Northumbria Research Link

Citation: Nguyen, Thuyuyen (2009) Information technology adoption in SMEs: an integrated framework. International Journal of Entrepreneurial Behaviour & Research, 15 (2). pp. 162-186. ISSN 1355-2554

Published by: Emerald

URL: http://dx.doi.org/10.1108/13552550910944566 <http://dx.doi.org/10.1108/13552550910944566>

This version was downloaded from Northumbria Research Link: https://nrl.northumbria.ac.uk/id/eprint/1869/

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: http://nrl.northumbria.ac.uk/policies.html

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)

Northumbria University NEWCASTLE

University Library

Information technology adoption in SMEs: an integrated framework

ThuyUyen H. Nguyen
Teesside Business School, University of Teesside, Middlesbrough, UK

Abstract

Purpose – The aim of this research is to gain a clearer understanding of information technology (IT) adoption in small and medium-sized enterprises (SMEs) by analysing and contrasting the current literature. Whilst describing how and why SMEs acquire IT, the paper also seeks to highlight the enablers as well as the inhibitors that influence the adoption process.

Design/methodology/approach – The method was a review of literature including empirical research and case studies related to IT adoption from various databases such as Business Premier, Science Direct, JStor and Emerald Insight. Supporting material was accessed from reference books regarding similar concepts and theories.

Findings – The literature suggests that SMEs adopt IT for many reasons. In general, the majority of the changes result from pressures from both internal and external sources. In addition to these drivers, there are factors that influence the process either directly or indirectly. Based on these different perspectives the paper proposes a conceptual framework that is composed of those perspectives that are relevant to the adoption of IT in SMEs.

Research limitations/implications – This conceptual framework for the IT adoption process is based on the existing literature. It is open to and requires empirical testing to determine its relevance and validity in a practical setting.

Originality/value – The paper demonstrates the process of IT adoption in SMEs by combining perspectives from the literature. The framework will help adopters gain a practical overview of the IT adoption process in SMEs.

Keywords Communication technologies, Small to medium-sized enterprises, Small enterprises

Paper type Research paper

Introduction

Information technology adoption is an important topic of study in a number of areas including small and medium-sized enterprises (SMEs). IT can lower production and labour costs, add value to products and services and increase a company's competitive advantage (Corso *et al.*, 2003; Levy *et al.*, 2001; Nguyen *et al.*, 2007; Premkumar, 2003). Some studies and reports have shown that IT is a means that could enhance the business process (Acar *et al.*, 2005; Búrca *et al.*, 2005; Levy *et al.*, 2001). This echoes the study by Ballantine and Stray (1998), which suggests that IT or information systems (IS) are not just tools but techniques to be understood before any capital investment is made.

The author would like to thank Professor Ted Fuller for his initial encouragement with this paper. The author also would like to thank Professor Andrew Atherton for his guidance and feedback throughout the development of the paper. Finally, special thanks go to Drs Michael Newby and Mark Newby for their support and encouragement for this paper.

Despite the significant contribution that IT has made to business, many studies indicate that there are a large number of unsuccessful IT implementations in SMEs and that the adoption rate is very slow (Acar *et al.*, 2005; Mole *et al.*, 2004; Shin, 2006; Southern and Tilley, 2000). There appear to be three main reasons for this. First, management is unclear on how and why their firms adopt IT in the first place (Levy *et al.*, 2001; Southern and Tilley, 2000). Second, there is a misconception toward the IT adoption process mainly because managers do not understand the relationship between IT and the firms themselves (Bull, 2003; Carson and Gilmore, 2000) or are uncertain about the opportunities that IT can offer (Southern and Tilley, 2000). Finally, firms do not have the capabilities to expand their IT resource (Acar *et al.*, 2005; Claessen, 2005) because of lack of business and IT strategy, limited access to capital resources, emphasis on automating, influence of major customers and limited IS skills (Ballantine *et al.*, 1998; Bhagwat and Sharma, 2007; Bruque and Moyano, 2007). Levy *et al.* (2001) suggests that IT adoption in SMEs often happens without any proper planning and as a result there is a low percentage of successful implementations. From another aspect, Carson and Gilmore (2000) suggest that SMEs, especially new ones, often have to face the problems of ambiguity and uncertainty when it comes to IT adoption. They argue that new start-up firms rely heavily on developing "appropriate" or "suitable" means for their firms' functionalities. This is mainly because of a lack of resources such as financial, technical, and managerial (Bhagwat and Sharma, 2007). The result is a limitation in the development process for these firms. Macpherson *et al.* (2003) suggest that there is a lack of connection between the firms and IT and many firms have misconceptions about the role of IT. In fact, it is unclear whether firms see IT as an opportunity or a threat and we cannot assume that using IT in small firms is always beneficial (Oakey and Cooper, 1991). This view is reinforced by Macpherson *et al.* (2003) who suggest that it cannot be assumed that IT is practical for every firm because the functions vary between firms.

When it comes to variables that influence IT adoption firms tend to ignore the significance of many factors that directly or indirectly affect the process. Some authors suggest that there are few studies of factors influencing IT adoption in SMEs (Morgan *et al.*, 2006; Premkumar, 2003), other evidence from the literature shows that there are many research studies on this subject. These include intangible factors such as management behaviour, internal and external resources, and use of professional consultants, which were investigated and analysed from different approaches and perspectives (Bassellier *et al.*, 2003; Bruque and Moyano, 2007; Claessen, 2005; Currie, 2004).

The purpose of this paper is to understand more clearly the process of SMEs adopting IT. The method used was a review of different concepts, methodologies and theories from studies that are relevant to the subject within this business sector. The aim of this research is to investigate how and why SMEs acquire or adopt IT and the factors surrounding the process. The paper also highlights the enablers as well as the inhibitors that affect the change process as well as what we can learn from the existing literature. Particularly, what SMEs can do to increase the likelihood of success in the adoption process. From the review, concepts and perspectives were identified that the author believes could add further to the database of knowledge and give a clearer understanding the whole process and influencing factors. At the root of the adoption process are the drivers of IT, which explain why firms adopt IT in the first place. The

drivers include technology-push and market-pull, internal pressure and external pressure together with competition and innovation. These reasons can be exemplified in an IT adoption model, which was derived from selected sources (see Figure 1). Beside the drivers of IT adoption, many studies have suggested that there are other factors that contribute to the adoption process. The key factors that directly contribute to the changes in the organisation are management characteristics and behaviours, the firm's culture, external network, external resources or professional expertises and the IT itself. Using the IT adoption model, the author incorporates the key factors and proposes a framework that reconceptualises the IT adoption process (see Figure 2).

This paper does not cover all aspects of the literature and does not claim that this framework is relevant for all businesses but acknowledges that it depends on the circumstances of each firm. The first part of the paper covers different concepts and drivers of IT adoption in SMEs. This is followed by a discussion of the different perspectives of various research studies. From these, the author puts forward a

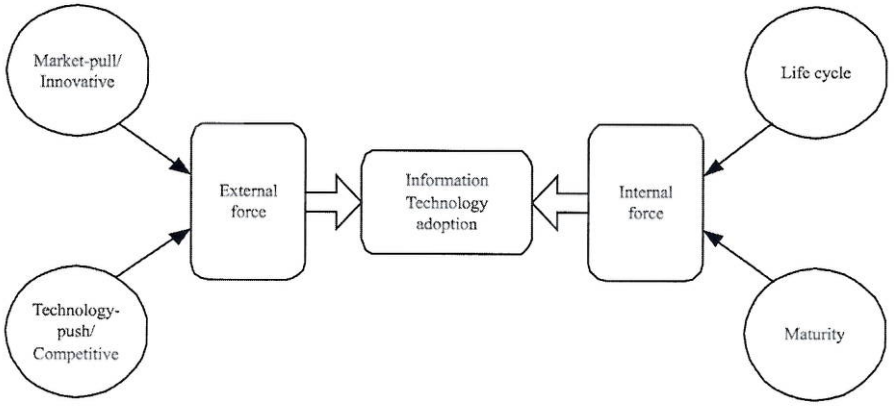

Figure 1.
Drivers to information technology adoption model

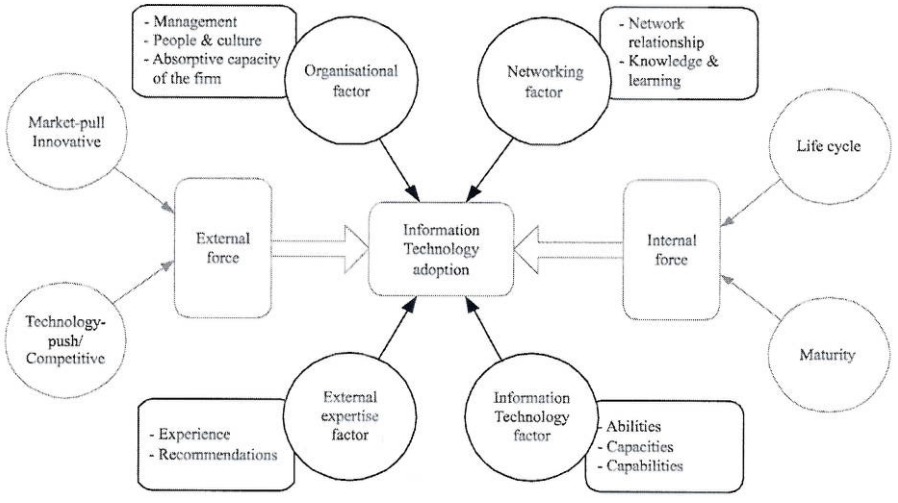

Figure 2.
A reconceptualised framework for information technology adoption process

framework that summarises the relevant perspectives that, according to the literature, affect the IT adoption in SMEs. Barriers to the changes are also discussed as well as suggestions for further research and investigation.

