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ABSTRACT

Despite the increased number of SME adopters of information communication technology for their business, there are limited studies that address the factors affecting SME's adoption decision. Especially, a theoretical perspective on E-business adoption model for SMEs is required to understand better the SME's complex adoption decision and, in turn, to provide a realistic means of guidelines for other SME's for their adoption decision. Thus, the goal of this study is three-fold: i) to review key literature of the factors affecting SME's adoption decision and then summarize major determinants of key dimensions with definition and literature sources, ii) to propose a theoretical framework of e-business adoption, and iii) to provide an insightful discussion on the driving factors and barriers of the e-business adoption decision by SMEs.

Keywords

OBTG (Organizational – Business – Technological - Governmental) E-Business adoption model, SMEs, Information and Communication Technology, E-business, e-commerce

INTRODUCTION

Small and medium size enterprises (SMEs) play a significant role in the economy of many countries to provide employment opportunities and support large-scale firms. SMEs comprise 99.7%, 92%, 90%, 98% and 99.7% of the enterprises in the U.S., Singapore, the UK, Hong Kong, and the Republic of Korea (Korea) respectively (Chau et al. 2002; KIMI 2002; OECD 1997; Towler 2002). However, only 25% and 26% of SMEs in the US and Korea, respectively, are using the Internet for their business (MIC 2002; Nua_Internet_Surveys 2001). In light of the fact that Korea has the world's fifth largest Internet market and has the highest Internet penetration in the world (ITU 2003), the percentage of SMEs in other countries using the Internet for business is perhaps lower than 26%. Moreover, the penetration rate of adoption of other Information and Communication Technology (ICT) is lower than the Internet use.

In the SME sector, the rate of ICT adoption, which is also described as computerization, E-commerce, EDI, Internet business, etc., is lower than that of big companies. This is mainly because of their characteristic of "resource-poverty," which includes a lack of finances, ICT experts, time, and planning (Blili et al. 1993; Paraskevas et al. 2002; Soh et al. 1997). This phenomenon is also seen in other countries (OECD 2003). For these reasons, governments of some countries have made an effort to initiate a wider diffusion of ICT for the SME sector. The Korean Government, for example, has taken a direct and indirect role to lead the ICT diffusion for SME since 2001 (KIMI 2003). Under the government's plan, 3 Telcos and about 130 application service providers (ASPs), including IT ventures, compose in consortiums to promote adoption of ICT and to create business models suitable for SMEs. The biggest benefit of the construction of consortium is to provide application program and service platform for the Internet business at an extremely low cost with governmental support.

Despite the increased number of SME adopters of ICT, there are limited studies that address the factors affecting SME's adoption decision. Especially, a theoretical perspective on E-business adoption model for SMEs is required to better

understand the SME's complex adoption decision conceptually and, in turn, to provide a realistic means of guidelines for other SME's for their adoption decision. Thus, the goal of this research-in-progress is three-fold: i) to review key literature of the factors affecting SME's adoption decision and then summarize major determinants of key dimensions with definition and literature sources, ii) to propose a theoretical framework of e-business adoption, and iii) to provide an insightful discussion on the driving factors and barriers of the e-business adoption decision by SMEs.

LITTERATURE REVIEW

Many SME studies (Chong et al. 2007; Dholakia et al. 2004; McCole et al. 2005; Scupola 2003; Seyal et al. 2004) suggest various internal explanatory factors related to internal business organization and technology, and external factors related to business environment. These factors affect the SME's adoption decision of new information and communication technologies (e.g., inter information systems, computerization of businesses, e-commerce, EDI, etc.). For example, internal factors, such as lack of technology awareness (Locke et al. 2002; MIC 2002; Rogers 1995) and implementation cost (Locke et al. 2002; Purao et al. 1998), are crucial elements in the general adoption of ICT by SMEs. Lack of technology awareness contains several sub components, which include unfamiliarity of technologies, uncertainty of ICT benefits, and a lack of guidance (Purao & Campbell, 1998; MIC, 2002). Implementation cost is mostly related to technology factors including software, hardware, training, maintenance costs, etc. On the other hand, external environmental factors, such as national-level information technology infrastructure, industry-level technology availability, and market-level critical mass (Abell & Lim, 1996), are also major barriers to obstruct the ICT adoption in SME. Lefebvre and Lefevre (1996a) identified three levels of external factors (industry, macroeconomic, and national policy level) affecting the general and competitive environment where a particular firm has to operate. Iacovou et al. (1995) identified three factors of EDI adoption: external pressures (i.e., competitive pressure and requirements by trading partners), perceived benefits of the new technology, and organizational readiness.

