score and is thus a better measure of internal consistency (Fornell and Larcker, 1981; Kim, Ferrin and Rao, 2008) All the variables' composite reliability scores exceed 0.7. Thus, all factors in the measurement model had adequate reliability and convergent validity.

Table 4. Reliability, average extracted variance and discriminant validity

Factor	composite reliability	CAE	PIR	BIR	ICO	MIT
CAE	0.764	0.6241				
PIR	0.837	0.208	0.636			
BIR	0.872	0.167	0.057	0.695		
ICO	0.817	0.229	0.059	0.071	0.530	
MIT	0.744	0.043	0.042	0.077	0.067	0.685

Structural Model

Comparison of all fit indices with the corresponding recommended values provided evidence of a good model fit (x^2=235.09 with df=10, AGFI=0.821, NFI=0.977, CFI=0.981, IFI=0.981 RMSEA=0.057). Thus, this study could proceed to examine the path coefficients of the structural model. The completely standardized path coefficients of the structural model provide evidence for the hypothesized relationship and are shown in Figure 2. All the relationships of the tested model are statistically significant at level 0.01, and consequently provide support for our hypotheses. We explored the relationships between 'exogenous latent variables' and 'endogenous latent variables'. All the measurements in this model fit within the acceptable range and are above the minimum recommend values. The completely standardized path coefficients of the structural model provide evidence for the hypothesised relationships and are shown in Figure 2.
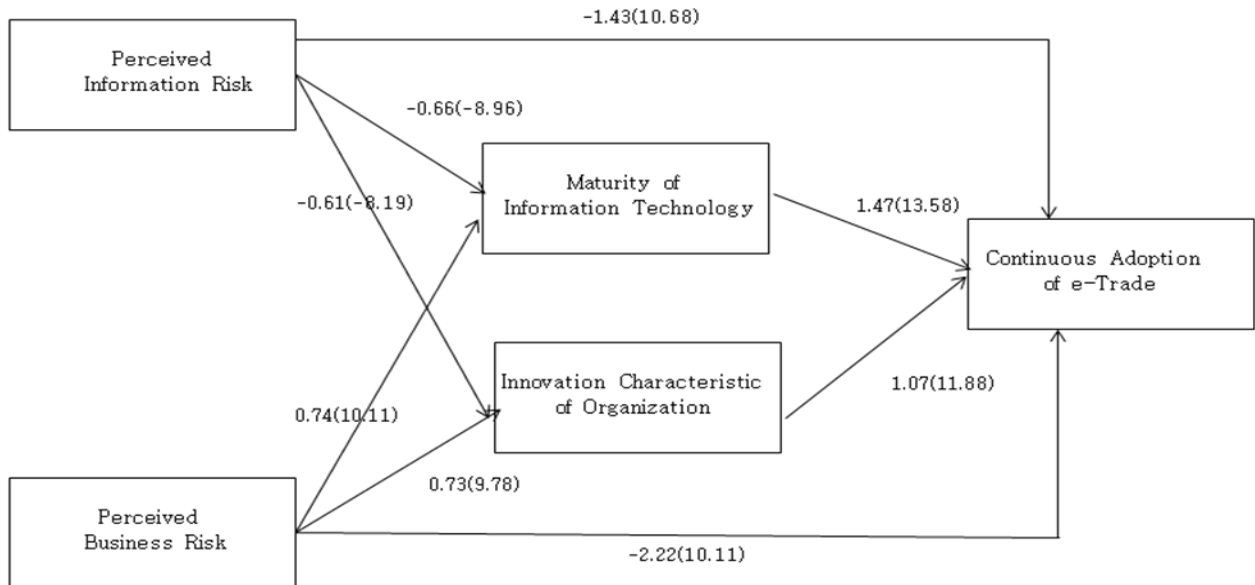
Results

The results show that firms which distrust the product information offered by information technology have a negative attitude towards "the maturity of information technology", "innovation characteristics" and thus towards "the continuous adoption of e-trade". The t-value of "perceived information risk" is statistically significant in all relationships (shown in Fig.2). These findings indicate that such firms are reluctant to continuously adopt e-trade systems. Accordingly hypotheses

H1-1 to H1-3 are supported.

Secondly, exploring the direct effect of "perceived business risk", the t-value of all relationships had a significant statistical influence. We expected that "perceived business risk" would have a negative influence on "maturity of information technology" and on "innovation characteristics". However, our results show that "business risk" actually has a positive influence on "the environment of an organisation". Although the t-values are significant statistically, the path coefficients are positive so H2-1 and H2-2 are therefore rejected.