Reasons for information technology adoption

For many firms, the most common reasons for IT adoption is to provide a means to enhance survival and/or growth, staying competitive and/or enhancing innovation abilities (Bridge and Peel, 1999; Búrca *et al.*, 2005; Bruque and Moyano, 2007). SMEs adopt IT for different reasons, because the functions of firms vary in different environments (Macpherson *et al.*, 2003) and they do not necessarily operate in the same way or have the same impact (Oakey and Cooper, 1991). Some argue that this move to IT is in response or reaction to an event (Winter, 2003) while others suggest that the change results from the pressure from customers and an emphasis on improving efficiency (Ballantine *et al.*, 1998; Corso *et al.*, 2003). Another argument is that the change is in response to the pressures from the internal and external environment (Morel and Ramanujam, 1999). According to Barney (1991), a firm's analysis of its strengths and weaknesses (internally), and opportunities and threats (externally) has been a major focus for many research studies. These changes are, sometimes, rationalised as innovativeness or competitiveness (Lefebvre and Lefebvre, 1993).

A study by Siggelkow and Levinthal (2005) found firms go through changes within certain stages of their life cycle or in response to changes of their external environment. Andries and Debackere (2006) confirm this view by pointing out that firms seek IT adoption in response to changes, both internal and external. Internal changes include the life cycle or maturity of the firm and external changes are survival or stability in the market. As firms go through different stages in their life cycle, they adapt to situations that suit them (Siggelkow and Levinthal, 2005). However, there is no agreement among researchers on how many stages there are within a firm's life-cycle. Firms go through different stages and respond to changes throughout those stages. This includes the need to satisfy certain requirements or to respond or adapt to a required improvement (Andries and Debackere, 2006). A recent study by Phelps *et al.* (2007) disagrees with this view and suggests that the firms go through states instead of stages in term of growth. These states are related to managerial problems and are unpredictable. These problems include changes that are faced by firms and the absorptive capacity of the firms. The authors argue that absorptive capacity play a critical role in their growth condition. This argument supports Zahra and George (2002) study that absorptive capacity generates competitive advantage of a firm.

External changes refer to causes such as technology-push and market-pull (Andries and Debackere, 2006; Henderson and Clark, 1990). Here, technology-push describes an innovation that is well developed and the market, under the pressure of this advanced technology, is required to absorb it. On the other hand, market-pull refers to a social need where IT is developed to satisfy this need. Often, the market-pull adopters are the innovators or first movers in the market (Laudon and Laudon, 2007). Market-pull also refers to certain standards established by the industry. In order for the firm to conform to newly established standards, it needs to implement certain features or changes in its process to accommodate such changes (Romano *et al.*, 2001).

In the similar context, IT adoption is also measured through competitiveness and innovativeness. Innovation usually occurs when firms are striving to move forward

with growth and profitability being the inspiration. On the other hand, survival means staying competitive in the market, becoming stable or just fitting-in (Jones (2003) echoing Jennings and Beaver (1997)). Here, innovators represent alternatives between divergence (trigger by infusion of resource) and convergence (external constraints) (Druilhe and Garnsey, 2004). Khan and Manopichetwattana (1989) suggest that product and process innovations of firms are linked to a broadening market and internationalisation. For many companies, growth occurs via improvements in efficiency and effectiveness (Capello, 1999; Gray and Gonsalves, 2002). Atherton (2003) confirms this view by suggesting that to invest in growth and innovation, one of the necessary resources is technology.

Liao *et al.* (2003) suggest that innovation is a result of an interaction between internal knowledge and external knowledge. Here, the authors argue that firms absorb information from their external environment, transforming this information into knowledge. This suggestion follows the study by Chaston and Mangles (2000) about the existence of a business network in SMEs among UK manufacturing firms. The study found evidence that firms do learn from the network by acquiring knowledge required to survive or stay competitive in the market. A study by Chell and Baines (2000) on entrepreneurship and micro-business networking behaviour also found that management in these firms uses their relationship with the network for additional information. Simmie (2002) confirms that knowledge is created through learning from the network via transfer of information through data, documents, software and standards. From a different perspective, Atherton and Hannon (2000) suggest that, in SMEs innovation can be viewed as a management process that affects the business performance. In a case study of five businesses, these authors propose a framework, which represents three stages of the innovation process: strategy for innovation, development of innovative and commercialisation of the solutions. In summary, the above studies stress the significance of the network relationship where, according to Granovetter (1985), external relationship could enhance knowledge development in SMEs; thus, knowledge can be transferred and promote innovation.

Competitive advantage relates to a company's ability to learn from previous experience (Gibb, 1997). It is often concerned with ways in which SMEs create and sustain their ability to stay in front (Jones, 2003). This may also be a result of being influenced by the external factors such as the inter-firm collaboration (Rosenfeld, 1996) or influenced by combination of various factors (Gadenne, 1998). Firms tend to seek cost reduction and/or product differentiation (Porter, 1998). They also tend to emphasise behaviours and actions that stress the importance of links between competitiveness and performance. Man *et al.* (2002) propose a model of competitiveness, which contains three dimensions: potential (internally and externally), process (entrepreneurial competencies) and performance (firm performance) and four qualification characteristics: long-term orientation, controllability, relativity and dynamism. This model suggests a foundation for a long-term focus rather than short-term focus such as age, education, experience and background.

To summarise, we can say that firms seek IT enhancement for a purpose, which is to satisfy certain requirements or to respond to necessary improvements, which could arise from pressures from internal and external sources (Andries and Debackere, 2006; Ballantine *et al.*, 1998; Barney, 1991; Gray and Gonsalves, 2002; Lefebvre and Lefebvre,

1993; Morel and Ramanujam, 1999; Winter, 2003). The drivers of IT adoption are the root of the process, and this is captured in the proposed IT adoption model given in Figure 1.

Factors influencing information technology adoption

As well as looking at the drivers of IT adoption, we must also analyse the IT adoption process itself, as this causes change in the organisation. To define this process, it is important to identify the factors involved in IT adoption. There is a large body of literature on different perspectives on factors that affect the IT adoption process. Most of them focus on top management, employees, the external experts and IT vendors, the firm's capability to handle the new IT, the people and culture, and other firms within the network. The author categorised these perspectives into four major factors: organisational, networking, external expertise and IT itself.

Organisational

The first factor is organisational or the internal environment and includes the size of the firm and its goals, the people within the firm, their behaviour, culture, identity, structure and knowledge (Watson, 2002). Thus, these elements have direct impact upon the nature of the firm. For instance, culture in SMEs is highly influenced by owner-manager's attitude, personality and values (Denison *et al.*, 2004). Top management or owner-managers make all decisions (Stanworth and Gray, 1992) and these decisions are based on existing knowledge, personal judgement and communication skills (Carson and Gilmore, 2000). The employees' knowledge and involvement contribute to the rise or fall of the firm (Fenn, 2005). Within a firm, existing knowledge is absorbed, transformed and used to generate new knowledge, which, in turn, promotes innovation (Gray, 2006). In this paper, the author divides this category further into four elements: culture, top management, employees and the absorptive capacity of the firm (Bruque and Moyano, 2007; Denison *et al.*, 2004; Gray, 2006; Igbaria *et al.*, 1997; Premkumar, 2003).

Culture. Corporate culture exists within a firm and can be an organisation's core competency (Barney, 1986). It is the way people do and share things following certain meanings, values and beliefs within a firm (Denison *et al.*, 2004; Watson, 2002). The type of culture does depend on how the firm was established, how it is being developed over time and the environment in which it exists (Hall *et al.*, 2001). A study by Minguzzi and Passaro (2001) suggests that culture is an internal factor, which includes the characteristics of human resources and the degree of openness to change. According to the authors, it is often assumed that SMEs are resistant to change and are usually portrayed as such. This resistance is determined by the "homogeneity" structure of their culture and cause them to have doubts about innovation. The IT adoption process is a change within the organisation that affects the culture of that organisation and vice versa. If a culture is open to accept new, challenging activities and embrace learning, it will be prepared for the change, while a traditional culture that is inflexible or holds back is not likely to accept change (Hall *et al.*, 2001).

Changing culture or shaping it is a process that requires strategic planning (Watson, 2002). Denison *et al.*(2004) suggest that within SMEs, especially in a family business, culture is influenced by the founder's or owner-manager's values and belief system. This study used the model developed in previous study by Denison and

Mishra (1995) based on four traits of organisational culture: involvement, consistency, adoptability and mission. Using this theory, Denison *et al.* (2004) also suggest that family controlled firms do have a distinct performance enhanced culture based on the 12 indices in the Denison Organisational Culture model. The authors argue that by recognising these strengths, firms can gain competitive advantage. Thus, culture portrays the way people do and share things in respect to certain meanings, values and beliefs within a firm (Denison and Mishra, 1995; Denison *et al.*, 2004; Watson, 2002). Firms that are open to accept new, challenging activities and embrace learning cultures (Hall *et al.*, 2001) and recognise the strength of their culture are likely to advance innovation and gain advantage over their competitors (Denison *et al.*, 2004).

