A FRAMEWORK FOR THE ADOPTION OF ICT AND SECURITY TECHNOLOGIES BY SME'S

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Abstract

SME's have become an integral part of the Australian economy and are an employer of a large number of Australians. The Australian Bureau of Statistics reports that a majority of SME's have adopted ICT, however Australian SME's are lagging behind when compared to organisations of a similar nature. Although Australian SME's have adopted ICT, very few have adopted any security technologies to secure their infrastructures. This paper looks at the adoption rates of ICT and security technologies by Australian SME as well as some of the influential factors regarding their adoption. A framework has been developed (adapted from Earl, 2000) which identifies the four stage evolutionary process for ICT adoption, security technology adoption and trust.

ICT and Security in Australian SMEs

Small and Medium sized firms in Australia are important to the health of the national economy. According to recent investigations (ABS, 2000) almost 90% of all businesses are characterised as Small to Medium sized Enterprises (SMEs). Over 50% of Australia's workforce is employed by businesses that fall within this category and almost 44% of all production revenue nationally is attributed to SMEs (ABS, 2000). As corporations downsize in response to global competitive pressures and workers experience a reduction in employment security SME's are becoming increasingly important. Furthermore SMEs gain further significance as people look for lifestyle alternatives or maintain a small business after the traditional retirement age (Rashid, 2001).

SMEs are often described as being flexible, active and informal. Due to the unique characteristics SMEs possess they are able to deliver to market in a timely manner, which allow them to adapt to market demands. SMEs are able to service customers in a more personal way compared to corporate firms and therefore are accredited with a competitive edge (Van Beveren, 2002a). Both employees and operators of SME's work hard in maintaining strong relationships with suppliers and clients whilst working on a tight timeline. Furthermore the external pressures such as competition from big business is a constant threat to their survival yet the importance to the communal and cultural aspects to society is understated (eCom-Adviser, 2000).

The Australian Bureau of Statistics (ABS) have defined micro businesses as those businesses with less than 5 employees, small businesses as those which employee 5-19 people and medium enterprises as businesses which have 20-99 employees (ABS, 2003c; NOIE, 2002b). Approximately 56 percent of Australian employees work in firms containing less than 10 people while around 12 percent of people are employed in firms consisting 10 – 99 persons. Only a small percentage of the Australian workforce are employed in firms categorised as having over 100 employees (eCom-Adviser, 2000). Statistically the classification of small and medium businesses is not standardised throughout the world and therefore is difficult to compare details of research originating from other countries.

The ABS has also published recent details of usage of ICT within SMEs, results show computers are being used in the running of the business for 79% of micro firms (less than 5 staff), 91% of small businesses (5-20 employees) and 99% of medium sized firms (21-99 employees). The levels of Internet usage for these were at 64% for micro businesses, 75% for small enterprises and 92% for medium business. Furthermore the percentage of SMEs with a web site or home page

was significantly less with only 14% of micro businesses, 32% of small firms and 56% of medium enterprises. This indicates that a large potential exists for the promotion to and adoption of high end ICT systems by SME's (ABS, 2003b).

While the adoption of ICT in businesses of all sizes is predominately high, there has been limited adoption of security practices and technologies. The ABS have reported that only 15% of medium sized firms, 4% of small businesses and 2% of micro businesses have adopted a security policy (ABS, 2003a); a document, which outlines the security mechanisms and controls that will be implemented in an organisation (Goure, 2002). Furthermore the adoption of security technologies such as firewalls, authentication systems and intrusion detection systems is not extensive amongst organisations of any type. Anti virus software has been reported as being the most highly implemented security technology amongst SMEs, with 78% of micro businesses, 83% of small businesses and 89% of medium sized firms having some form of protection against computer viruses (ABS, 2003a).

Influential factors regarding adoption of ICT by SMEs

Contemporary studies relating to adoption of technology in SMEs have included the technological, organisational, environmental and individual aspects of the firm (Rashid, 2001). The four influences form an adoption framework formulated from several SME adoption studies. (Figure 1.). The four factors within the framework interplay within a SME and serve as an evaluative structure to determine the propensity of innovation adoption specific to the firm, thereby directly impacting the decision process of the manager (Rashid, 2001). The technological or innovation factors include issues such as the relative advantages of the innovation, the complexity, compatibility, cost and the image surrounding the innovation. Organisational factors influencing adoption cover such aspects as the size of the firm, the quality of the existing information systems, the intensity of the information being processed, the level of specialisation of the firm as well as the level of support of adoption originating from management. Environmental factors impacting adoption include the pressure from competition and within the supply chain, public policy as well as the role of government. Individual factors affecting innovation adoption, according to Rashid's framework, incorporate the decision maker's innovativeness as well as their knowledge of technology.