Rashid and Al-Qirim (2001) proposed a framework for e-commerce technology adoption by New Zealand SMEs. The framework consists of four contexts: technological, organizational, environmental, and individual contexts. Kurnia and Johnston (2000) suggest a general framework including three key explanatory variables: the external environment, the technology, and the capabilities of an organization. Their model is similar to the contexts of Tornatzky and Fleischer's (1990) model. Based on Tomatzky and Fleischer's model, Scupola (2003) suggests other external factors, such as competitive pressure, government intervention, and supplier and buyers' components, influencing the adoption decision of Internet commerce. Other studies (Chong et al. 2007; OECD 2000; Scupola 2003) suggest the role of government as a primarily external factor of the ICT adoption. Government's role is mainly related to financial support and policy, such as tax breaks, technology-adoption tax credits, financing, interventions, business regulations, and others. According to a report by OECD (2000), SMEs need more financing than big enterprises because of the structure characteristics of SMEs (e.g., lack of experience and weakness of market power). Besides, due to the development of a variety of ICT and the proliferation of ASPs, ICT outsourcing is emerging as an influencing factor and becoming suitable for many SMEs sectors (Teng, et al, 1995; Turban, et al, 2000). Therefore, outsourcing elements factors are also considered as influencing factors for SMEs to overcome their weak positions in the market.

In this study, drawing upon the previous relevant literature (Chong et al. 2007; Dholakia et al. 2004; Fink et al. 2006; McCole et al. 2005; Rashid et al. 2001; Scupola 2003; Seyal et al. 2004), a number of factors influencing the adoption decision of information communication technology in SMEs are identified. In general, there are two different groups of factors: organization-related internal factors and business environment-related external factors. Further, these two factor groups are classified into four dimensions influencing the e-business adoption decision by SMEs: internal organizational dimension, external business environmental dimension, technology dimension, and government related dimensions. Table 1 summarizes major influencing factors related to the four dimensions with definitions and literature sources.

Types	Definition	Major Determinants (Literature source)
Organizational factors (internal)	Organizational (internal) attributes that affect the ICT adoption decision of the SME	- Organization characteristics (e.g., size, age, type of business, past experience, centralization, formalization, technocratization, etc) (Dholakia et al. 2004; Lefebvre et al. 1996a) - Technological awareness and motivation (Lefebvre et al. 1996a; Locke et al. 2002; Rogers 1995) - Technical capabilities (Lefebvre et al. 1996b; MIC 2002; Purao et al. 1998)