Top management. In SMEs, management make all decisions from daily operations to future investment (Bruque and Moyano, 2007; Stanworth and Gray, 1992), so their roles directly affect the IT adoption process. A major part of the literature focuses on top management or owner-managers' characteristics and behaviour or social trait (Smith, 2007). Top management's social trait refers to their behaviours and frames of reference. Studies have shown that in SMEs, the role of the top management or the owner-manager is crucial to the firm as their decisions affect all activities of the firm, both current and future (Fuller-Love, 2006; Smith, 2007; Thong, 1999). This also applies to the decision to adopt IT from planning to implementing and, afterwards, maintaining and upgrading the system. This is to make sure that it meets the requirement of current IT and satisfies the organisational goals such as to maximising productivity and maintaining the quality of its products and services (Bruque and Moyano, 2007; Fuller and Lewis, 2002b; Riemenschneider and McKinney, 2001/2002).

Numerous studies have been carried out on the social behaviour and frames of reference of top management (Riemenschneider and McKinney, 2001/2002; Thong and Yap, 1995). A number of studies found that the greater the understanding that management has of IT, the more likely that they will adopt IT and the more successful the adoption (Bassellier *et al.*, 2003; DeLone, 1988; Fuller and Lewis, 2002b). Management's innovation is no less important as it represents creativity and motivation to growth (Jones *et al.*, 2007; Premkumar and Roberts, 1999). The study by Thong and Yap (1995) suggests that managers who are highly innovative and have a positive attitude toward IT together with a competent IT background are more likely to be successful in adopting new IT.

On the other hand, Keh *et al.* (2002), argue that managers identify opportunities through knowledge and experience acquired (through a social relationship network) not by individual psychological traits. A study by Harrison *et al.* (1997) of 162 small businesses from different industries used the theory of planned behaviour (TPB) to explain and predict the decisions to adopt IT in small businesses. The TPB was used as a background theory to test and predict these decisions based on three variables of top management: attitude, subjective norms and perceived control. Their findings also confirmed that executives decide to adopt IT for competitive purposes. From a similar perspective, Jones *et al.* (2007) refer to owner-manager's sense-making and discursive resources as human capital, which plays a key role in SMEs knowledge environment and is part of cognitive social capital. Together with the factors of absorptive capacity and social capital, human capital is the foundation of growth, profit and survival.

At this point, we can say that the characteristics and behaviour of top management or owner-managers affect the daily activities as well as the future of the business

(Smith, 2007; Thong, 1999). The more positive perception they have toward IT, the higher the chances that they will adopt and implement IT (Harrison *et al.*, 1997; Premkumar, 2003). Their understanding of IT and innovation skills contributes substantially to the likelihood of IT adoption (Bassellier *et al.*, 2003; Fuller and Lewis, 2002b; Thong, 1999; Thong and Yap, 1995). Their management administrative abilities and skills also contribute to the adoption process (Carson and Gilmore, 2000; Gagnon and Toulouse, 1996; Sarasvathy, 2003).

Employees. It is clear that in most firms, management or the owner-manager are not the only people who contribute to the success of the business. Employees also make a contribution and they have a major impact on the rise or fall of the business (Fenn, 2005). From this point of view, employees are assets, as a firm's success depends on them. They are a resource that needs to be developed (Darby and Zucker, 2001; Egbu *et al.*, 2005; Keogh, 1999).

Premkumar and Roberts (1999) suggest that keeping employees informed or aware of the new IT allows them to maximise the resources that can help be more productive. Other studies have shown that having employees as part of the project or involving them has several advantages (Anderson and Huang, 2006). Igbaria *et al.* (1997) provided evidence that employees' involvement in new projects or changes of practices produces a higher success rate. To the employees, on a personal level, it makes them feel that they are part of the team, the family or the company itself and that they are important and responsible for the success of the project. This echoes Preece's (1995) vies that employee knowledge is the firm's "human capital" and employees' involvement in the adoption process yield higher success rates. Clear communication to employees of the firm's current situation as well as their status in the firm before, during and after the implementation of change is also necessary (Turban *et al.*, 2005). Management should make sure that employees are fully aware and understand the impact of changes. If a company starts to change to a new computer system, employees may have doubts over job security (Bull, 2003).

Some employees may not believe that the new system will change or improve the way the business functions (Anderson and Huang, 2006). Because of the negative aspect of attitude, Bruque and Moyano (2007) suggest that it could be more effective to hire new staff rather than train existing staff. On the other hand, the cost of hiring new staff is sometimes higher than providing training to the current ones. Training must be provided to existing employees if there is a substantial change in the IT. Currently, there are many management books and policies suggesting how to achieve effective communication, provide training to employees on the new systems and help management to deliver or transfer knowledge successfully to others (Fuller-Love, 2006; Piccoli, 2008).

Based on the above analysis, we can infer that involving employees in any changes in the process makes such success more likely. When employees are part of the process, they can provide input for activities that they are dealing with everyday and in which managers are not involved (Anderson and Huang, 2006). Although in small firms, employees often do not have the same perspective toward the businesses as owner-managers (Petts *et al.*, 1998) their knowledge still is the company's capital. They contribute to a firm's absorptive capacity through which firms can advance and adapt to changes (Macpherson *et al.*, 2003).

Absorptive capacity of the firm. Absorptive capacity refers to the capability that a firm can advance and adapt to change through the circle of absorbing knowledge, transforming knowledge and creating new knowledge and generating competitive advantage (Zahra and George, 2002). The construction of this capability includes the daily routines and processes that a firm uses to obtain, absorb, process and utilise its knowledge. In their reconceptualisation model, the authors suggest that there are two elements, potential and realised, within absorptive capacity. Potential capacity refers to the capacity to acquire knowledge and the ability to assimilate this knowledge. On the other hand, realised capacity concentrates on the transformation and exploitation of knowledge.

The study by Liao *et al.* (2003) suggests that there is a relationship between absorptive capacity and organisational responsiveness in terms of growth in SMEs. The directly related factors are acquisition of external knowledge, and the transforming and disseminating of internal knowledge. These relationships were moderated by environmental dynamism and the strategic orientation of SMEs. Some have suggested that absorptive capacity is part of the supply chain management (SCM) where knowledge and resources are being shared and exchanged between firms, their suppliers and their customers (Meeus *et al.*, 2001; Yli-Renko *et al.*, 2001). Gray (2006) suggests that absorptive capacity in SMEs is a precondition to the successful adoption of innovation and growth. In his study of more than 1,500 SME owners across the UK between 2003 and 2004, the author looked for relationships of absorptive capacity in education levels and a firm's experience that link to innovation and performance of the firm. The findings suggest that the higher the levels of education as well as staff development and propensity to innovate, the stronger the growth and orientation of the firms. However, there was not enough data to suggest that the firm's experience links to their innovation and performance.

Carayannis *et al.* (2006) suggest that technological learning and IT promote entrepreneurial development and growth. The IT adoption process requires teamwork and acceptance across all functions within a firm. It requires top management support, clear communication to the employees, and the employees' acceptance of the changes (Anderson and Huang, 2006; Macpherson *et al.*, 2003; Premkumar and Roberts, 1999; Sarasvathy, 2003; Smith, 2007). Management should ensure that there is efficient knowledge sharing among individuals within the firm. A recent study by Jones (2006) added an additional element to the Zahra and George's (2002) reconceptualisation model, a managerial agency. This element includes gatekeepers, boundary spanners and change agents with strategic choice that is exercised by top management. The implication is that people from different groups coming from a different background interpret and do things differently. Management should make sure that employees appreciate that others see and understand things in different ways. This diversity combined with external knowledge and information leads to the creation of new knowledge and hence to competitive advantage.

Networking

Networking in SMEs exists through the many interactions between firms, business partners, vendors, suppliers and customers, in other words, the stakeholders. These networks can be personal-networks or business-networks and are not restricted by organisational boundaries (Taylor and Pandza, 2003). Through this network, firms can

exchange, collaborate and share knowledge, information and communication. Due to the nature of SMEs, which generally lack IT resources and skills (Chan and Chung, 2002; Levy *et al.*, 2001), firms can benefit from a network relationship when it comes to IT adoption. Fletcher (2002) suggests that networking can provide potential resources for many small business firms. Lema and Duréndez (2007) suggest that small firms rely on their personal network. Within this network lies the source of knowledge where, owner-managers strengthen their businesses by having access to scarce resources such as skills, information and knowledge (Macpherson *et al.*, 2003).

Network relationship. Fuller and Lewis (2002a) suggest that relationship in small business is important and there are different strategies and meanings in each type of relationship that firms have developed (Table I). The owner-managers of small businesses interact with their stakeholders. The authors' suggest there are five types of relationship: network, contract, personal service, personalised and strategic development.

These relationship strategies represent how people behave, interact and deal with each type of stakeholder based on the necessity and benefit of their daily activities. In a mix of relationships, overlapping between economic, social relations and mutual trust, stem sources of explicit knowledge for the local networks of SMEs (Chiarvesio *et al.*, 2004). A review by Pittaway *et al.* (2004) suggests that the principal benefits of networking include sharing of risk, gaining access to new markets and technology, faster delivery of products to the market, gathering complementary skills, and safeguarding property rights when complete or contingent contracts are not possible. The networks are a means for obtaining access to external knowledge.

