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A Model of Factor Influences on Electronic Commerce Adoption and Diffusion in Small- and Medium-sized Enterprises

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Abstract

To survive in today's global marketplace, businesses need to be able to deliver products on time, maintain market credibility and introduce new products and services faster than competitors. This is especially crucial to the Small- and Medium-sized Enterprises (SMEs). Since the emergence of the Internet, it has allowed SMEs to compete effectively and efficiently in both domestic and international market. Unfortunately, such leverage is often impeded by the resistance and mismanagement of SMEs to adopt Electronic Commerce (EC) proficiently. Consequently, this research aims to investigate how SMEs can adopt and implement EC successfully to achieve competitive advantage. Building on an examination of current technology diffusion literature, a model of EC diffusion has been developed. It investigates the factors that influence SMEs in the adoption of EC, followed by an examination in the diffusion process, which SMEs adopt to integrate EC into their business systems.

Keywords: Business-to-Business Electronic Commerce, Adoption and Diffusion, Internet, Small and Medium-sized Enterprises, Cross-country studies.

1. Introduction

Electronic Commerce has changed the way business is conducted around the world. The commercialisation of the Internet and World Wide Web (WWW) has driven Electronic Commerce to become one of the most important media for facilitating the sharing of business information within organisations and between business partners. It was predicted by the year 2003, US\$3.2 trillion worth of businesses will be traded over the Internet worldwide (Forrester Research, 1998) while the Asia Pacific region will have Electronic Commerce revenue of US\$992 billion by year 2004 (Gartner Group, 2000). In Australia it was reported that 1.4 billion electronic transactions took place by the end of 1997 and there are more than 1.6 million Internet users at the start of 1998 (DIST, 1998). And while the numerous prognoses of Electronic Commerce growth differ greatly, they serve as a clear indication of the importance for and impact on the business world.

Smith (1998) details the benefit of Electronic Commerce to be lower cost of trading, faster and better-informed business decisions, and less importance of geography. Other authors mentioned various advantages relevant to Small- and Medium-sized Enterprises such as the "levelling of the playing fields" with the big business (Longenecker, Moore and Petty, 1997); location independence (Longenecker, Moore and Petty, 1997; Puroo and Campbell, 1998); time independence (Puroo

and Campbell, 1998); the ease of communication (Iacovou, Benbasat and Dexter, 1995) and ability to achieve competitive advantages for the businesses (Whiteley, 1998).

In many cases, research indicates that the Internet and Electronic Commerce will have significant positive effects on the traditional value chain and business processes (Benjamin and Wigand, 1995). Such improvement requires the (re-)development and application of new concepts and models to allow Small- and Medium-sized Enterprises to take advantage of the many benefits of Electronic Commerce. In a globalised economy with less and less opportunities for regional and niche market positions, the adoption and successful diffusion of Internet technology into an integrated Electronic Commerce business approach becomes a strategic necessity.

In this study, the following definitions of adoption and diffusion have been chosen to distinguish these two key concepts. **Adoption** is a *decision* to make full use of an innovation as the best course of action whereas rejection is a decision not to adopt an available innovation (Roger, 1983:21). There are two levels of adoption. Initially, innovation must be purchased, adopted and acquired by an organisation. Subsequently, it must be accepted by the ultimate users in that organisation and community (Manross and Rice, 1986). In this study, it is proposed that several internal and external environmental factors influence different levels of Electronic Commerce adoption for the organisation.

As for **diffusion**, it is *the process* during which an innovation is communicated through certain channels over time among members of a social system (Rogers, 1983). Technology diffusion follows the five broad stages of: *initiation, adoption, implementation, evaluation* and *integration*. Corresponding to the evolutionary nature of Electronic Commerce and Web information systems (Bauer, Glasson and Scharl, 1999), the diffusion of Electronic Commerce business process integration is viewed as a cyclical, recurring process. This process is illustrated in the research model.

2. Research Objectives

The purpose of this paper is to identify a comprehensive set of potential determinants influencing the successful adoption and/or diffusion process of Electronic Commerce. The specific objective of this research is to construct a generic model of Electronic Commerce adoption and diffusion processes for Small- and Medium-sized Enterprises.

The above objective can be translated into the following research questions:

- What factors facilitate or inhibit the adoption of Electronic Commerce in Small- and Medium-sized Enterprises?
- What diffusion processes do Small- and Medium-sized Enterprises go through to successfully adopt Electronic Commerce?