		- Strategic motivations in terms of costs, productivity, quality, flexibility (Lefebvre et al. 1996b) - Lack of guidance about how to start the process (MIC 2002; Purao et al. 1998) - Management support (Palvia et al. 1999; Rashid et al. 2001; Thong 1999) - Users' knowledge and involvement (Kwon 1990; Rashid et al. 2001) - Organizational culture (Seyal et al. 2004) - Communication effectiveness (Ball et al. 1987) - Information intensity (Rashid et al. 2001) - Perceived readiness (Iacovou et al. 1995) - Perceived relative advantage (Soh et al. 1997)
Business environment factors (external)	External business attributes that influence the SME's adoption decision	- Electronic and telecommunications environment (e.g., IT infrastructure) (Dholakia et al. 2004) - Pressure from competitors (Lefebvre et al. 1996a; Premkumar et al. 1999; Scupola 2003; Thong 1999) - Outsourcing elements (Teng et al. 1995; Turban et al. 2000) - Buyers and Suppliers' pressure (Abell et al. 1996; Premkumar et al. 1999; Rashid et al. 2001; Scupola 2003) - Business Partner (Iacovou et al. 1995) - E-Commerce Benefits (Scupola 2003) - Availability of capital, inflation (Lefebvre et al. 1996b)
Technology related factors	Information technology related attributes that promote or deter the SME's adoption decision	- Technology availability (Scupola 2003) - Complexity (Rashid et al. 2001) - Benefits: usefulness (Iacovou et al. 1995; Poon et al. 1997; Rogers 1995; Vickery 2002) - Adoption Risk/Cost: (KIMI 2002; Locke et al. 2002; Purao et al. 1998; Rashid et al. 2001) - Security Hazards: (Abell et al. 1996; MIC 2002; Purao et al. 1998)
Government related factors	Government related attributes (e.g., polities, leadership, initiatives, IT infrastructure, etc.) that affect the adoption decision of the SME	- Government Role: tax break, technology-adoption tax credits, financing, intervention (Lefebvre et al. 1996a; OECD 2000; Scupola 2003) - Information channel & trade policies (Kettinger 1994; Lefebvre et al. 1996a; Rashid et al. 2001) - Level of support (Chong et al. 2007) - Control industry regulation (Lefebvre et al. 1996a)

Table1. Factors affecting SMEs' ICT adoption decision (partially adopted from Walczuch et al., 2000)

OBTG (ORGANIZATION, BUSINESS, TECHNOLOGY, AND GOVERNMENT RELATED FACTORS) ICT ADOPTION MODEL FOR SMES

Previous studies have examined a number of factors influencing the adoption decision of information communication technology by SMEs. On the basis of existing literature on driving factors and barriers of ICT adoption by SMEs, a holistic Organizational–Business–Technological–Governmental (OBTG) ICT adoption model is proposed. The OBTG ICT adoption model is depicted in Figure 1.

Organizational dimension refers to the organization's internal attributes that affect the ICT adoption decision. The factors of this dimension are related to the internal organizational elements of SMEs including organizational characteristics (size, age, type of business, etc), culture, capability, firm's self-efficacy, awareness and motivation to use technology, management support, and others.

Business dimension refers to the external factors or attributes that influence the SME's ICT adoption decision. The factors of this dimension are related to the general business environment within which a particular SME has to operate. The factors include business related pressure, competition, and relationships with stakeholders and outsourcing partners.

While the two internal and external dimensions directly influence the ICT adoption decision, there are two other dimensions indirectly contribute to the decision (i.e., technology and government dimensions). *Technology dimension* refers to the ICT

related attributes that promote or deter the ICT adoption, which includes availability of technology, technology-business fit, cost, and fear factors.

Government dimension is another key dimension which few studies have identified as a factor influencing the SME's ICT adoption decision. The role and leadership of government is very important especially for SMEs in developing and underdeveloped countries for their ICT adoption and implementation. The government can help SME's ICT adoption directly, by giving financial subsidies and making favorable regulations and policies for SMEs, and indirectly, by conducting informational campaigns to increase awareness, and facilitating the access to related technologies for SMEs through ICT infrastructure.