Figure 2. Hypotheses test results

We also tested the relationship between "perceived business risk" and "continuous adoption of e-trade". The path coefficient is significant statistically and is negative. Therefore, those firms that recognize "perceived business risk" have an aversion towards e-trade. Thus H2-1 and H2-2 are rejected and the hypothesis H2-3 is supported.

Thirdly, we tested the total effect of the relationship between "the environment of an organisation" and "future adoption". The results show that the "innovation characteristics of organisation" and "maturity of information technology" have a positive direct effect on "continuous adoption of e-trade". Thus, H3-1 and H3-2 are both supported.

Table 5. The direct, indirect and total effect of variables depicted

	Direct effect			Indirect effect			total effect		
	MIT	**ICO**	**CAE**	**MIT**	**ICO**	**CAE**	**MIT**	**ICO**	**CAE**
PIR	-0.66	-0.61	-1.43			-1.622	-0.658	-0.614	-0.190
PBR	0.74	0.73	-2.22			1.873	0.742	0.733	-0.347
MIT			1.47						1.466
ICO			1.07						1.072

In addition to testing the direct effects, we also tested the total and the indirect effect. In our model, the total effect of perceived information risk, perceived business risk, maturity of information technology and innovation characteristic of an organisation affect the continuous adoption of e-trade are -0.190, -0.347, 1.466 and 1.072. Accordingly, the maturity of information technology had the strongest effect on the continuous adoption of e-trade, and the perceived business risk has a stronger effect than perceived information risk. The direct, indirect and total effects of perceived information risk, perceived business risk, maturity of information technology and innovation characteristic of organisation on continuous use of e-trade are summarized in Table 5.

Discussion

Our study looked at the perceived barriers to the continuing use of e-trading by Korean SMEs. We argued that understanding the extent of impediments to e-trading had important implications for the efficiency of these small firms. Our review of the literature identified a number of predictors and we employed these in a model. The purpose of the model was to establish whether factors had a positive or negative effect, and the extent of the effect, on the decision to continuously use e-trade. This model formed the basis for our survey of 164 SMEs who currently used some form of e-trading.

We found that the organisation environment is an important predictor and that perceived information risk and perceived business risk has a negative influence on the continuous use of e-trade. Our results are similar to those of previous research carried out about the acceptance and diffusion of innovation (Kshetri, 2007; Lawson et al., 2003; Salo and Karjaluoto, 2007; Udo, 2001). In examining the relationship between perceived information risk and environment of an organisation, we found that information risk has a negative influence on the maturity of information technology and on the innovation characteristics of an organisation. Again our results are similar to those found in previous studies. Perceived information risk exhibited a stronger negative effect on the maturity of information technology than that of the innovation characteristics of an organisation, but there was very little difference between these values.

In our analysis of the direct effect, the 'maturity of information technology' and 'innovation characteristics of an organisation' are controlled. However, the total effect analysis considers mediation variables. That is, the maturity of information technology and the innovation characteristics of an organisation are considered in the total effect when examining the effect which perceived risk has on the continuous use of e-trade. The total effect results show that perceived information risk has a negative effect on the environment of an organisation, on information maturity and on the continuous use of e-trade. So perceptions of information risk have an important influence.

Interestingly, perceptions of business risk has a positive influence on the innovation characteristics of an organisation, this result differs from our original expectation. This result means that the greater the business risk, the more likely firms will be to strengthen the innovation characteristics of their organisations. This result raises both academic and business interest because it is different from previous results and requires a reinterpretation of the role of negative predictors such as business risk. We interpreted this finding to propose that firms which already use an e-trade system want to strengthen their information technology systems to maintain information security. Perceived business risk factor is a negative effect on the continuous use of e-trade in total effect, but it has a positive effect on the maturity of information technology and on the innovation characteristics of an organisation. These results show that perceived business risk has a stronger negative influence than perceived information risk on the continuous use of e-trade. Consequently business risk is a major concern for the use of e-trade systems.

Based on our findings, we propose that e-trade systems should be strengthened by some sort of guarantee. For example, insurance for goods which are traded on e-trade systems could be one

method. We note that the value of the relationship between perceived risk and continuous use of e-trade in direct effect, decreased in total effect. This could be explained by the fact that perceived risk in the use of e-trade falls when the IT environment of an organisation is improved. Thus increased internal IT expertise and application, in other words familiarity, appears to reduce the perception of risk and enhances confidence in the e-trade system. Our results also show that firms worry about the exposure of their business information and leakage of confidential information. Moreover, perceived information risk and perceived business are 'trust' factors. Consequently building more trust into the systems would have a considerable positive effect in encouraging e-trade use.