Although it is acknowledged that adoption and diffusion processes vary from industry to industry, it is anticipated that the findings of this study should be more broadly applicable to most companies. It is therefore the intention of this research to develop models and conclusions that are generalisable to most industries. It is anticipated that this study will provide valuable insights into the current perceptions of Electronic Commerce in enterprises that are engaged in the business-to-business transactions with its counterparts. Answers to the research questions should prove of interest and

value to Small- and Medium-sized Enterprises owners, practising managers and those seeking to adopt and implement Electronic Commerce strategies.

2.1 Scope of the Research

In this research, the scope of Electronic Commerce applications is limited to the utilisation of Internet as the technology infrastructure to communicate, distribute and conduct information exchange and business transactions with business partners. The overwhelming growth rate of the Internet since the commercialisation in the early 1990's make it the most utilised Wide Area Network platform even for business-to-business communications and make the further substitution of previous platforms highly likely throughout the next decade.

Due to the differences in the strategic success factors and the underlying technologies, a classification into *Business-to-Business Electronic Commerce* and *Business-to-Consumer Electronic Commerce* has become common amongst previous studies (Kalakota and Whinston, 1997; Tech Forecast, 1999). The difference appears to be the use of the Internet to automate business transactions between companies for business-to-business Electronic Commerce, while the other, business-to-consumer Electronic Commerce, is the use of Internet to sell merchandise or provide services to customers in much the same way as a store or a catalogue (Tech Forecast, 1999). It is estimated that 53% of Electronic Commerce capabilities are estimated to be based on business-to-business relationship and the Forrester Research predicts that business-to-business Electronic Commerce will hit US\$2.7 trillion by 2004 in US alone (Forrester Research, 2000). This research will purposefully focus on organisations that use Electronic Commerce to carry out transactions and interactions that effectuate existing business relationship or pre-existing contractual relations between its trading partners (i.e. Business-to-Business Electronic Commerce).

2.2 Development of Research Model

In building a generalisable model for Business-to-Business Electronic Commerce adoption and diffusion processes, the identification of internal and external environmental factors that exert influence on adoption and diffusion. The distinction into internal and external environmental factors is made to distinguish between organisation-specific (and organisation-determined) factors and factors that are imposed (and determined) from outside the organisation. Each of these factors is analysed for its role in previous adoption and diffusion models, which are mainly found in Information Technology related models. By way of analogy these factors are then examined for their suitability for inclusion into an Electronic Commerce related model.

2.3 Empirical Input into the Research Model

Four Small- and Medium-sized enterprises, two from Western Australia and two from Singapore, were selected to participate in interviews in April and September 1999. This empirical input has been essential to the research as it provided direction as to what adoption factors are imperative to Small- and Medium-sized Enterprises; how these factors are being assessed; and what measures are being used. Other issues covered during the interview included the facilitating factors, barriers, strengths, weaknesses and general experience that the organisation faced during or prior the adoption of Electronic Commerce – all of which helped to design the proposed model.

3. A Proposed Model of Electronic Commerce Adoption by Small- and Medium-sized Enterprises

It is believed that the Internet will eventually be an extremely important vehicle for commercial and consumer transactions. To date, however, SMEs have been slow to adopt the technology. While most firms now have an Internet presence, in the form of a corporate Web site, few Small- and Medium-sized Enterprises use Internet to conduct transactions with customers and suppliers (Purao and Campbell, 1998). In a recent survey of Electronic Commerce in Australian Small- and Medium-sized Enterprises, it was found that only 11% of the Small- and Medium-sized Enterprises place orders and 7% pay over the Internet (Small Business Index, 1999), confirming that widespread use of the Internet does not automatically translate into Electronic Commerce. Moreover, early adopters of Electronic Commerce have found that customers have been slow to accept the technology and therefore, with few exceptions, the benefits of early adoption have not been realised. Even in cases where benefits are generally available to all potential Electronic Commerce adopters, some adopted Electronic Commerce rapidly while others require longer time to adopt (Dos Santos and Peffers, 1998).

Using theoretical foundations from established information systems implementation research, innovation diffusion, Electronic Commerce and small business literature, this research seeks to explain Electronic Commerce implementation success by examining factors that may be associated with the adoption and diffusion of Electronic Commerce within organisations and between its business partners. The relationships of these factors with the process of Electronic Commerce adoption and diffusion are shown in Figure 1 (Chong, 1999).