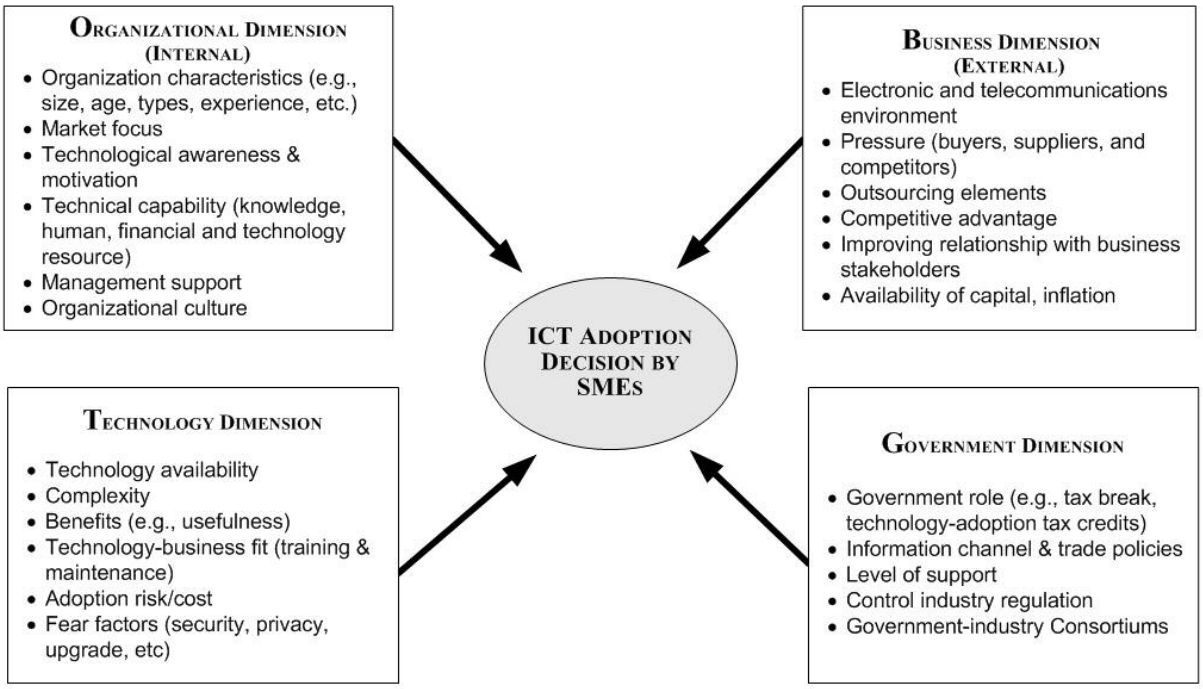

Figure 1: OBTG Adoption Model for SMEs

DATA COLLECTION AND ANALYSIS

To investigate the effects of OBTG (Organizational, Business, Technology and Government) dimensions of ICT adoption model, case studies were conducted using the sample data collected by the National Computerization Agency, one of the executive agencies of the Korean government. This study uses 10 cases of SMEs for the preliminary analysis. The cases are relatively small SMEs in various business areas. They also have the common characteristics of resource poverty. Nonetheless, they continue to try to adopt ICT to facilitate their business, to save time, and to reduce cost. Brief descriptions of all ten companies are summarized in table 2.

Case Company[1]	Type of business	Number of Employees	Year of ICT Adoption	Using ICT service Application
C1	IT consulting	15	2002	Insurance (Health, life, pension) management, Homepage
C2	Server Hosting	4	2002	Accounting, Internet billing, Homepage
C3	Private Exchange management	4	2001	Accounting
C4	Computer training	N/A	1997	Accounting, Internet billing Homepage

[1] The companies are renamed for the privacy purpose.

C5	Body shop, Car repair	8	2002	Accounting, Total management, CRM, Job scheduling. Homepage
C6	Web Magazine	4	2002	Accounting
C7	Furniture design & sale		2001	Web storage, E-mail hosting
C8	Dental clinic	33	2001, 1998	EDI(insurance), Homepage
C9	Beauty shop	20	1998, 2001	Sale analysis, DB marketing, Customer Management program
C10	Printing, publishing	N/A	N/A	FTP, email, Homepage

Table 2. Brief descriptions of the cases

PRELIMINAR RESULTS OF THE CASE ANALYSIS

Using the OBTG framework, each case is analyzed to identify factors. The SMEs have experienced various benefits from the usage of the ICT service platforms. There are three main reasons why the SME's adopt ICT: savings of maintenance cost, reduction of transaction time, and increasing efficiency of work. Those are very similar to the benefits found in other literature: increased productivity (Abell et al. 1996), distance related barrier disappearance (Walczuch et al. 2000), and ease of access to potential customers (Poon et al. 1997).