Implications

We believe that our study has contributed to the debates about e-trade by employing a sample of firms who actually use the technological process. Previous research relating to e-trade has generally focused on the adoption and diffusion of e-trade. Whilst these studies have established the usefulness and convenience of e-trade, the pace of diffusion remains slow. Consequently an awareness and understanding of how barriers are perceived should help to increase the diffusion of e-trade systems. To achieve this understanding, this study presented and validated a research model of an e-trade system; the model included the barriers and the environment of an organisation. We believe that the study has implications for both practitioners and academics. The study demonstrates the negative influence of perceptions about risk associated with innovation. Consequently, we believe that these results may help companies appreciate the managerial implications of adopting and use of e-trade systems. For government and other bodies who wish to promote new, more efficient technological processes, we suggest that the findings help by demonstrating the nature of the barriers. In turn, our findings indicate what has to be done for developing and extending the use of e-trade.

For academics, we had employed a sample who already used the system, thus our study extends the literature on adoption. Our results show that perceived risks have a negative influence on the continuous use of e-trade. These findings are similar to the results from other research on innovation, but extend the concepts to existing users. We have proposed that because of the perceptions of risk, there is a need to overcome the uneasiness associated with the new technology. Consequently, government and organisations might consider the use of an insurance system when companies use e-trade systems. Importantly we argue that the fear of an e-trade system creating risks appears to be related to the lack of innovation characteristic within the organisation. We propose this could be overcome by the continuing use of the e-trade system itself. Thus we are arguing that familiarity will help to build confidence and overcome the perceived barriers. This point appears to be confirmed by our finding that the innovation maturity of information technology has a positive influence.

Limitations and further research

Our study has limitations which could be addressed in any future research. Importantly, one of our reviewers pointed out that organisational characteristics would have an effect on the perceptions of risk. Thus if a company had information maturity and innovative characteristics they might view risk differently. This is a very good point that deserves attention in future work. It was also pointed out that our method did not allow us to identify the direction of causality. Hence the characteristics of the organization could impact on the perception of risk rather than as we describe. This issue thus needs to be tested.

Our study explores the continuous use of e-trade by existing users, but it would be beneficial to examine differences between users and non-users of e-trade systems. We only examined Korean SMEs, so it would be useful to also examine the foreign counterparts in the e-trade transactions. We argued that the use of e-trade increased efficiency, but did not study the financial impact. The study might be extended to examine the financial implications. Such an extension of the scope of the study might adopt the conception of risks identified by Bloom, Milne and Adler (1994). They had noted that

negative endogenous latent variables could include economic, psychological and physical risk. Nonetheless, we hope that this study will serve as a foundation for future research in the subject area.

References

Anderson, A.R., (2000) The Protean Entrepreneur: the entrepreneurial process as fitting self and circumstance", *Journal of Enterprising Culture*, Vol. 8, No 3, pp. 201-234

Anderson, A.R., Steinerte, E., Russell, E.O. (2010), The Nature of Trust in Virtual Entrepreneurial Networks, *The International Journal of E-Entrepreneurship and Innovation,* Vol.1, No.1, pp. 1-21

Anderson, A.R., Dodd, S.D., Jack S., (2010), Network practices and entrepreneurial growth, *Scandinavian Journal of Management,* Vol.25, No. 2, pp. 121-133

Bayo-Moriones, A. and Lera-Lopez, F. (2007) 'A firm-level analysis of determinants of ICT adoption in Spain', *Technovation*, Vol. 27, No. 6-7, pp.352-366.

Bernadas, C. and Verville, J. (2005) 'Disparity of the infusion of e-business within SMEs: a global perspective', *International Journal of Technology Management*, Vol. 31, No.1-2, pp.39-46.

Bloom, P. N., Milne, G. R. and Adler, A. (1994) 'Avoiding misuse of new information technology: legal and societal considerations', *The Journal of Marketing*, Vol. 58, No.1, pp.98-110.

Bouwman, H., Carlsson, C., Molina-Castillo, F. J. and Walden, P. (2007) 'Barriers and drivers in the adoption of current and future mobile services in Finland', *Telematics and Informatics*, Vol. 24, No. 2, pp.145-160.

Bruque, S. and Moyano, J. (2007) 'Organisational determinants of information technology adoption and implementation in SMEs: the case of family and cooperative firms', *Technovation*, Vol. 27, No. 5, pp.241–253.