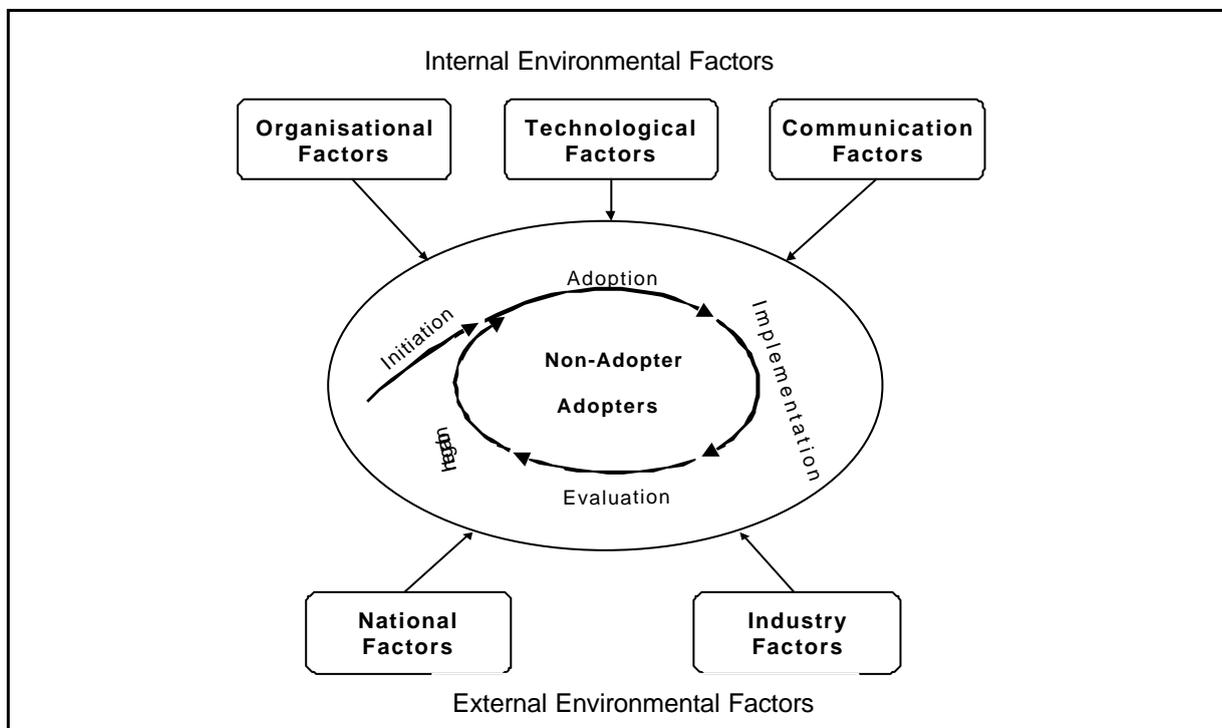


Figure 1: Proposed Electronic Commerce Adoption Model for Small and Medium Enterprises

Since past information systems research indicates that organisations that adopt a technology at different times may have distinct perceptions regarding the adoption of a particular technology (Dillon and Morris, 1996; Dos Santos and Peffers, 1995; Dos Santos and Peffers, 1998; Iacovou, Benbasat and Dexter, 1995), it is also the objective of this study to examine whether the proposed factors will influence different levels of Electronic Commerce adoption for the organisation. For an application such as Electronic Commerce to be used throughout the organisation and between its business partners, it is reasonable to expect that a protracted period may be required before all users are “up to speed”, on how to use the tool effectively (Brancheau and Wetherbe, 1990). It is also important to understand adopters who are likely to be “laggards” so that intervention strategies can be designed for them. In this study, the categories of adopters have been adapted from Rogers (1983) and will be classified into the following categories: *non-adopters*, *early adopters*, *majority*, and *laggards*. Some of the dominant characteristics of each adopter category are: early adopters are usually companies that decrease uncertainty about a new idea such as Electronic Commerce by adopting it, they usually serve as a role model for many other companies of the industry; early majority adopt Electronic Commerce just before the average while the late majority adopt it just after the average. Both had the tendency to wait and see, play safe while letting others lead. As for laggards, they are expected to be the last to adopt Electronic Commerce. They tend to be suspicious of new innovations such as Electronic Commerce, thus being the extremely cautious in adopting it. Lastly, non-adopters are companies that do not intend to adopt Electronic Commerce or those who have tried but decided not to continue to adopt Electronic Commerce.

4. Internal and External Environmental Factors

In the absence of empirical studies to assist in the selection of the most significant variables for Electronic Commerce adoption, all relevant factors have been identified and grouped into broad categories after extensive literature review and preliminary interviews. The broadest categories of relevance to Electronic Commerce adoption appear to be *internal* and *external environmental factors*. This research may reveal how the factors of internal and external environment affect the adoption and the diffusion process of Electronic Commerce.