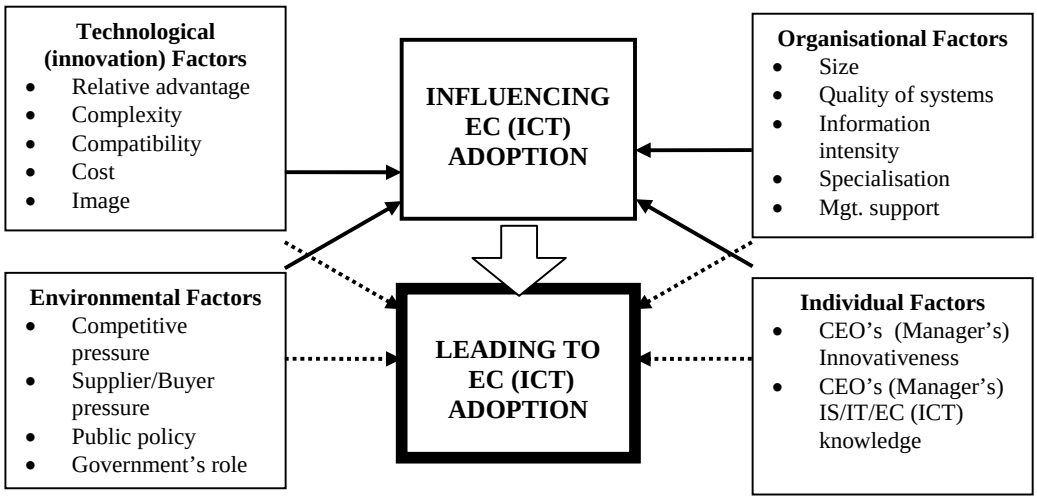

Figure 1: A framework for EC (ICT) technology adoption by SMEs (Rashid, 2001)

Rashid's adoption framework for technology adoption indicates that any or all of the four factors can impact to the process of ICT adoption. There is no indication as to the level of importance or the sequence of events that the factors may operate at significant stages of the adoption process. The authors have acknowledged that there may be some factors impacting more than other factors at any specific part of the adoption stage process.

The Organisational factors collectively impact on the resources of the business in relation to adoption of ICT innovations. Environmental factors provide significant impetus for adoption where the issues relating to market climate and the firm's standing in the market directly influence the uptake of technology. Increases in the incorporation of ICT within SMEs directly impacts on the functionality of the firm, increasing productivity and profitability of the business. Individual factors incorporate the management aspects attributed to the business and thereby influence significantly any decisions to enhance the business with ICT systems.

It has been identified by the authors that the role of the individual is possibly the most significant influential issue regarding the adoption of ICT into SMEs. The role of the manager involves making possibly high-risk decisions, thus potentially affecting the performance of the business.

Trust in the technology with relation to handling transactions, securing systems and maintaining relationships is a considerable issue affecting decision makers of SMEs. Furthermore the issue of trust between individuals within organizations is a significant issue especially when establishing business relationships for business-to-business online functions. As indicated in Figure 1, trust issues was not a separate influential factor by Rashid, however the issue of trust is significant and warrants inclusion in Rashid's framework.

ICT and Security adoption issues

Research suggests that Australian SMEs are lagging behind similar businesses internationally regarding uptake of ICT, thus placing themselves in a less competitive position (Simpson, 2002; Times, 2000). The products and processes adopted by SMEs at an earlier stage can provide an increased competitive edge and simultaneously create an environment that is conducive to further innovations and faster evolution (Damanpour, 2001). The adoption of ICT in the early stages of trading not only assists in the more rapid development of the firm, but also allows the firm to compete with medium sized firms while remaining small (Bridge, 1999).

The online component of a business can be leveraged to deliver effective marketing, value added services to customers and market reach. This can result in the positive networking with other business, government as well as consumers alike (Haynes, 1998). Supply chain management has been seen as one of the primary benefits to the incorporation of ICT into SMEs. Costs are driven down as business relationships and partnerships, both developing and entrenched, are reinforced (OECD, 2000). Recognition of the benefits of adopting ICT throughout the business by SMEs,

can positively reinforce the concept and possible evolution of the firm toward a truly digitised enterprise where ICT co-ordinates and supports all business processes (Varadarajan, 2002).

Issues that lead operators of SMEs to consider adoption of ICT into businesses may result from a defensive reaction to competitors who have already adopted technology. This defensive reaction is often an attempt to address retention of market share. Early adopters are at an advantage due to taking a lead in adopting advantageous technology in their market niche, therefore forcing competitors to catch up (OECD, 2000). Small business operators may also experience pressure to adopt ICT systems by suppliers and/or customers within the supply chain. This can be a positive step as business partners can assist in the integration process. Unfortunately SMEs may be required to implement ICT that is not best suited to the business (Parasuraman, 2002).

The evolution of ICT and Security uptake

The levels of ICT adoption by SMEs need to be addressed in terms of an evolutionary process. The simplest and easiest ICT tools are best promoted first, thereby developing positive attitudes to technology and cultural acceptance to more complex forms of ICT (CEC, 1996). The evolution of e-business for firms has been described in the contemporary literature illustrating the transition from email use, website, online store, then to a fully digitised e-business commonly identified as Reformation (Earl, 2000). A SME might progress from developing a static website (brochure ware) on the Internet to selling on the Internet and eventually grow into a fully transactional enterprise (Booty, 2000).