Chorev, S. and Anderson, A.R. (2006) 'Success in Israeli high-tech start-ups: critical factors and process', *Technovation*, Vol. 26, No. 2, pp.162-174.

Daniel, E., Wilson, H. and Myers, A. (2002) 'Adoption of e-commerce by SMEs in the UK', *International Small Business Journal*, Vol. 20, No. 3, pp.253–270.

Dearing, J., Meyer, G.. and Kazmierczak, J. (1994) 'Portraying the new: communication between university innovators and potential users', *Science Communication* , Vol. 16, No. 1, pp.11–42.

Drew, S. (2003) 'Strategic uses of e-commerce by SMEs in the East of England', *European Management Journal*, Vol. 21, No. 1, pp.79-88.

Eastin, M. S. (2002) 'Diffusion of e-commerce: an analysis of the adoption of four e-commerce activities', *Telematics and Informatics*, Vol. 19, No. 3, pp.251-267.

Fathian, M., Akhavan, P. and Hoorali, M. (2008) 'E-readiness assessment of non-profit ICT SMEs in a developing country: the case of Iran', *Technovation*, Vol. 28, No. 9, pp.578-590.

Fillis, I., Johansson, U. and Wagner, B. (2003) 'A conceptualisation of the opportunities and barriers to e-business in the smaller firm', *Journal of Small Business and Enterprise Development*, Vol. 10,

No. 3, pp.336-344.

Fillis, I., Johansson, U. and Wagner, B. (2004) 'Factors impacting on e-business adoption and development in the smaller Scottish firm', *International Journal of Entrepreneurial Behaviour and Research*, Vol. 10, No. 3, pp178-191.

Fornell, C. and Larcker, D. F. (1981) 'Evaluating structural equation models with unobservable variables and measurement error', *Journal of Marketing Research*, Vol. 18, pp.39-50.

Grandon, E. E. and Pearson, M. J. (2004), 'Electronic commerce adoption: an empirical study of small and medium US businesses', *Information & Management*, Vol. 42, No. 1, pp.197-216.

Gunasekaran, A. and Ngai, E. W. T. (2005) 'E-commerce in Hong Kong: an empirical perspective and analysis', *Internet Research*, Vol. 15, No. 2, pp.141-159.

Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (1998) *Multivariate Data Analysis*, 5th edn., Prentice-Hall.

Harbi, S., Amamou, M. and Anderson, A.R. (2009) 'Establishing high-tech industry: the Tunisian ICT experience', *Technovation*, Vol. 29, No. 6-7, pp.465-480.

Hanseth, O. and Ciborra, C. (2007). Risk, Complexity and ICT, Cheltenham, UK; Edward Elgar

Heung, V. C. S. (2003) 'Barriers to implementing e-commerce in the travel industry: a practical perspective', *International Journal of Hospitality Management*, Vol. 22, No. 1, pp.111-118.

Irvine, W. and Anderson, A.R. (2008) 'Information communication technology, peripherality and smaller rural hospitality businesses in Scotland', *International Journal of Entrepreneurial Behaviour and Research*, Vol. 14, No.4, pp.200-218.

Jack, S. L., Dodd, S. D., and Anderson, A. R. (2004). Social structures and entrepreneurial networks: The strength of strong ties. *International Journal of Entrepreneurship and Innovation,* Vol. 5, No. 2, pp. 107-128.

Joen, B.N., Han, K. S. and Lee, M.J. (2006) 'Determining factors for the adoption of e-business: the case of SMEs in Korea', *Applied Economics*, Vol. 38, No. 16, pp.1905-1916.

Johnson, J.D., Meyer, M., Woodsworth, M., Ethington, C., Stengle, M. P. H. (1998), 'Information technologies within the cancer information service: factors related to innovation adoption', *Preventative Medicine*, Vol. 25, No. 5, part 1, pp.S71-S83.

Jöreskog, K. G. and Sörbom, D. (1989) *LISREL 7 User's Reference Guide*. Chicago: Scientific Software International.

Kim, D.J., Ferrin, D.L. and Rao, H. R. (2008) 'A trust-based consumer decision-making model in electronic commerce: the role of trust, perceived risk, and their antecedents', *Decision Support Systems*, Vol. 44, No. 2, pp.544–564.

Kimberly, J. R. and Evanisko, M. J. (1981) 'Organizational innovation: the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations', *Academy of Management Journal*, Vol. 24, No. 4, pp.689–713.