Within the internal environment, it comprises of **organisational factors** (organisational structure, firm size, organisational culture, organisational readiness, management support to Electronic Commerce adoption,); **technological factors** (technical and organisational compatibility to adopt Electronic Commerce, perceived relative advantage of Electronic Commerce over current practice or systems, complexity of Electronic Commerce, trialability of Electronic Commerce, observability of Electronic Commerce advantages); and **communication factors** (information source, communication channels, communication frequency). In addition to the above, **national** (cultural differences, level of national infrastructure, level of governmental involvement) and **industry factors** (competitive pressures, pressure from trading partners, critical mass) are posited to influence the adoption and diffusion process in Small- and Medium-sized Enterprises. With the foundation supplied by the proposed theoretical model, the review of vast organisational and diffusion theories introduced here, and the support of the body of research by empirical validation, a theory extension of Electronic Commerce adoption for Small- and Medium-sized Enterprises will be achieved.

4.1 Internal Environmental Factors

Several internal environmental factors influence the adoption of Electronic Commerce and among the most commonly investigated characteristics that promote the adoption of the technology are developed by Rogers (1995) and adapted in the following: *perceived relative advantage* (ie. the perceived Electronic Commerce benefits and impact), *compatibility* (both technical and organisational), *trialability* (the degree to which Electronic Commerce can be pilot tested or experimented), *complexity* (ease of use or learning Electronic Commerce) and *observability* (the extent to which relative advantage or gains of Electronic Commerce are clear). The above **technological factors** have been the key feature of several information technology adoption studies (Iacovou, Benbasat and Dexter, 1995; Kwon and Zmud, 1987; Moore and Benbasat, 1991; Sharif, 1994; Tornatzky and Klein, 1982)

It has been argued that positive organisational factors contribute to the success of technology diffusion (Bowonder, Miyake and Linstone, 1994). Some of the **organisational factors** that has been noted by scholars in diffusion studies include *organisational structure* (Ives, Hamilton and Davis, 1980); *size of firm* (Iacovou, Benbasat and Dexter, 1995; Nilankantan and Scamell, 1990; Igbaria, Zinatelli and Cragg, 1997) and *organisational culture* (Cooper, 1994; Fink and Kazakoff, 1997; Kydd and Jones, 1989).

Another recurrent observation is that the issue of Electronic Commerce seems to be more of a management problem rather than a technical one (Corbitt, Behrendorf and Brown-Parker, 1997). Many researchers have found that through the lack of top executives' support, technology cannot be successfully implemented (Beatty, 1998; Cooper and Zmud, 1990; Gagnon and Toulouse, 1996; Kwon and Zmud, 1987; Lambert, 1996; Manross and Rice, 1986). *Top management support* is therefore a critical organisational factor for the success of Electronic Commerce adoption and diffusion.

Several other organisational factors that inhibit technology adoptions were also identified after conducting preliminary interviews and an extensive literature search. Among these are the cost of technology, a lack of managerial and technological skills, a lack of system integration and a lack of financial resources (Pfeiffer, 1992; Saunders and Clark, 1992; Swatman and Swatman, 1991; Cragg and King, 1993; Iacovou, Benbasat and Dexter, 1995; Nilankantan and Scamell, 1990). These inhibitors are expected to play a big role in the context of small organisations, where resources and computer sophistication are limited (Swatman and Swatman, 1991). Indeed, previous empirical findings further suggested that economic costs and lack of technical knowledge are two of the most important factors that hinder IT growth in small organisations (Cragg and King, 1993). These findings were consistent with the study done by Kwon and Zmud (1987) who commented that successful technology implementation occurs when organisational resources (eg. time, funding, and technical skills) are positively supported for initial motivating and implementing effort. Thus, contributing to another important variable of the organisational factor in this study – the *organisational readiness* for Electronic Commerce adoption.

According to the findings of preliminary interviews and literature search, there is a lack of reliable source of information for Small- and Medium-sized Enterprises to gain knowledge in Electronic Commerce. In addition, the insufficient knowledge and experience in communicating information about new business systems to employees and trading partners hinders the smooth adoption of Electronic Commerce. The communication processes which organisations used to communicate

knowledge and persuasion of technology adoption have been studied extensively. Following the work of Rogers (1983), other scholars argue that the adoption of a new technology is influenced by *communication channel types* (mass media vs. interpersonal channels), *information source* (external source vs. internal source) and *communication amount* (Brancheau and Wetherbe, 1990; Nilankantan and Scamell, 1990). Hence, the addition of **communication factors** to the current model.