Depending on the goal and the capability of SMEs, the ICT choice and its usage are diverse. The usage of the ICT service platforms that the SMEs have used can be categorized into two areas: non-core business and core business activity. Non-core business consists of accounting and insurance management of employees, and core-business activity consists of web-storage services for internet transaction, materials management application for body shops, sales analysis application for beauty shops, and more. Most IT ventures (C2, C3, C4, and C6) have only chosen an accounting service platform as a non-core business. On the other hand, other SMEs have used the Internet based service platforms to extend their market as core business activity. However, even the same solutions have different usage in the SMEs. For example, the homepage in C8 is used for mere public information while C2 uses its homepage for Internet business.

Organizational Environment-related Factors

Awareness: Four SMEs (C1, C2, C3, and C4) have the positive awareness of ICT adoption in the light of their intention and effort of other ICT adoption and pursuit of business extension via ICT service platform (C5, C8, C9, and C10). The result shows that higher awareness about ICT has played a very important role in ICT adoption and extension.

Perceived benefit: Five SMEs (C1, C2, C3, C4, and C6) have known the benefit of ICT adoption through previous experience. Therefore, they are highly willing to adopt new ICT service platforms with the expectation of benefit (C8). The perceived benefit is highly related to new ICT adoption.

Business-related Factors

Outsourcing element: Some SMEs (C3, C4, C6, and C10) are dependent upon an agent to fill in the part of the business process that they cannot perform or deal with. They use an accounting service application customized to their business. They call it "simple bookkeeping", which provides an account form balance sheet and makes it easier for their users to write and report their accounting. For example, in C3, one of IT ventures having 4 employees, used to pay about $250 per month to an agent for tax accounting. However, after using the ICT service platform, they now pay only about $15 (not including broadband Internet service) per month.

Buyer and Supplier: The C7 has difficulty sending its estimate and blueprint to the customers on the Internet, because their main customers are women in their 50s, who are not familiar with the Internet. Therefore, it has to retain both online and offline business structure. The C2 has used an accounting program that enables them to do Internet transactions according to the increasing trends of Internet business. However, since many people in Korea tend to think that the receipt issued on the Internet is not trustworthy, the C2 has sent the receipt to their customers by mail. This type of problem can be a barrier to the extension of the Internet business.

Business partner: SMEs, who are subcontractors or agents of the big enterprises that use EDI or e-commerce, tend to adopt an EDI system or e-commerce solution (Abell & Lim, 1996; KIMI, 2003). The C7, who is an agent and is associated with its supplier (a big enterprise), transacts business together on the Internet by the supplier's request.

Among the business related factors, outsourcing element seems to be an important factor to initiate ICT adoption in SMEs because most of SMEs cannot implement the ICT project by themselves and that cost is too much for some of the SMEs. The outsourcing element differs greatly by the characteristics and the types of business in SMEs. Therefore, this factor is highly related to technology availability as a substitute of an outsourcing element. In conclusion, the results suggest that certain outsourcing elements with reasonable costs can provide the motivation of ICT adoption to many SMEs.

Technology-related Factors

Cost: Even in the SMEs already using ICT, cost is still a critical barrier (C1). The lowered price of ICT service platforms caused SMEs (C3, C4, and C9) to change their business partners or disconnect them. Due to the limitation of capability or time, they outsourced a part of their business to accountants (C3 and C4) and a private consultant (C9). In short, the lowered cost of ICT causes SMEs to adopt ICT. The lowered cost is a driving factor to adopt ICT by SMEs.

Maintenance and Training: The limited technological knowledge of employees and their management capability can be a barrier to adoption and extension of the information systems. Some CEOs (C1 and C2) are worried about the introduction of ICT because of the fear that their employees might be not familiar with it. C1 and C2 complain about the lack of training for their employees from the ICT service providers. Nonetheless, this factor seems not to be a critical factor to adopt new ICT because they can ask the ICT service providers what they want and to train their employees.