Premkumar and Roberts (1999) described the networking or external environmental factor in small business to include vendors, partners, competitors and IT. For IT, the emphasis of the external environmental perspective is concentrated on the competitive pressure of the market where a certain IT has shown positive results for many other competitors. Although IT adoption is for the firm itself, collaboration of the "external users" such as vendors, business partners, stakeholders and customers should be exploited. Collaboration is one of the four competitive scenarios in the focus-dominance model of Levy *et al.* (2001). It is where firms work together to communicate and share

Network relationship	Key orientation
Network	To facilitate the formation of informal interconnected channels of communication through participation
Contract	An expressed wish to work with people that share the same vision of mutual trust and reciprocity, i.e. transfer of goods or services for payment of the same
Personal service	To form a significant relationship with people – ones that are indicative of the competitive nature of the firm to provide an unparalleled service
Personalised	To consider the individuality of a person/organization and to build and adapt the relationship on the basis of its distinctiveness
Strategic development	To develop reciprocal relationships with stakeholders who, through experience, share a common goal or interest in securing the future growth of their firm

Table I.
Fuller and Lewis definitive differences in small-business owners' orientation to relationships

knowledge and information between and amongst themselves. As mentioned earlier, one of the reasons for IT adoption in SMEs is technology-push. IT should provide a means of communication, and must be compatible between partners; otherwise, one of the parties will be isolated. In other words, IT integration between firms should be streamlined and an interface has to be created so that one system can respond to another (Darby and Zucker, 2001). More over, collaboration also can help firms reduce costs (Costello, 1996; Daily and Dollinger, 1991; Levy *et al.* 2001; Taylor and Pandza, 2003).

Knowledge and learning. According to Rosenfeld (1996) small firms' competitiveness is strongly influenced by inter-firm collaboration. Collaboration among SMEs and larger firms or customers is also common and this can be a route to survival and a gain in knowledge sharing (Levy *et al.*, 2003). However, Thorpe *et al.* (2005) point out that many firms failed to recognise the managerial difficulties of collaboration between the firms and their external environment so they are unable to keep up with the requirement. SMEs also depend on other external resources and knowledge (Lema and Duréndez, 2007; Rothwell, 1991). Several studies have shown that absorptive capacity is part of the external relationship network or part of the Supply Chain Management (Meeus *et al.*, 2001; Yli-Renko *et al.*, 2001) and provides an opportunity to coordinate efforts and exchange information that can create new knowledge (Pittaway *et al.* 2004; Teece, 1992). Rothwell (1991) highlights the significance of effective inter-organisational and network relationships as learning opportunities for SMEs manufacturing in Europe. Lipparini and Sobrero (1994) demonstrate that firms with strong relational competence often become innovative and competitive. Following this point, Gibb (1997) argues that skills relating to learning through a network environment and ability to work with external resources are essential. Taylor and Pandza (2003) suggest by properly learning, managing and developing network of relationships, owner-managers can create a competitive advantage for their firms and differentiate themselves from their competitors. Levy *et al.* (2003) suggest that SMEs are the knowledge generators through IT. Their study of 37 SMEs in the UK tested the theory of co-operation and showed that inter-organisational knowledge sharing plays an important role in maintaining competitive advantage.

As such, we can assume that relationships of firms to their external environment such as stakeholders, suppliers, customers and business partners, sometimes have a direct influence on the firms' daily activities (Fuller and Lewis, 2002a). Small firms are different from large firms in that small firms' business and personal success are socially rather than psychologically constituted (Cope, 2003). Firms can become more innovative and entrepreneurial by developing links with external sources of knowledge (Jones, 2001). In other words, small firms rely upon a relationship network or a personal network (Lema and Duréndez, 2007). Within these networks, firms have access to information, knowledge and learning opportunities for themselves and their employees. It is also a means for owner-managers to strengthen their businesses by providing access to certain resources that are not available to others (Chell and Baines, 2000; Porter, 1998; Taylor and Pandza, 2003). It is imperative that firms establish and maintain the connection to this network because it is the source for information, knowledge and opportunities (Dew *et al.*, 2004). Knowledge is the source that can be transferred and promote innovation (Granovetter, 1985; Levy *et al.*, 2003;

Jones, 2003). In addition, the network creates trust and smoothes out transaction costs (Yli-Renko *et al.*, 2001). Hence, networking has a major impact on IT adoption.

External experts/professional consultant

One of the more important aspects of the IT adoption process is the assistance of external experts, consultants or IT vendors. Their professional skills are needed because, as indicated by different studies, there is a lack of IT expertise in most SMEs (Soh *et al.*, 1992; Thong *et al.*, 1996; Chan and Chung, 2002; Hjalmarsson and Johansson, 2003). Finding the appropriate expertise to assist with IT adoption is even harder for many SMEs as not all consultants or software vendors are appropriate for a firm's IT adoption.

Experience and recommendation. Some experts, both software vendors and IT consultants, argue that, by working with other firms within the same market they have acquired the knowledge from these firms and would be able to give effective advice about certain IT applications (Kole, 1983). One component in the recursive learning model by Fuller (1996) pointed out the importance of external advice and resources. It suggests that IT/IS vendors and consultants, whose role is to shape their services to support business development, are the bridges that connect the business users and the suppliers while supporting the learning process of the business. Turban *et al.* (2005) suggest that most consulting firms have vast knowledge acquired and absorbed from assisting their clients. As such, they can offer their "service" or knowledge to firms that seek their help.

For many firms, seeking external expertise is a solution to the problem of adopting IT (Izushi, 2005). A study by Soh *et al.* (1992) of 96 firms in Singapore adopting IT used case studies to compare two groups of small businesses that were using IT specialists or consultants and those who were not. This study suggests that those who received external assistance completed their projects on time and within budget as opposed to those who did not. A later study by Thong *et al.* (1996) of 114 small businesses, also in Singapore, found that external IT expertise plays an important role in the IT implementation process. The result showed that, in small businesses, support from top management, even though it is essential, is not as important as effective external support from IT consultants. Given the lack of expertise in a small business environment, the provision of high quality external expertise should be considered in the planning process for IT adoption. In another study, Rothwell (1991) argues that firms benefit from having no in-house experts. The reason is that it gives the firms the flexibilities to utilise external consultants. This argument is an extension to the finding by Jarillo (1989) that growth can be due to a firm's willingness to utilise external resources.

Not all firms are successful using external expertise or consultants (Bull, 2003; Shin, 2006), nor is every software package suitable for a firm (Shin, 2006). It is suggested that one cannot assume that IT is practical for every firm because the functions within a firm vary one from another (Macpherson *et al.*, 2003). In addition, there is a great difference between sales representatives and technical support even in the same IT company (Bull, 2003). For these reasons, before deciding upon any software package, firms should make a judgment to the best of their knowledge. They also should consider learning from the earlier adopters. This is because if IT is well defined and

developed, the followers will take less risk in terms of technology stability (Laudon and Laudon, 2007). Swift (2001) suggests the following:

- firm should not take a vendor's claim at face value;
- never assume a vendor reference is valid;
- always talk with the reference's IS staff;
- never take IS claims at face value;
- always talk to the users of the system;
- always talk without the vendor present; and
- always talk with the users without the IS organization present.

Last, but not least, negotiating a performance-related contract is also necessary as problems may arise after implementation (Bull, 2003).

Due to the nature of SMEs, which generally lack of IT expertise and skills (Izushi, 2005; Thong *et al.*, 1996), firms should seek professional consultants when it comes to IT adoption (Fuller, 1996). Quality advice from professional consultants or IT vendors is always useful for management or owner-managers as many of them do not have sufficient experience or understanding of IT (Kole, 1983; Thong *et al.*, 1996; Turban *et al.*, 2005). However, owner-managers should also take into consideration that not all suggestions or software packages fit with the needs of an individual business (Izushi, 2005). Therefore, a clear definition or purpose behind pursuing new IT is essential. Lack of such preparation can impede the success of the process (Soh *et al.*, 1992).

Information technology

There is a body of research that show that IT helps firms to streamline their business processes by changing the way people behave and work (Lau *et al.*, 2001). IT is also a means to enhance the way people capture and distribute information (Claessen, 2005; Currie, 2004; Rhodes and Carter, 1998), lower production and labour costs, add value to products and services and increase the company's competitive advantage (Carbonara, 2005; Levy *et al.*, 2001; Powell and Dent-Micallef, 1997). This perspective not only focuses on IT itself, it also focuses on the IT abilities, capabilities and capacities of firms as well. One refers to the skills, another refers to resources and strategies and the last one refers to the ability of firms to absorb, process, and deliver the information that the firm holds (Carbonara, 2005; Premkumar, 2003).

It is imperative that management should consider the appropriate application for their firms when deciding whether or not to adopt new IT. These considerations are the size of the business, their employees' knowledge of IT and the amount of information that the organisation has (Premkumar and Roberts, 1999). Other areas to look into are cost, risk and competitive advantage. Proudlock *et al.* (1999) suggests guidelines for IT adoption in these areas. Their strategies included expanding on existing IT, purchasing off-the-shelf applications, industry-standard software or market leading IT. It does not make sense for a firm to look at sophisticated systems, which contains a multi-tier data warehouse with robust Human Resource Information Systems when all it needs is a small program that could handle about one hundred records for its workforce. IT abilities, capabilities and capacities of the organisation play an important role in the IT adoption process. They should be carefully examined as they have an impact on the organisation as a whole (Búrca *et al.*, 2005).