4.2 External Environmental Factors

According to Fink and Kazakoff (1997), Small- and Medium-sized Enterprises are usually characterised by a high level of environmental uncertainty such as fluctuations in interest rates, reliability of supply, competition, etc. Related to this point that the use of IT and Electronic Commerce is often imposed on Small- and Medium-sized Enterprises by major customers or suppliers. Such *pressure from trading partners* plays a critical role in previous studies of IT and Electronic Commerce adoption by small firms (Beatty, 1998; Hart and Saunders, 1994; Iacovou, Benasat and Dexter, 1995; Swatman and Swatman, 1991; Webster, 1994). The other variable that stems from the industry factor is the *competitive pressure* which Small- and Medium-sized Enterprises faced within the industry. It refers to the Electronic Commerce capability of the firm's industry and most importantly, to that of its competitor. As more competitors adopt Electronic Commerce, small firms are more inclined to adopt Electronic Commerce in order to maintain their own competitive position.

Critical mass or externalities is also an important factor for any organisation trying to adopt new technology or system to its fullest potential. For example, the usefulness of a personal computer depends on the number of people who use computers and the wide range of available software (Caskey and Sellon, 1994). This is true for Electronic Commerce too. Without the wide acceptance of applications or systems, current or potential customers may resist the adoption of Electronic Commerce because of the lack of infrastructure, suitable platform, or compatible technological standards. Previous authors supporting the significance of this variable in technology diffusion studies include Bowonder, Miyake and Linstone, (1994); Caskey and Sellon (1994); Pennings and Harianto (1992) and Takac and Singh (1992).

Apart from industry factors, another factor that drives technology adoption in the external environment includes **national factors**. Given the ongoing rapid globalisation of business and systems, there is a pressing need to learn how widely adoption theory applies in other cultures around the world. *Cultural differences* that exist between different countries may affect the organisation's ability to adopt and utilise Electronic Commerce. Past studies on the cross-national diffusion of technology have observed that an innovation diffuses differently in different cultures depending on the sociocultural environments (Gatignon, Jehoshua, and Thomas, 1989; Helsen, Kamel and Wayne, 1993; Takada and Jain, 1991). In view of the above, the Hofstede's (1980) cultural dimensions have been adopted in this research to study the influence of cultural differences on the adoption and diffusion of Electronic Commerce. He describes four dimensions of what can be used to distinguish between different cultures: power-distance; uncertainty avoidance; masculinity; and individualism.

Other than cultural dimensions, this study also investigates *the level of national infrastructure and government's involvement* in the adoption of Electronic Commerce. While a nation's

infrastructure is defined by its basic communication and transport capacity, many governmental have been the source of funding infrastructure projects (Kettinger, 1994). The impact of government policies and initiatives has been shown to have direct and indirect stimulation to the supply of information which produces faster technology diffusion (Stoneman and David, 1986). In addition, as computers and telecommunication technology has progressed, many governments are now refocusing their attention from traditional “brick and mortar” infrastructure development to electronic communications and transport projects (Joshi and Sauter, 1991). Other examples of governmental efforts to establish a national information infrastructure (NII) in U.S. and Singapore (Kettinger, 1994; Tan, 1998) have shown that both governments provide a legitimate and positive leadership role in developing the information infrastructure in its effort to digitise its economy.

5. Conclusion and Further Research

This research has identified the factors exerting influence on the adoption and diffusion of Business-to-Business Electronic Commerce in Small- and Medium-sized Enterprises. Furthermore these factors have been combined into a model to describe and explain the drivers and critical success factors for Electronic Commerce implementations. Since the factors were derived from extensive analysis of secondary sources, mainly existing adoption and diffusion literature, and complemented through primary research, the proposed model is expected to be sufficiently robust.

However, the proposed model requires further testing for thorough empirical validation. It is the position of the authors that a multi-methodological approach will be required to capture the reach of the adoption and the richness of the diffusion processes. It is therefore planned to test the proposed model via a survey encompassing 150 Australian Small- and Medium-sized enterprises and a further 50 enterprises drawn from Singapore to ensure cultural and economical independence. This will be supplemented by a detailed examination of three enterprises using a multiple case study approach. This combination of inductive and qualitative approach aims at constructing a testable model that will assist Small- and Medium-sized Enterprises in the adoption decision and the diffusion process.

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