Kshetri, N. (2007) 'Barriers to e-commerce and competitive business models in developing countries:

a case study', *Electronic Commerce Research and Applications*, Vol.6, No. 4, pp.443-452.

Lawson, R., Alcock, C., Cooper, J. and Burgess, L. (2003) 'Factors affecting adoption of electronic commerce technologies by SMEs: an Australian study', *Journal of Small Business and Enterprise Development*, Vol. 10, No. 3, pp.265-276.

Lee, H., O'Keefe, R. M. and Yun, K. (2003) 'The growth of broadband and electronic commerce in South Korea: contributing factors', *The Information Society*, Vol. 19, No. 1, pp.81-93.

Li, J. H., Anderson, A.R., and Harrison, R.T., (2003) 'The evolution of agile manufacturing', *Business Process Management Journal*, Vol. 9, No. 2, pp. 170-189

Liu, X. and Wei, K. K. (2003) 'An empirical study of product differences in consumers' e-commerce adoption behavior', *Electronic Commerce Research and Applications*, Vol. 2, No. 3, pp.229-239.

MacGregor, R. C. and Vrazalic, L. (2005) 'A basic model of electronic commerce adoption barriers – a study of regional small businesses in Sweden and Australia', *Journal of Small Business and Enterprise Development*, Vol.12, No. 4, pp.510-527.

Matlay, H. and Addis, M. (2003) 'Adoption of ICT and e-commerce in small businesses: an HEI-based consultancy perspective', *Journal of Small Business and Enterprise Development*, Vol. 10, No. 3, pp.321-335.

Molla, A. and Licker, P. S. (2001) 'E-commerce systems success: an attempt to extend and respecify the Delone and Maclean model of IS success', *Journal of Electronic Commerce Research*, Vol. 2, No. 3, pp.131−141.

Oh, K.Y., Cruickshank, D. and Anderson, A.R. (2009) 'The adoption of e-trade innovations by Korean small and medium sized firms', *Technovation*, Vol. 29, No. 2, pp.110-121.

Oxley, J.E. and Yeung, B. (2001) 'E-commerce readiness: institutional environment and international competitiveness', *Journal of International Business Studies*, Vol. 32, No. 4, pp.705-723.

Premkumar, G., and Ramamurthy, K. (1995) 'The role of interorganizational and organizational factors on the decision mode for adoption of inteorganizational systems', *Decision Science*, Vol. 26, No. 3, pp.303–336.

Seyal, A.H., Rahman, M.N.A., Mohammad, H.A.Y. H.A., (2007) ' A quantative analysis of factors contributing electronic data interchange adoption among Bruneian SMEs', *Business Process Management Journal,* vol. 13, No. 5, pp. 728-746.

Salo, J. and Karjaluoto, H. (2007) 'A conceptual model of trust in the online environment', *Online Information Review*, Vol. 31, No. 5, pp.604-621.

Subba Rao, S., Metts, G., Mora Monge, C.A., (2003) 'Electronic commerce development in small and medium sized enterprises,   stage model and its implications', *Business Process Management Journal,* Vol. 9, No. 1, pp. 11-32.

Tan, J., Tyler, K., Manica, A. (2007) 'Business-to-business adoption of ecommerce in China', *Information & Management*, Vol. 44, No. 3, pp.332–351.

Thong, J. Y. L. (1999) 'An integrated model of information systems adoption in small business', *Journal of Management Information Systems*, Vol. 15, No. 4, pp.187–214.

Tornatzky, L. G.. Fleischer, M. (1990) *The Process of Technological Innovation*, Lexington Books.

Udo, G. J. (2001) 'Privacy and security concerns as major barriers for e-commerce : a survey study', *Information Management & Computer Security*, Vol. 9, No. 4, pp.165-174.

UNCTAD (2000). United Nations Conference on Trade and Development, Building Confidence, Electronic Commerce. http://r0.unctad.org/ecommerce/docs/building.pdf, [accessed 26/8/2009].

Viswanathan, N.K. and Pick, J.B. (2005) 'Comparison of e-commerce in India and Mexico: an example of technology diffusion in developing nations', *International Journal of Technology Management*, Vol. 31, No. 1-2, pp.2-19.

Walczuch, R., Van Braven, G. and Lundgren, H. (2000) 'Internet adoption barriers for small firms in The Netherlands', *European Management Journal*, Vol. 18, No. 5, pp.561-572.

Zhu, K., Kraemer, K. and Xu, S. (2003) 'Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors', *European Journal of Information Systems* Vol. 12, pp.251–268.