Abilities, capabilities and capacities. IT abilities of a firm include employees' collaboration among themselves, between departments and with their suppliers and customers. Mata *et al.* (1995) suggests that IT managers should not only understand and appreciate the business needs for the firm as a whole including the needs of its suppliers and customers, but also be able to work with them. As mentioned earlier, IT is a resource that can assist firms to enhance their business practices so a clear definition or purpose in pursuing new IT should be defined before any decisions on IT adoption are made. According to Naslund and Newby (2005), many businesses implement new and robust information systems because everybody else in the market does so. Often, because there was no clear definition or strategy of the purposes of IT adoption, many projects fail due to this "management fad". The study suggests that there should be a clear definition for IT adoption before proceeding with the project. To avoid IT adoption failure, it is essential that a firm has the ability to handle new IT and that management understands the need for new IT (Bhagwat and Sharma, 2007; Naslund and Newby, 2005; Premkumar, 2003).

IT capabilities deal with a firm's capable of implementing and deploying IT (Zhang *et al.*, 2004). Guan and Ma (2003) argue that IT innovation capability of a firm cannot be measured by a single dimension. It is a special asset comprised of technology infrastructure, production, process, knowledge, experiences and organization (Guan *et al.*, 2006). According to the authors, IT capabilities can be seen as a system and cannot be codified. It is collaboration between internal experience and experimental acquisition, which must include a wide variety of assets and resources to lead to a successful implementation. Caldeira and Ward (2003) suggest that business capability comprise different components. They are organisational competences, organisational process, technical process, technical skills, managerial skills, business skills and the allocation of resources within the firms. According to the authors, these components contribute to the understanding and success of IT adoption in manufacturing SMEs.

IT capacity refers to a firm's ability to absorb and handle information and has a direct influence on the adoption decision (Gray, 2006; Liao *et al.*, 2003). Normally, IT enhancement is not only for the current stage of the business but it must also be appropriate for future short-term business expansion (Moss and Atre, 2003). As a result, selecting proper software packages to fit the business requirement is no less critical than the other factors. Powell (1992) suggests firms should evaluate IS/IT systems using different techniques before implementation. In his study, the author demonstrates strengths and weaknesses of methods such as evaluation of subject methods (i.e. user attitude surveys, event logging, Delphi evidence) and object methods (cost-benefit analysis, value analysis, multiple criteria approaches, simulation techniques, etc.). This is particularly important for SMEs because of the lack of financial support as well as lack of IT knowledge. Most of them do not have the ability to invest in large IT infrastructure or enterprise application packages. Instead, they tend to seek off-the-shelf products that they are able to afford (Shin, 2006). Others believe that IT should be treated as an allocation of resources (Bessant *et al.*, 2001; Teece *et al.*, 1997). Here, it is suggested that a firm's capacity is limited and allocation of resources can maximise its ability to absorb, process and transform IT. When and how to change are also important (Andries and Debackere, 2006). Teece *et al.* (1997) suggest that firms need new set of objectives if they decide to change or adopt new IT.

Baumeister (2002) suggests that changes in process should happen over time instead of instantaneously.

From this section on factors influencing the IT adoption process, it can be seen that there are a large number of studies examining the involvement of these influencers in the adoption process. The author categorises different concepts and perspectives into four factors, which are organisational, networking, external expertise and technology capability:

- Organisational includes culture, employees (both management and subordinates) and the knowledge transfer of the firms.
- Networking covers the relationships of the firms with their external environment. This is including suppliers, customers, stakeholders, government officials and research academics. Knowledge and learning from this networking factor as it plays major role in SMEs knowledge transfer and innovation.
- External expertise fulfils the gaps in term of the lack of IT expertise and experience within SMEs.
- IT itself specifies the abilities, capacities and capabilities of the firms when it comes to IT adoption.

Based on the original model (Figure 1) the author reconceptualises key influences that directly contribute to the IT adoption process (Figure 2). The author believes that by synchronising the related literature together, this framework could add further to knowledge, give a clearer understanding of why SMEs adopt IT and what factors contribute to the process for improving the adoption of IT by SMEs.

Barriers to IT adoption

Directly affecting the way owners manage their businesses is their educational and family background. Many do not have high level qualifications (Fuller-Love, 2006) or strong leadership skills (Jones, 2003). Their innovativeness influences the business performance (Stanworth and Gray, 1992) and the culture of the firm (Smith and Whittaker, 1999). They see their business as a reflection of themselves, an extension of their self-image or personal achievements. Some of them hold that their authority allows them to do whatever they want because their ownership of the businesses (Fuller-Love, 2006). Some of these managers perceive they will lose their power, control and influence when it comes to IT adoption (Macrì *et al.*, 2001). In businesses where there are two or more owner-managers, there is often a conflict over who should play the central role (Cromie, 1990). Another problem is that often, in smaller firms, family members are hired to hold vital positions (Jones, 2003; Lema and Duréndez, 2007; Smith, 2007). This often leads to management problems due to their non-qualification for positions compared to external hires who are better fitted for the positions (Lema and Duréndez, 2007).

Many owner-manages use their personal possessions as guarantees so they do not act unconditionally on IT investment like larger corporations (Eden *et al.*, 1997). As suggested by Piccoli (2008), implementing a new computer system of any kind requires long-term investment. This means that sufficient financial resources need to be invested along with time and other resources. Andries and Debackere (2006) suggest "resources, capabilities and strategies" are factors enabling adoption of new IT. Financial commitment is crucial and must be planned accordingly. This should include

the initial cost of software and hardware, the cost of personnel training and development and the post implementation costs (Shelly *et al.*, 2001). For these reasons, in many instances, owner-managers become micro-managers wanting to control every small detail of the daily operations. In any case, they have to see or at least believe that new IT will bring advantages to the firm. Many studies confirmed that management's perception of IT is that such tools can provide them with some advantage in their business environment (Harrison *et al.*, 1997; Lee and Runge, 2001; Riemenschneider *et al.*, 2003).

Another factor that prevents or inhibits the adoption of IT in small firms is the cost of the project (Premkumar, 2003). Costs seem to be the problem for the majority of SMEs (Lema and Duréndez, 2007), although others argue that both time and costs are fundamental issues (Smith and Whittaker, 1999; Westhead and Storey, 1996). A study by Lefebvre *et al.* (1995) suggests that there is no link between IT investment and financial performance. The reason behind this is that gains normally offset the cost of investment so the change is not significant. A study by Ballantine and Stray (1998) examines the IS/IT investment in UK companies and suggests that it is difficult to measure the benefits and costs associated with such investment. On the other hand, Gadenne (1998) demonstrates that firms that invest using internal finance are often more successful than firms that acquire finance externally. However, cost is still a fundamental issue when it comes to IT adoption and implementation. Most small businesses do not have sufficient financial resources, and most owner-managers mortgage their own personal property (Fuller-Love, 2006). This is one of the reasons why before investing further, either to expand or to survive in the market, these owner-managers frequently have to have some indications or guarantee of a return on their investment (Lee and Runge, 2001).

SMEs, when working with larger enterprises, are often unable to keep up with IT efficiency of their larger partners although there is a recognition that a knowledge benefit lies in supply chain management. It all depends on the ability of each partner to keep up with the rapid change in the chain (Beecham and Cordey-Hayes, 1998). Another issue is SMEs' lack of codification of their business processes as compared to large corporations (Ward, 2004). Another barrier is that IT adoption requires long-term planning and investment. For some companies, acquiring new IT is planned as it is seen as providing competitive advantage or an investment toward growth in the future. However, for many others, acquiring IT is not planned (Levy *et al.*, 2001) as managers do not have enough time to focus on the long-term planning process (Fuller, 1996; Fuller-Love, 2006). Lema and Duréndez (2007) suggest that most owner-manager are not good in long-term or strategic planning but they often benefit from sufficient flexibility to exploit innovation in short-term investment (Thorpe *et al.*, 2005).

Implications for further research

This paper focused on IT adoption in SMEs. As demonstrated, there is a large body of literature covering concepts, theory and frameworks developed in this subject where the impetus for adopting IT is often the choice of being innovative or surviving and staying competitive in the market. Adopting new IT promises to lower the cost of production and labour while adding value to products and services as it increases, or at least keeping competitive advantage (Bridge and Peel, 1999; Bruque and Moyano, 2007; Búrca *et al.*, 2005). However, not all firms are taking advantage of this opportunity. One

problem that impedes this process is the financial status of the firm. In most small businesses financial resources are from their personal resources and to invest in the business is a major consideration. Often, owner-managers need to see the promise of success, in terms of return on investment, because they cannot afford to take risks (Fuller-Love, 2006). In-depth studies should be carried out into business venturing. This could show SMEs how investment, opportunities and risk taking could improve their business and achieve not only survival, but also an increase in profitability.

Another drawback is the lack of management skills, which prevent firms from developing further (Jones, 2003; Thong, 1999). Owner-managers' contribution, leadership and commitment qualities determine the success of the project they are leading (Igbaria *et al.*, 1997). As suggested in a study by Naslund and Newby (2005), management is the key to the success of project implementation. They must not only claim to be involved and contributing to the project, they also have to show their commitment and participation in the project itself.

As suggested in the literature, management learning in SMEs needs revisiting (Deakins and Freel, 1998; Gibb, 1997). Large-scale and in-depth studies showed that management or owner-managers have a major impact on the firms themselves (Gagnon and Toulouse, 1996; Lee and Runge, 2001; Lema and Duréndez, 2007; Macpherson *et al.*, 2003; Smith, 2007; Thong and Yap, 1995). However, there is not sufficient evidence to conclude that management in different industries have different impacts on the firms themselves when it comes to IT adoption. Comparatives studies on the specific industry such as retailing, manufacturing, support and services could yield better understanding of the impact.