According to Earl (2002) the evolution of a SME is established in six stages starting with limited use of technology through to the full integration of business automated processes as seen in the digitised firm. The six stages have been adopted simplified into four stages to evaluate levels of trust experienced at each level of the evolutionary schema as shown in Figure 2.

Stage	**ICT**	**Security**	**Trust**
1. No Usage	No ICT	No Security	No need to trust
2. Basic	Email/Static Web Site	Basic security - passwords, secure web mail, antivirus software and configuration of browser settings	Some trust -Initiative?
3. Intermediate	eCommerce - payments	Secure Socket Layer (SSL), Digital certificates, and secure payment options	High trust – Credibility/confidence
4. Advanced	EBusiness – B2B exchange	Tightest security – PKI, VPN	Ultimate trust - Benevolence, faith??

Figure 2: A four stage evolutionary process for ICT, security and trust, adapted from (Earl, 2000).

The four-stage process as illustrated in Figure 2 is explained as follows:

1. No Usage: There is no ICT usage or limited usage and therefore security technologies are not required and trust is limited or non-existent.
2. Basic ICT usage: Email and Static Web pages are implemented within the business; basic security should be implemented such as passwords, secure web mail, antivirus software and configuration of browser settings therefore some trust is required.
3. Intermediate ICT usage: eCommerce platforms are being used including online payment systems. An increased level of security is required. Technologies that could be adopted at this stage are Secure Socket Layer (SSL), Digital certificates, and secure payment options. Trust is required (credibility or confidence?).
4. Advanced ICT usage: eBusiness platforms are used including Business to Business (B2B) processes. A higher level of security is required such as Public Key Infrastructure (PKI), and Virtual Private Networks (VPNs) which allow secure business-to-business communications. Trust is essential in the relationships between partners who use this technology. (Benevolence, faith).

Financial gains are the most obvious advantage of automated transaction processing. The supply chain management benefits to SMEs include more streamlined administrative processes particularly in the fields of taxation, invoicing and human resources. Increases in B2B interactions will create networks of association where knowledge is communicated interactively both vertically and horizontally across the supply chain (Van Beveren, 2002b).

The most effective way for SMEs to be involved on the Internet is to be part of a portal. The concept of the portal is the online equivalent of traditional Industrial District or Marketplace in the "bricks and mortar" world and would be of benefit to SMEs in terms of relationships, leveraging resources, the sharing of ideas and formulation of strategy (Van Beveren, 2002b). Furthermore the increased adoption of a portal in a regional environment would eventually create a critical mass that delivers added value to associations incorporated within the portal and increases the level of competition directed to larger businesses from the experienced synergies (Braun, 2003).

Collective benefits for SMEs would include the adoption and maintenance of technology including online payment systems, the adoption or development of education, as well as the creation of channels of communication between SMEs, Government and the large organizations. The development of production networks would link processes and share in the maintenance of finance as well as research and development. Support services such activities as legal, insurance and human resource functions could be afforded by associated SMEs in the portal environment (Fariselli, 1999).

The promotion of synergetic strength in numbers, the promise of critical mass and the eventual competitive leverage against larger firms should be considered as an incentive for early adoption and involvement in portal development by SMEs. Portals and B2B activities in general have not been positively accepted despite the advantages of early adoption. SMEs involved in portal arrangements could provide competitive leverage to opposing larger firms and therefore establish better contractual arrangements with corporate enterprises (OECD, 2000).

ICT/Security resistance issues.

Although many SME administrators understand the benefits of ICT and security technologies, some consider it to be irrelevant to their operations and are demonstrating significant levels of resistance to adoption. Due to time constraints experienced by managers of SMEs, often they are not fully informed about ICT concepts and the strategies necessary for positive integration into the firm (eCom-Adviser, 2000). Issues such as perceived investment recovery, comfort with traditional forms of supply management and selling, perceived levels of risk, security concerns and training costs are cited as being serious barriers to uptake of ICT by SMEs (Kendall, 2001). Many firms see IT as not being part of the core business function and evade the use of technology as it provides a distraction to delivery of the business products and services (Dagdilelis, 2003).

The perception of risk involved in adopting ICT is a major issue to managers and owner-operators of SMEs; disruption to the business processes and relative position in the market are factors that many administrators have considered to be too great (Sparrow, 1999). The complexity of providing secure payment systems and privacy of personal and company sensitive information are barriers to adoption. This is compounded by the relative general lack of knowledge of ICT by operators of SMEs (OECD, 2000).

The global reach of ICT systems raises issues regarding international laws and in particular how effective those laws are at maintaining competition and fair-trading. As a result there is limited protection afforded to SMEs, particularly regarding e-business practices. This is demonstrated by the difficulty that government bodies have at policing existing international trade laws (Fariselli, 1999).

Conclusion

This paper has outlined the adoption rates of ICT and security technology amongst Australian SMEs as well as the factors that play a part in influencing their adoption. A framework has been developed which illustrates the evolutionary process of ICT adoption, security technology adoption and trust. This framework identifies the security technologies and levels of trust that should be established at each evolution. This paper has created a framework for further research into ICT adoption, security technologies and trust within Australian SME's

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