Fear factor (security and privacy): The fear of the possibility of leaking company's valuable information can be a critical barrier to adopting and extending implementation of new ICT service applications. Two companies (C3 and C7) are afraid of exposing their company information to outsider. C3 is unwilling to adopt new ICT because of this reason. In C7's case, since most business activities are processed and arranged through the Internet, the security and privacy concerns about its business information and marketing strategy are the major fear factors of their new ICT adoption decision.

Technology availability (Hard to find solution & Customization): This is a crucial barrier that directly influences SME's ICT adoption decision. The CEOs of C2 and C6 insist that the sample accounting program provided by the ICT consortiums needs to be more developed and customized, although they are satisfied with the function and the price. The CEO of C2 points out that the absence of a suitable application program is one of the barriers to adopt new ICT by SMEs. The CEO of C1 tried to use a personnel management application program of the consortium. However, he could not use it because the program was not suitable for his business practice.

In conclusion, the result shows that high cost is still a main barrier in some SMEs in the extension of ICT adoption like initial adoption. The results also show that the cost of ICT adoption could be decreased gradually, depending on the level of ICT development and the degree of the assistance of external environment. The lowered cost of ICT might influence more on the wider adoption of ICT in the SME sectors.

Government-related Factors

Cost related financing: The SMEs have used one of the ICT service platforms developed by the support of the government. They are satisfied with the price of the ICT service platforms. This factor might come from the government's support.

Cooperation Work: All SMEs have used an ICT service platform provided by the consortium, which have played an important role in ICT adoption in the SME sector. They were organized in 2001 by the enforcement of government legislation to promote ICT adoption in SMEs. They are divided into five-business domains: content service, telecommunication service, application service, web-hosting, and on-line training. Owing to the sharing work between the members of the consortiums, ASPs and other service providers can reduce the development cost of ICT service platforms. Moreover, they do not need additional labor for marketing and billing because Telcos and ISPs, as the leaders, are in charge of the management and operation of the consortium. Therefore, they can not only reduce the cost of outsourcing, but also focus more on their core business.

Information channel: The result shows that SMEs got the ICT information through various channels: an acquaintance (C10), customers (C4), the Internet (C3), newspapers (C6), etc. Ironically, many SMEs can reach the information of ICT service platforms not from marketers or advertisement of the ICT service providers, but from their acquaintances and other parties.

One thing that the Korean government did for the promotion of ICT adoption was to create the ICT consortium to provide financial support for the development and the training of ICT service platforms. The creation of the ICT consortium seems to be very meaningful in terms of the improvement of the SME's atmosphere to diffuse the ICT adoption. Cooperation work created by the ICT consortium plays an important role in the process of ICT adoption in Korea. All SMEs in this study have used the ICT service platform provided by the consortium, whose main function is to provide the particular ICT service applications to the SMEs at lower price. Due to the division of the work between the members of the ICT consortium, each company can concentrate on its core business. For example, ASPs can focus on the development of ICT service applications without being concerned about the marketing or the advertisement of their products. Instead, Telcos and ISPs, which are leaders of the ICT consortiums, are in charge of marketing and management of the ICT service platforms. In short, the governmental role is helpful to reduce or break up the cost barrier and technology availability barrier.

CONCLUSION

The preliminary analysis results of the ten cases show that the barriers related to cost and technology availability are the most crucial factors which affect the SME's e-business adoption decision. Among the business-related factors, outsourcing elements are emerging as influencing factors to adopt ICT. The government related factors are also important factors in the reduction of the main barriers and the creation of atmosphere of e-commerce adoption in the SME sector. Especially, the governmental role is very important to break through the barriers of ICT adoption in SMEs. The primary role of government is to open the way of using ICT without the burden of cost and to create the atmosphere of ICT usage through systematical supports.

The major contribution of this research-in-progress is to propose an OBTG (Organizational–Business–Technological-Governmental) e-business adoption model for SMEs and to preliminary validate the model using ten cases of SMEs from a secondary data collected by an information communication technology (ICT) consortium. Although the number of cases is too small to generalize for all SMEs' environments, this research-in-progress reveals important factors which affect ICT adoption decision by SMEs. It is expected that the proposed model will be tested empirically in the future.

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