Conclusions

Many challenges and pitfalls await small businesses when it comes to IT adoption. Some arise from internal sources and some are external to the business (Andries and Debackere, 2006; Corso *et al.*, 2003; Morel and Ramanujam, 1999; Southern and Tilley, 2000; Winter, 2003). Within the business itself (the internal environment), the status of the business, in the context of having new rivals, expanding the business or investing in new business channels, is one of the factors. The second one, the external environment, is the maturity of the business, where survival becomes a vital issue in the business, and results in a need to adopt new IT. In a similar context, Andries and Debackere (2006) suggests that reasons for changes are internal, the firm's maturity, and external, survival and stability in the market. This structure is demonstrated by the drivers to IT adoption model (see Figure 1). The change occurs because of technology push and market pull, internal and external pressure, together with competition and innovation.

From a macro-perspective, the author categorised influences on IT adoption into four major factors, which are organisational, networking, external expertise and IT capabilities. Using the IT adoption model as the root of the IT adoption process and incorporating the key factors, the author puts forward a framework that reconceptualises this process (see Figure 2). The author believes that this framework, a synchronisation of different perspectives, could add further to the database of knowledge, give a clearer understanding of why SMEs adopt IT and what factors contribute to the process for improving the adoption of IT by SMEs.

This macro-perspective of IT adoption in SMEs adds an inclusive picture of a typical IT adoption process to the body of literature. It highlights the areas to which non-adopters can refer for future IT acquisition. The author contends that this conceptual framework for the IT adoption process is based on the references from the literature. It is open to and requires testing to determine its relevancy and validity in a practical environment.

References

Acar, E., Koçak, I., Sey, Y. and Arditi, D. (2005), "Use of information and communication technologies by small and medium-sized enterprises (SMEs) in building construction", *Construction Management and Economics*, Vol. 23 No. 7, pp. 713-22.

Anderson, R. and Huang, W. (2006), "Empowering salespeople: personal, managerial, and organizational perspectives", *Psychology and Marketing*, Vol. 23 No. 2, pp. 139-59.

Andries, P. and Debackere, K. (2006), "Adaptation in new technology-based ventures: insights at the company level", *International Journal of Management Reviews*, Vol. 8 No. 2, pp. 91-112.

Atherton, A. (2003), "The uncertainty of knowing: an analysis of the nature of knowledge in a small business context", *Human Relations*, Vol. 56 No. 11, pp. 1379-98.

Atherton, A. and Hannon, P.D. (2000), "Innovation processes and the small business: a conceptual analysis", *International Journal of Business Performance Management*, Vol. 2 No. 4, pp. 276-92.

Ballantine, J. and Stray, S. (1998), "Financial appraisal and the IS/IT investment decision making process", *Journal of Information Technology*, Vol. 13 No. 1, pp. 3-14.

Ballantine, J., Levy, M. and Powell, P. (1998), "Evaluating information systems in small and medium-sized enterprises: issues and evidence", *European Journal of Information Systems*, Vol. 7 No. 4, pp. 241-51.

Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99-120.

Barney, J.B. (1986), "Organizational culture: can it be a source of sustained competitive advantage?", *Academy of Management Review*, Vol. 11 No. 3, pp. 656-65.

Bassellier, G., Benbasat, I. and Reich, B. (2003), "The influence of business managers' IT competence on championing IT", *Information Systems Research*, Vol. 14 No. 4, pp. 317-36.

Baumeister, H. (2002), "Customer relationship management for SMEs, e2000 e-business and e-work", *Proceedings of E2002 Conference, Prague, October*.

Beecham, M. and Cordey-Hayes, M. (1998), "Partnering and knowledge transfer in the UK motor industry", *Technovation*, Vol. 18 No. 3, pp. 191-205.

Bessant, J., Francis, D., Meredith, S., Kaplinsky, R. and Brown, S. (2001), "Developing manufacturing agility in SMEs", *International Journal of Technology Management*, Vol. 2 No. 1, pp. 28-54.

Bhagwat, R. and Sharma, M.K. (2007), "Information system architecture: a framework for a cluster of small and medium-sized enterprises (SMEs)", *Production Planning and Control*, Vol. 18 No. 4, pp. 283-96.

Bridge, J. and Peel, M. (1999), "A study of computer usage and strategic planning in the SME sector", *International Small Business Journal*, Vol. 17 No. 4, pp. 82-7.

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. 241-53.

Bull, C. (2003), "Strategic issues in customer relationship management (CRM) implementation", *Business Process Management Journal*, Vol. 9 No. 5, pp. 592-602.

Búrca, S., Fynes, B. and Marshall, D. (2005), "Strategic technology adoption: extending ERP across the supply chain", *Journal of Enterprise Information Management*, Vol. 18 No. 4, pp. 427-40.

Caldeira, M. and Ward, J. (2003), "Using resource-based theory to interpret the successful adoption and use of information systems and technology in manufacturing small and medium-sized enterprises", *European Journal of Information Systems*, Vol. 12 No. 2, pp. 127-41.

Capello, R. (1999), "Spatial transfer of knowledge in high technology milieux: learning versus collective learning processes", *Regional Studies*, Vol. 33 No. 4, pp. 353-65.

Carayannis, E.G., Popescu, D., Sipp, C. and Stewart, M. (2006), "Technological learning for entrepreneurial development (TL4ED) in the knowledge economy (KE): case studies and lessons learned", *Technovation*, Vol. 26 No. 4, pp. 419-43.

Carbonara, N. (2005), "Information and communication technology and geographical clusters: opportunities and spread", *Technovation*, Vol. 25 No. 3, pp. 213-22.

Carson, D. and Gilmore, A. (2000), "SME marketing management competencies", *International Business Review*, Vol. 9 No. 3, pp. 363-82.

Chan, M. and Chung, W. (2002), "A framework to develop an enterprise information portal for contract manufacturing", *International Journal of Production Economics*, Vol. 75 Nos 1-2, pp. 113-26.

Chaston, I. and Mangles, T. (2000), "Business networks: assisting knowledge management and competence acquisition within UK manufacturing firms", *Journal of Small Business and Enterprise Development*, Vol. 7 No. 2, pp. 160-70.

Chell, E. and Baines, S. (2000), "Networking entrepreneurship and microbusiness behaviour", *Entrepreneurship and Regional Development*, Vol. 12 No. 3, pp. 195-215.

Chiarvesio, M., Di Maria, E. and Micelli, S. (2004), "From local networks of SMEs to virtual districts? Evidence from recent trends in Italy", *Research Policy*, Vol. 33 No. 10, pp. 1509-28.

Claessen, E. (2005), "Strategic use of IC reporting in small and medium-sized IT companies: a progress report from a Nordic project", *Journal of Intellectual Capital*, Vol. 6 No. 4, pp. 558-69.

Cope, J. (2003), "Entrepreneurial learning and critical reflection: discontinuous events as triggers for 'higher-level' learning", *Management Learning*, Vol. 34 No. 4, pp. 429-50.

Corso, M., Martini, A., Pellegrini, L. and Paolucci, E. (2003), "Technological and organizational tools for knowledge management: in search of configurations", *Small Business Economics*, Vol. 21 No. 4, pp. 397-408.

Costello, N. (1996), "Learning and routines in high-tech SMEs: analyzing rich case study material", *Journal of Economic Issues*, Vol. 30 No. 2, pp. 591-7.

Cromie, S. (1990), "The problems experienced by young firms", *International Small Business Journal*, Vol. 9 No. 3, pp. 43-61.

Currie, W. (2004), "The organizing vision of application service provision: a process-oriented analysis", *Information and Organization*, Vol. 14 No. 4, pp. 237-67.

Daily, C. and Dollinger, M. (1991), "Family firms are different", *Review of Business*, Vol. 13 No. 1, pp. 3-5.

Darby, M. and Zucker, L. (2001), "Growing by leaps and inches: creative destruction, real cost reduction, and inching up", *Economics Inquiry*, Vol. 41 No. 1, pp. 1-19.

DeLone, W. (1988), "Determinants of success for computer usage in small business", *MIS Quarterly*, Vol. 12 No. 1, pp. 50-61.

Deakins, D. and Freel, M. (1998), "Entrepreneurial learning and the growth process in SMEs", *The Learning Organization*, Vol. 5 No. 3, pp. 144-55.

Denison, D.R. and Mishra, A.K. (1995), "Toward a theory of organizational culture and effectiveness", *Organization Science*, Vol. 6 No. 2, pp. 204-23.

Denison, D., Lief, C. and Ward, J. (2004), "Culture in family-owned enterprises: recognizing and leveraging unique strengths", *Family Business Review*, Vol. 17 No. 1, pp. 61-71.

Dew, N., Velamuri, S.R. and Venkataraman, S. (2004), "Dispersed knowledge and an entrepreneurial theory of the firm", *Journal of Business Venturing*, Vol. 19 No. 5, pp. 659-79.

Druilhe, C. and Garnsey, E. (2004), "Do academic spin-outs differ and does it matter?", *Journal of Technology Transfer*, Vol. 29 Nos 3-4, pp. 269-85.

Eden, L., Levitas, E. and Martinez, R. (1997), "The production, transfer and spillover of technology: comparing large and small multinationals as technology producers", *Small Business Economics*, Vol. 9 No. 1, pp. 53-66.

Egbu, C.O., Hari, S. and Renukappa, S.H. (2005), "Knowledge management for sustainable competitiveness in small and medium surveying practices", *Structural Survey*, Vol. 23 No. 1, pp. 7-21.

Fenn, D. (2005), *Alpha Dogs*, HarperCollins, New York, NY.

Fletcher, K. (2002), "Editorial: The role of CRM in changing and facilitating competitive advantage", *Journal of Database Marketing*, Vol. 9 No. 3, pp. 203-6.

Fuller, T. (1996), "Fulfilling IT needs in small businesses; a recursive learning model", *International Small Business Journal*, Vol. 14 No. 4, pp. 25-44.

Fuller, T. and Lewis, J. (2002a), "'Relationships mean everything' a typology of small-business relationship strategies in a reflexive context", *British Journal of Management*, Vol. 13 No. 4, pp. 317-36.

Fuller, T. and Lewis, J. (2002b), "Owner managers' technological perspectives; implicating technology in SME relationship strategies", paper presented at 25th ISBA National Small Firms Conference: Competing Perspective of Small Business and Entrepreneurship, Brighton, 13-15 November.

Fuller-Love, N. (2006), "Management development in small firms", *International Journal of Management Reviews*, Vol. 8 No. 3, pp. 175-90.

Gadenne, D. (1998), "Critical success factors for small businesses: an inter-industry comparison", *International Small Business Journal*, Vol. 17 No. 1, pp. 36-56.

Gagnon, Y. and Toulouse, J. (1996), "The behavior of business managers when adopting new technologies", *Technological Forecasting and Social Change*, Vol. 52 No. 1, pp. 59-74.

Gibb, A.A. (1997), "Small firms' training and competitiveness: building upon the small firm as a learning organization", *International Small Business Journal*, Vol. 15 No. 3, pp. 13-29.

Granovetter, M. (1985), "Economic action and social structure: the problem of embeddedness", *The American Journal of Sociology*, Vol. 91 No. 3, pp. 481-510.

Gray, C. (2006), "Absorptive capacity, knowledge management and innovation in entrepreneurial small firms", *International Journal of Entrepreneurial Behaviour & Research*, Vol. 12 No. 6, pp. 345-60.

Gray, C. and Gonsalves, E. (2002), "Organizational learning and entrepreneurial strategy", *The International Journal of Entrepreneurship and Innovation*, Vol. 3 No. 1, pp. 27-33.

Guan, J. and Ma, N. (2003), "Innovative capability and export performance of Chinese firms", *Technovation*, Vol. 23 No. 9, pp. 737-47.

Guan, J.C., Yam, R.C.M., Mok, C.K. and Ma, N. (2006), "A study of the relationship between competitiveness and technological innovation capability based on DEA models", *European Journal of Operational Research*, Vol. 170 No. 3, pp. 971-86.

Hall, A., Melin, L. and Norqvist, M. (2001), "Entrepreneurship as radical change in the family business: exploring the role of cultural patterns", *Family Business Review*, Vol. 14 No. 3, pp. 193-208.

Harrison, D., Mykytyn, P.J. and Riemenschneider, C. (1997), "Executive decisions about adoption of information technology in small business: theory and empirical tests", *Information Systems Research*, Vol. 8 No. 2, pp. 171-95.

Henderson, R.M. and Clark, K.B. (1990), "Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms", *Administrative Science Quarterly*, Vol. 35 No. 1, pp. 9-30.

Hjalmarsson, D. and Johansson, A.W. (2003), "Public advisory services – theory and practice", *Entrepreneurship and Regional Development*, Vol. 15 No. 1, pp. 83-98.

Igbaria, M., Zinatelli, N., Cragg, P. and Cavaye, A. (1997), "Personal computing acceptance factors in small firms: a structural equation model", *MIS Quarterly*, Vol. 21 No. 3, pp. 279-305.

Izushi, H. (2005), "Creation of relational assets through the 'library of equipment' model: an industrial modernization approach of Japan's local technology centres", *Entrepreneurship and Regional Development*, Vol. 17 No. 3, pp. 183-204.

Jarillo, J.C. (1989), "Entrepreneurship and growth: the strategic use of external resources", *Journal of Business Venturing*, Vol. 4 No. 2, pp. 133-47.

Jennings, P. and Beaver, G. (1997), "The performance and competitive advantage of small firms: a management perspective", *International Small Business Journal*, Vol. 15 No. 2, pp. 63-75.

Jones, O. (2001), "Expanding capabilities in a mature manufacturing firm: absorptive capacity and the TCS", *International Small Business Journal*, Vol. 19 No. 3, pp. 39-55.

Jones, O. (2003), "Competitive advantage in SMEs: towards a conceptual framework", in Jones, O. and Tilley, F. (Eds), *Competitive Advantage in SMEs*, Wiley, Chichester, pp. 15-33.

Jones, O. (2006), "Developing absorptive capacity in mature organizations: the change agent's role", *Management Learning*, Vol. 37 No. 3, pp. 355-76.

Jones, O., Macpherson, A., Thorpe, R. and Ghecham, A. (2007), "The evolution of business knowledge in SMEs: conceptualizing strategic space", *Strategic Change*, Vol. 16, pp. 281-94.

Keh, H., Foo, M. and Lim, B. (2002), "Opportunity evaluation under risky conditions: the cognitive processes of entrepreneurs", *Entrepreneurship: Theory and Practice*, Vol. 27 No. 2, pp. 125-48.

Keogh, W. (1999), "Understanding processes and adding value within innovative small firms", *Knowledge and Process Management*, Vol. 6 No. 2, pp. 114-25.

Khan, A. and Manopichetwattana, V. (1989), "Innovative and noninnovative small firms: types and characteristics", *Management Science*, Vol. 35 No. 5, pp. 597-606.

Kole, M. (1983), "Going outside for MIS implementation", *Information and Management*, Vol. 6 No. 5, pp. 261-8.

Lau, T., Wong, Y., Chan, K. and Law, M. (2001), "Information technology and the work environment – does IT change the way people interact at work?", *Human Systems Management*, Vol. 20 No. 3, pp. 267-79.

Laudon, K. and Laudon, J. (2007), *Essentials of Business Information Systems*, 7th ed., Prentice-Hall, Englewood Cliffs, NJ.

Lee, J. and Runge, J. (2001), "Adoption of information technology in small business: testing drivers of adoption for entrepreneurs", *Journal of Computer Information Systems*, Vol. 42 No. 1, pp. 44-58.

Lefebvre, E., Lefebvre, L. and Roy, M. (1995), "Technological penetration and organizational learning in SMEs: the cumulative effect", *Technovation*, Vol. 15 No. 8, pp. 511-22.

Lefebvre, L. and Lefebvre, E. (1993), "Competitive positioning and innovative effort in SMEs", *Small Business Economics*, Vol. 5 No. 4, pp. 297-305.

Lema, D. and Duréndez, A. (2007), "Managerial behaviour of small and medium-sized family businesses: an empirical study", *International Journal of Entrepreneurial Behaviour & Research*, Vol. 13 No. 3, pp. 151-72.

Levy, M., Loebbecke, C. and Powell, P. (2003), "SMEs, co-opetition and knowledge sharing: the role of information systems", *European Journal of Information Systems*, Vol. 12 No. 1, pp. 3-17.

Levy, M., Powell, P. and Yetton, P. (2001), "SMEs: aligning IS and the strategic context", *Journal of Information Technology*, Vol. 16 No. 3, pp. 133-44.

Liao, J., Welsch, H. and Stoica, M. (2003), "Organizational absorptive capacity and responsiveness: an empirical investigation of growth-oriented SMEs", *Entrepreneurship: Theory and Practice*, Vol. 28 No. 1, pp. 63-85.

Lipparini, A. and Sobrero, M. (1994), "The glue and the pieces: entrepreneurship and innovation in small-firm networks", *Journal of Business Venturing*, Vol. 9 No. 2, pp. 125-40.

Macpherson, A., Jones, O., Zhang, M. and Wilson, A. (2003), "Re-conceptualising learning spaces: developing capabilities in a high-tech small firm", *Journal of Workplace Learning*, Vol. 15 No. 6, pp. 259-70.

Macrì, D.M., Tagliaventi, M.R. and Bertolotti, F. (2001), "Sociometric location and innovation: how the social network intervenes between the structural position of early adopters and changes in the power map", *Technovation*, Vol. 21 No. 1, pp. 1-13.

Man, T.W.Y., Lau, T. and Chan, K.F. (2002), "The competitiveness of small and medium enterprises: a conceptualization with focus on entrepreneurial competencies", *Journal of Business Venturing*, Vol. 17 No. 2, pp. 123-42.

Mata, F.J., Fuerst, W.L. and Barney, J.B. (1995), "Information technology and sustained competitive advantage: a resource-based analysis", *MIS Quarterly*, Vol. 19 No. 4, pp. 487-505.

Meeus, M.T.H., Oerlemans, L.A.G. and Hage, J. (2001), "Patterns of interactive learning in a high-tech region", *Organization Studies*, Vol. 22 No. 1, pp. 145-72.

Minguzzi, A. and Passaro, R. (2001), "The network of relationships between the economic environment and the entrepreneurial culture in small firms", *Journal of Business Venturing*, Vol. 16 No. 2, pp. 181-207.

Mole, K.F., Ghobadian, A., O'Regan, N. and Liu, J. (2004), "The use and deployment of soft process technologies within UK manufacturing SMEs: an empirical assessment using logit models", *Journal of Small Business Management*, Vol. 42 No. 3, pp. 303-24.

Morel, B. and Ramanujam, R. (1999), "Through the looking glass of complexity: the dynamics of organizations as adaptive and evolving systems", *Organization Science*, Vol. 10 No. 3, pp. 278-93.

Morgan, A., Colebourne, D. and Thomas, B. (2006), "The development of ICT advisors for SME businesses: an innovative approach", *Technovation*, Vol. 26 No. 8, pp. 980-7.

Moss, L. and Atre, S. (2003), *Business Intelligence Roadmap*, Addison-Wesley, Reading, MA.

Naslund, D. and Newby, M. (2005), "ERP implementation: critical success factors and lessons learned from other organizational innovations", *Applied Computing and Informatics*, Vol. 3 No. 2.

Nguyen, T., Sherif, J. and Newby, M. (2007), "Strategies for successful CRM implementation", *Information Management & Computer Security*, Vol. 15 No. 2, pp. 102-15.

Oakey, R.P. and Cooper, S.Y. (1991), "The relationship between product technology and innovation performance in high technology small firms", *Technovation*, Vol. 11 No. 2, pp. 79-92.

Petts, J., Herd, A. and O'Heocha, M. (1998), "Environmental responsiveness, individuals and organizational learning: SMEs' experience", *Journal of Environmental Planning and Management*, Vol. 41 No. 6, pp. 711-30.

Phelps, R., Adams, R. and Bessant, J. (2007), "Life cycles of growing organizations: a review with implications for knowledge and learning", *International Journal of Management Reviews*, Vol. 9 No. 1, pp. 1-30.

Piccoli, G. (2008), *Information Systems for Managers*, Wiley, Hoboken, NJ.

Pittaway, L., Robertson, M., Munir, K., Denyer, D. and Neely, A. (2004), "Networking and innovation: a systematic review of the evidence", *International Journal of Management Reviews*, Vol. 5/6 No. 3, pp. 137-68.

Porter, M.E. (1998), "Clusters and the new economics of competition", *Harvard Business Review*, Vol. 76 No. 6, pp. 77-90.

Powell, P. (1992), "Information technology evaluation: is it different?", *The Journal of the Operational Research Society*, Vol. 43 No. 1, pp. 29-42.

Powell, T. and Dent-Micallef, A. (1997), "Information technology as competitive advantage: the role of human, business, and technology resources", *Strategic Management Journal*, Vol. 18 No. 5, pp. 375-405.

Preece, D. (1995), *Organizations and Technical Change: Strategy, Objectives, and Involvement*, Routledge, London.

Premkumar, G. (2003), "A meta-analysis of research on information technology implementation in small business", *Journal of Organizational Computing and Electronic Commerce*, Vol. 13 No. 2, pp. 91-121.

Premkumar, G. and Roberts, M. (1999), "Adoption of new information technologies in rural small businesses", *Omega*, Vol. 27 No. 4, pp. 467-84.

Proudlock, M., Phelps, B. and Gamble, P. (1999), "IT adoption strategies: best practice guidelines for professional SMEs", *Journal of Small Business and Enterprise Development*, Vol. 6 No. 3, pp. 240-52.

Rhodes, E. and Carter, R. (1998), "Electronic commerce technologies and changing product distribution", *International Journal of Technology Management*, Vol. 15 Nos 1/2, pp. 31-48.

Riemenschneider, C. and McKinney, V. (2001/2002), "Assessing belief differences in small business adopters and non-adopters of web-based e-commerce", *Journal of Computer Information Systems*, Vol. 42 No. 2, pp. 101-7.

Riemenschneider, C., Harrison, D. and Mykytyn, P. (2003), "Understanding IT adoption decisions in small business: integrating current theories", *Information and Management*, Vol. 40 No. 4, pp. 269-85.

Romano, A., Passiante, G. and Elia, V. (2001), "New sources of clustering in the digital economy", *Journal of Small Business and Enterprise Development*, Vol. 8 No. 1, pp. 19-27.

Rosenfeld, S.A. (1996), "Does cooperation enhance competitiveness? Assessing the impacts of inter-firm collaboration", *Research Policy*, Vol. 25 No. 2, pp. 247-63.

Rothwell, R. (1991), "External networking and innovation in small and medium-sized manufacturing firms in Europe", *Technovation*, Vol. 11 No. 2, pp. 93-112.

Sarasvathy, S. (2003), "Entrepreneurship as a science of the artificial", *Journal of Economic Psychology*, Vol. 24 No. 2, pp. 203-20.

Shelly, G., Cashman, T. and Rosenblatt, H. (2001), *Systems Analysis and Design*, 4th ed., Thompson, Pittsfield, MA.

Shin, I. (2006), "Adoption of enterprise application software and firm performance", *Small Business Economics*, Vol. 26 No. 3, pp. 241-56.

Siggelkow, N. and Levinthal, D. (2005), "Escaping real (non-benign) competency trap: linking the dynamics of organizational structure to the dynamics of search", *Strategic Organization*, Vol. 3 No. 1, pp. 85-115.

Simmie, J. (2002), "Knowledge spillovers and reasons for the concentration of innovative SMEs", *Urban Studies*, Vol. 39 No. 5, pp. 885-902.

Smith, A. and Whittaker, J. (1999), "Competence based management development provision to SMEs and the providers' perspective", *Journal of Management Development*, Vol. 18 No. 5, pp. 557-72.

Smith, M. (2007), "Real managerial differences between family and non-family firms", *International Journal of Entrepreneurial Behaviour & Research*, Vol. 13 No. 5, pp. 278-95.

Soh, C., Yap, C. and Raman, K. (1992), "Impact of consultants on computerization success in small businesses", *Information and Management*, Vol. 22 No. 5, pp. 309-19.

Southern, A. and Tilley, F. (2000), "Small firms and information and communication technologies (ICTs): toward a typology of ICTs usage", *New Technology, Work and Employment*, Vol. 15 No. 2, pp. 138-54.

Stanworth, J. and Gray, C. (1992), "Enterprise education: action-based research with training policy implication", *International Small Business Journal*, Vol. 10 No. 2, pp. 11-23.

Swift, R. (2001), *Accelerating Customer Relationships*, Prentice-Hall, Englewood Cliffs, NJ.

Taylor, D. and Pandza, K. (2003), "Networking capability: the competitive advantage of small firms", in Jones, O. and Tilley, F. (Eds), *Competitive Advantage in SMEs*, Wiley, Chichester, pp. 156-73.

Teece, D.J. (1992), "Competition, cooperation, and innovation: organizational arrangements for regimes of rapid technological progress", *Journal of Economic Behavior and Organization*, Vol. 18 No. 1, pp. 1-25.

Teece, D.J., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18 No. 7, pp. 509-33.

Thong, J. (1999), "An integrated model of information systems adoption in small businesses", *Journal of Management Information Systems*, Vol. 15 No. 4, pp. 187-214.

Thong, J. and Yap, C. (1995), "CEO characteristics, organizational characteristics and information technology adoption in small businesses", *Omega*, Vol. 23 No. 4, pp. 429-42.

Thong, J., Yap, C. and Raman, K. (1996), "Top management support, external expertise and information systems implementation in small businesses", *Information Systems Research*, Vol. 7 No. 2, pp. 248-67.

Thorpe, R., Holt, R., Macpherson, A. and Pittaway, L. (2005), "Using knowledge within small and medium-sized firms: a systematic review of the evidence", *International Journal of Management Reviews*, Vol. 7 No. 4, pp. 257-81.

Turban, E., Aronson, J.E. and Liang, T. (2005), *Decision Support Systems and Intelligent Systems*, 7th ed., Pearson Prentice-Hall, Englewood Cliffs, NJ.

Ward, T. (2004), "Cognition, creativity, and entrepreneurship", *Journal of Business Venturing*, Vol. 19 No. 2, pp. 173-88.

Watson, T.J. (2002), *Organising and Managing Work*, Prentice-Hall, Harlow.

Westhead, P. and Storey, D. (1996), "Management training and small firm performance: why is the link so weak?", *International Small Business Journal*, Vol. 14 No. 4, pp. 13-24.

Winter, S. (2003), "Understanding dynamic capabilities", *Strategic Management Journal*, Vol. 24 No. 10, pp. 991-5.

Yli-Renko, H., Autio, E. and Sapienza, H. (2001), "Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms", *Strategic Management Journal*, Vol. 22 Nos 6/7, Special Issue: Strategic Entrepreneurship: Entrepreneurial Strategies for Wealth Creation, pp. 587-613.

Zahra, S. and George, G. (2002), "Absorptive capacity: a review, reconceptualization, and extension", *Academy of Management Review*, Vol. 27 No. 2, pp. 185-203.

Zhang, M., McCullough, J. and Wei, R.Y. (2004), "Effects of organizational structure and information technology capability on organizational effectiveness in emerging markets", *Journal of the Academy of Business and Economics, (Online)*, January, available at: http://findarticles.com/ (accessed 30 October 2008).

Further reading

Buratti, N. and Penco, L. (2001), "Assisted technology transfer to SMEs: lessons from an exemplary case", *Technovation*, Vol. 21 No. 1, pp. 35-43.

Corresponding author

ThuyUyen H. Nguyen can be contacted at: T.Nguyen@tees.ac.uk